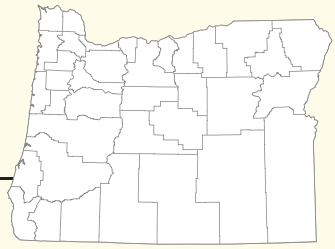
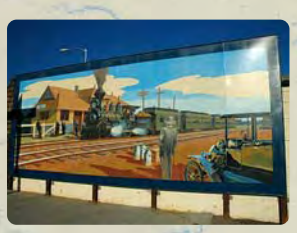
Malheur County

Multi-Jurisdictional Natural Hazard Mitigation Plan





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Malheur County

Multi-Jurisdictional Natural Hazards Mitigation Plan

Report for:

Malheur County, OR

And the incorporated cities of

Adrian, Jordan Valley, Nyssa, Ontario, and Vale

Prepared by:

The Oregon Natural Hazards Workgroup

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Special Thanks & Acknowledgements

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This Multi-Jurisdictional Natural Hazard Mitigation Plan was developed through a regional partnership funded by the Federal Emergency Management Agency's Pre-Disaster Mitigation Competitive Grant Program.[1] The Southeast Oregon Region grant was awarded to support the development of natural hazard mitigation plans for the region. The region's planning process utilized a four-phased planning process, plan templates and plan development support provided by the Oregon Natural Hazards Workgroup at the University of Oregon.

Regional partners include:

- Federal Emergency Management Agency Region 10
- Oregon Emergency Management
- Oregon Department of Geology and Mineral Industries
- Oregon Natural Hazards Workgroup at the University of Oregon's Community Service Center
- Resource Assistance for Rural Environments at the University of Oregon's Community Service Center
- Harney County
- Jefferson County
- Lake County
- Malheur County

[1] Grant: PDM-C-PL-10-OR—2005-003 Award Number: EMS-2005-PC-0004

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Executive Summary

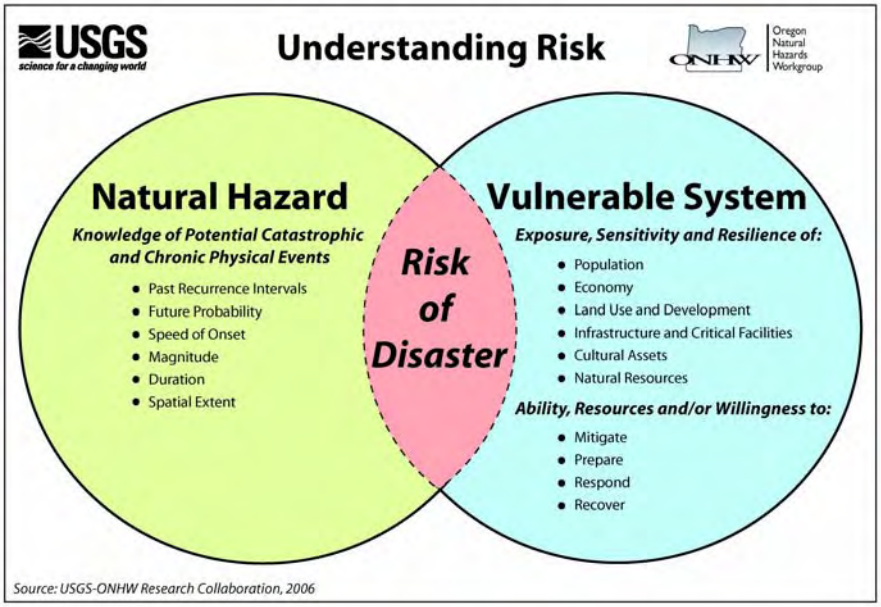
Malheur County developed this Multi-Jurisdictional Natural Hazard Mitigation Plan in an effort to reduce future loss of life and property resulting from natural disasters. It is impossible to predict exactly when these disasters will occur, or the extent to which they will affect the community. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from natural disasters.

Natural hazard mitigation is defined as a method of permanently reducing or alleviating the losses of life, property, and injuries resulting from natural hazards through long and short-term strategies. Example strategies include policy changes, such as updated ordinances, projects, such as seismic retrofits to critical facilities; and education and outreach to targeted audiences, such as Spanish speaking residents or the elderly. Natural hazard mitigation is the responsibility of individuals, private businesses and industries, state and local governments, and the federal government.

Why Develop this Mitigation Plan?

This natural hazards mitigation plan is intended to help Malheur County and its 5 incorporated cities (Adrian, Jordan Valley, Nyssa, Ontario, and Vale) reduce risks from natural hazards by identifying resources, information, and strategies for risk reduction. It will also help guide and coordinate mitigation activities throughout the community. The figure below is utilized throughout the plan to illustrate the concept of risk reduction.

Figure i.1 Understanding Risk



Source: Oregon Natural Hazards Workgroup, 2006

A natural hazard mitigation plan can help the community to understand what puts the community at risk. When a community can identify and understand the relationship between the natural hazards it faces, its vulnerable systems, and its existing capacity, it becomes

better equipped to identify and implement actions aimed at reducing the community's overall risk to natural hazards.

Who Participated in Developing the Plan?

In Fall 2005, the Oregon Natural Hazards Workgroup (ONHW) at the University of Oregon's Community Service Center partnered with the Department of Geology and Mineral Industries (DOGAMI) and the Southeast Oregon Region (Harney and Malheur as well as Jefferson and Lake Counties) to develop a Pre-Disaster Mitigation Planning Grant proposal. Each county joined the Partnership for Disaster Resistance and Resilience (*The Partnership*) by signing (through their County Commissions) a Memorandum of Understanding for this project. FEMA awarded the Southeast Oregon Region grant to support the development of the natural hazard mitigation plans for the four counties in the region[2]. ONHW, DOGAMI and the communities were awarded the grant in the Fall of 2005 and local planning efforts in this region began in the Fall of 2006.

The Malheur County Multi-Jurisdictional Natural Hazards Mitigation Plan is the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector and regional organizations. A RARE Participant was hired to serve as the plan Coordinator. A project steering committee guided the process of developing the plan. The steering committee was comprised of representatives from the following organizations.

- Ontario Police Department
- Malheur County Planning Department
- Oregon Department of Transportation
- Ontario Public Works Department
- Malheur County Road Department
- Oregon Natural Hazards Workgroup
- Malheur County Fire Department
- American Red Cross (Boise)
- Malheur County Court
- Vale Bureau of Land Management
- Malheur County Emergency Services
- Malheur Bell

The Malheur County Emergency Management Team was designated as the plan's convener and will take the lead in implementing, maintaining and updating the plan. Public participation played a key role in the development of goals and action items.

Over the entire course of the planning process (Phase I-IV), the Coordinator attended numerous meetings in the community (both county and city-specific organizations and teams) to 1) present and introduce the project; and 2) gather contacts, support, and information from the community. In addition, the Coordinator arranged to have periodic news stories published in local newspapers to announce the project and keep the public informed of its progress and ultimate completion. The Coordinator conducted interviews

[2] Grant: PDM-C-PL-10-OR—2005-003 Award Number: EMS-2005-PC-0004

with local stakeholders in government, nonprofit, and private sectors ("Stakeholder Interviews"); these individuals provided additional local expertise and information on hazards and community resilience and vulnerability factors. The Coordinator also presented the draft Plan to the public at the Malheur County Fair in the Public Safety Plaza.

What is the Plan's Mission?

The mission of the Malheur County Multi-Jurisdictional Natural Hazard Mitigation Plan is to:

…create a disaster resilient county by building partnerships, reducing risk, preventing loss, and protecting life, property, and the environment from future natural hazard events.

What are the Plan Goals?

The plan goals describe the overall direction that Malheur County agencies, organizations, and citizens can take toward mitigating risk from natural hazards. The format of the goals is as follows:

1. Protect Infrastructure, Safeguard Economy
   - Implement projects and activities to: lessen the impacts of natural hazards on infrastructure and property, protect the local economy, and reduce economic hardship in post-disaster situations.

2. Increase Education, Outreach, and Awareness
   - Implement education programs to increase awareness of hazards and risk-reduction practices for citizens, government, and business.

3. Strengthen Organizational and Community Capacity
   - Develop, strengthen, and sustain community partnerships among public and private sector stakeholders to build upon local resources for mitigation efforts.

4. Reduce the Threat to Life Safety
   - Minimize the threat to life in disaster events through mitigation activities that improve community notification and preparation.

5. Protect Natural and Cultural Resources
   - Strengthen land use planning and natural resource management to protect natural systems and allow them to serve mitigation functions; develop measures to protect cultural resources from natural hazard risks.

How are the Action Items Organized?

The action items are organized within an action matrix (located at the end of this Summary), which lists all multi-hazard and hazard-specific action items included in the mitigation plan. Data collection, research and the public participation process resulted in the development of actions. The Action Item Matrix portrays the overall plan framework and identifies linkages between the plan goals, and actions. The matrix documents a description of the action, the coordinating organization, the timeline, and the plan goals addressed.

- **Coordinating Organization:** The coordinating organization is the public agency with regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.
- **Internal Partners:** Internal partner organizations are departments within the community that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.
- **External Partners:** External Partner organizations can assist the community in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

The internal and external partner organizations listed in the mitigation plan are potential partners recommended by the project steering committee, but not necessarily contacted during the development of the plan. Partner organizations should be contacted by the coordinating organization to establish commitment of time and or resources to action items.

- **Timeline:** Action items include both short-term and long-term activities. Each action item includes an estimate of the timeline for implementation. *Short-term action items (ST)* are activities which city agencies are capable of implementing with existing resources and authorities within one to two years. *Long-term action items (LT)* may require new or additional resources or authorities and may take between one and five years to implement.
- **Plan Goals Addressed:** The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals following the implementation.

How will the plan be implemented?

The plan maintenance section of this document details the formal process that will ensure that the Malheur County Multi-Jurisdictional Natural Hazards Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a plan revision every five years. This section describes how the community will integrate public participation throughout the plan maintenance process. Finally, this section intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the Comprehensive Plan, Capital Improvement Plans, and Building Codes outlined in the Development Code.

Plan Adoption

The Malheur County Court, which is the local county government body, will be responsible for adopting the Malheur County Multi-Jurisdictional Natural Hazards Mitigation Plan and providing the support necessary to ensure plan implementation. Each of the 5 incorporated cities, all of whom completed city addendums for the plan, will also adopt the plan and provide support for city-specific actions. After the Plan is locally reviewed and deemed complete the Emergency Services Department will be responsible for submitting it to the State Hazard Mitigation Officer at Oregon Emergency Management. Oregon Emergency Management will then submit the Plan to the Federal Emergency Management Agency (FEMA – Region X) for review. This review will address the federal criteria outlined in FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA the County will

adopt the plan via resolution. At that point the County will gain eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and the Flood Mitigation Assistance program funds.

The success of the Natural Hazards Mitigation Plan depends on the maintenance of a competent Steering Committee, the incorporation of actions into existing plans and policies, and the continued support of community organizations. It is hereby directed that the appropriate county departments and programs implement and maintain the concepts in this Plan. Thorough familiarity with this Plan will result in the efficient and effective implementation of appropriate mitigation activities and a reduction in the risk and potential loss from future natural hazard events.

Malheur County NHMP Action Item Matrix

Action Item	Proposed Action Title	Jurisdiction	Coordinating Organization	Partner Organizations	Timeline	Alignment with Plan Goals				
						Protect Infrastructure, Safeguard Economy	Increase Education, Outreach, & Awareness	Strengthen Organizational & Community Capaci	Reduce the Threat to Life Safety	Protect Natural & Cultural Resources
D#1	Support the Malheur County Soil and Water Conservation District (SWCD) in its countywide water assessment project	COUNTY	SWCD	Irrigation Districts, Malheur Watershed Council, Owyhee Watershed Council	ST	X		X		X
D#2	Support the Malheur & Owyhee Watershed Councils' ongoing efforts to convert dirt irrigation canals into pipes	COUNTY	MWC, OWC	Irrigation Districts, Soil and Water Conservation District	ST	X		X		X
F#1	Update County and City floodplain ordinances	COUNTY	Planning	Ontario, Nyssa, Vale, Adrian, Jordan Valley, DLCD	ST	X			X	
F#2	Acquire flood-prone parcels near 36th St. bridge across the Malheur River	COUNTY	Planning	Road Dept, Emergency Services, Landowners	LT	X			X	X
F#3	Retrofit/modify 36th St. bridge and river channel to reduce repeated flood issues on the Malheur River	COUNTY	Planning	Emergency Services, Road Department, Army Corps of Engineers	LT	X			X	
F#4	Explore the potential for Malheur County to participate in the Community Rating System (CRS) of the National Flood Insurance Program (NFIP)	COUNTY, ALL CITIES		Planning, DLCD	LT	X	X	X	X	X
F#5	Implement stormwater improvement measures as identified in the 2003 City of Ontario Stormwater Master Plan	ONTARIO	Public Works	Planning	LT	X				
F#6	Identify flood-prone riverfront property for potential acquisition as part of the ongoing greenbelt space project	ONTARIO	Parks & Recreation	Planning, State Parks&Rec	ST				X	X
F#7	Conduct a Base Flood Elevation study on the area immediately surrounding the new I-84 overpass in Ontario	ONTARIO	Planning	County Planning, FEMA	ST	X			X	
F#8	Install USGS river gauges on Bully Creek and/or the Malheur River upstream of Vale	COUNTY, VALE		Boise NWS, Portland USGS	LT			X	X	
F#9	Obtain digital GPS floodplain maps for the county and cities	COUNTY, ALL CITIES	Planning	Cities, GIS, FEMA	ST		X	X		
F#10	Replace faulty flapper valve and head gate valve in storm drain near the city school bus shed	VALE	Public Works		LT	X				

Action Item	Proposed Action Title	Jurisdiction	Coordinating Organization	Partner Organizations	Timeline	Alignment with Plan Goals				
						Protect Infrastructure, Safeguard Economy	Increase Education, Outreach, & Awareness	Strengthen Organizational & Community Capaci	Reduce the Threat to Life Safety	Protect Natural & Cultural Resources
MH#1	Conduct Business Continuity Plan Development Workshops for small businesses and potentially local nonprofits and human services organizations	COUNTY, ALL CITIES		IBHS, ONHW, Malheur Community Services workgroup, Chambers of Commerce	LT		X	X		
MH#2	Work with Southeast Oregon Regional Food Bank to develop a plan/system for stocking and distributing emergency food boxes at all county food pantry locations for disaster situations	COUNTY	Southeast Oregon Regional Food Bank	Four Rivers Hunger Awareness and Prevention Coalition	LT		X	X		
MH#3	Develop an education program for Malheur County to raise awareness of natural hazards and potential mitigation activities	COUNTY, ALL CITIES	Malheur County Emergency Management Team		LT		X			
MH#4	Update the mission of the Malheur County Emergency Management Team to include the maintenance and review of the Natural Hazard Mitigation Plan	COUNTY	Emergency Management Team	County Court	ST			X		
MH#5	Identify historic structures that represent a significant cultural resource for the community, and identify mitigation to protect them from natural hazards	COUNTY, ALL CITIES		Oregon State Historic Presevation Office	LT	X			X	X
MH#6	Install arsenic removal equipment on municipal wells #7-9 to provide backup drinking water supply out of the floodplain	NYSSA	Public Works		ST	X		X	X	X
EQ#1	Inventory and identify critical facilities for seismic retrofit based on findings from the 2007 DOGAMI Seismic Assessment report	COUNTY, ALL CITIES	Emergency Management Team	Emergency Services, Planning	LT	X				
EQ#2	Research opportunities for a seismic study of Antelope Reservoir	COUNTY	Jordan Valley Irrigation District	DOGAMI, Idaho Geology	LT	X				X
SW#1	Acquire 35 kW generator to serve as a backup power source for the city of Jordan Valley's municipal well	JORDAN VALLEY	Public Works	Idaho Power	ST	X		X	X	

Action Item	Proposed Action Title	Jurisdiction	Coordinating Organization	Partner Organizations	Timeline	Alignment with Plan Goals				
						Protect Infrastructure, Safeguard Economy	Increase Education, Outreach, & Awareness	Strengthen Organizational & Community Capaci	Reduce the Threat to Life Safety	Protect Natural & Cultural Resources
SW#2	Replace primary electrical overhead lines to mountaintop communication services with underground lines.	COUNTY	Harney Electric Cooperative	Malheur County, Lake County, Harney County, Companies which are served by the utility and the utility company	LT	X				
SW#3	Shorten spans and anchor poles on utility lines in high wind or heavy icing areas.	COUNTY	Harney Electric Cooperative	Malheur County, Lake County, Harney County	LT	X				
WF#1	When complete, review and incorporate mitigation actions from the Malheur County Community Wildfire Protection Plan into the NHMP	COUNTY	Emergency Services	BLM, County Court, Emergency Management Team	ST		X	X		
LS#1	Reinforce the hillside underneath Nyssa's water storage tank to prevent erosion and a possible landslide and tank collapse	NYSSA	Public Works	Landowners	LT	X			X	

Section 1
Introduction

What is Natural Hazard Mitigation?

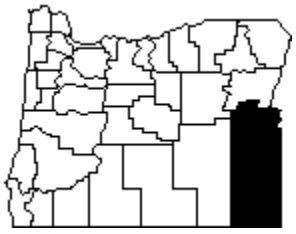
Natural hazard mitigation is defined as permanently reducing or alleviating the losses of life, property and injuries resulting from natural hazards through long and short-term strategies. Example strategies include policy changes, such as updated ordinances; projects, such as seismic retrofits to critical facilities; and education and outreach to targeted audiences, such as Spanish speaking residents or the elderly. Mitigation is the responsibility of individuals, private businesses and industries, state and local governments, and the federal government.[i]

Engaging in mitigation activities provides jurisdictions with a number of benefits, including reduced loss of life, property, essential services, critical facilities and economic hardship; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.

Why Develop a Mitigation Plan?

Malheur County and its 5 incorporated cities of Ontario, Vale, Nyssa, Adrian, and Jordan Valley developed this Natural Hazards Mitigation Plan in an effort to reduce future loss of life and property resulting from natural disasters. It is impossible to predict exactly when these disasters will occur, or the extent to which they will affect the county. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens, it is possible to minimize the losses that can result from natural disasters.

Natural disasters occur as a predictable interaction among three broad systems: the natural environment (e.g., climate, river systems, geology, etc.), the built environment (e.g., cities, buildings, utilities, etc.), and societal systems (e.g. cultural institutions, community organizations, business climate, etc.). A natural disaster occurs when a natural hazard impacts the built environment or societal systems and creates adverse conditions within a community.[ii]



This plan focuses on the primary natural hazards that could affect Malheur County, Oregon, which include flooding, wildfire, drought, severe weather, seismic activity (earthquakes), volcanic activity, and landslides. These hazards pose differing levels of risk for the community; the focus of the plan's mitigation actions is therefore on the county's highest priority hazards, but all have the potential to occur and cause damage.

The dramatic increase in the costs associated with natural disasters over the past decades has fostered interest in identifying and implementing effective means of reducing communities' vulnerability to hazards. A report submitted to Congress by the National Institute of Building Science's Multi-hazard Mitigation Council (MMC) highlights that for every dollar spent on mitigation, society can expect an average savings of $4.[iii] This Natural Hazards Mitigation Plan is intended to assist Malheur County in reducing its risk from natural hazards by identifying resources, information, and strategies for risk reduction.

The plan is strategic and non-regulatory in nature, meaning that it does not set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the County and its jurisdictions; (2) identification and prioritization of mitigation activities; (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other County plans and programs, including comprehensive plans for the

County and cities, the County's Emergency Operations Plan, and efforts by local community organizations.

The plan provides a set of actions to prepare for and reduce the risks posed by natural hazards through education and outreach programs, the development of partnerships, and the implementation of preventative activities such as land use planning programs, development of floodplain ordinances for all jurisdictions, structural retrofits for critical facilities, and wildland-urban interface fire protection measures. The actions described in the plan are intended to be implemented through existing plans and programs within the County, with the support of local government and local community organizations. Because the 5 incorporated cities in Malheur County have limited resources and rely on the county for certain services and public facilities, the actions identified in this plan are considered multi-jurisdictional actions because they benefit both the County and participating cities.

Policy Framework for Natural Hazards in Oregon

Planning for natural hazards is an integral element of Oregon's statewide land use planning program, which began in 1973. All Oregon cities and counties have comprehensive plans and ordinances that are required to comply with the statewide planning goals.

Statewide land use planning Goal 7: *Areas Subject to Natural Hazards* calls for local plans to include inventories, policies and ordinances to guide development in or away from hazard areas. Goal 7, along with other land use planning goals, has helped to reduce losses from natural hazards. Through risk identification and the recommendation of risk-reduction actions, this plan aligns with the goals of Malheur County's comprehensive plan and helps each jurisdiction in the County meet the requirements of statewide land use planning Goal 7. Malheur County's comprehensive plan includes its own Goal 7 – "NATURAL DISASTERS AND HAZARDS: To protect life and property from natural disasters and hazards." For more details on the goals of the County and cities' comprehensive plans, refer to Section 2.

The primary responsibility for the development and implementation of risk reduction strategies and policies lies with local jurisdictions. However, resources exist at the state and federal levels. Some of the key agencies in this area include Oregon Emergency Management (OEM), Oregon Building Codes Division (BCD), Oregon Department of Forestry (ODF), Oregon Department of Geology and Mineral Industries (DOGAMI), and the Department of Land Conservation and Development (DLCD).

The Disaster Mitigation Act of 2000 (DMA 2000) is the latest federal legislation addressing mitigation planning. It reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. As such, this Act established the Pre-Disaster Mitigation (PDM) grant program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP). Section 322 of the Act specifically addresses mitigation planning at the state and local levels. State and local communities must have approved mitigation plans in place in order to qualify to receive post-disaster HMGP funds. Mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to the individual communities and their capabilities.

How was the Plan Developed?

In Fall 2005, the Oregon Natural Hazards Workgroup (ONHW) at the University of Oregon's Community Service Center partnered with the Department of Geology and Mineral Industries (DOGAMI) and the Southeast Oregon Region (Harney and Malheur as well as Jefferson and Lake) counties to develop a Pre-Disaster Mitigation Planning Grant proposal. Each county joined the Partnership for Disaster Resistance and Resilience (The Partnership) by signing (through their County Commissions) a Memorandum of Understanding for this project. FEMA awarded the Southeast Oregon Region a grant to support the development of the natural hazard mitigation plans for the four counties in the region. ONHW, DOGAMI and the participating communities were awarded the grant in Fall 2005 and local planning efforts in this region began in Fall 2006.

ONHW provided participating communities with print and web-based resources and facilitated a quarterly series of plan development work sessions that focused on the four phases of the mitigation planning process. In addition, ONHW also provided communities with a number of regional mitigation products to be utilized in the local process. Those products include:

- Plan Templates;
- Training Manual;
- Regional Profile and Risk Assessment; and
- Household Preparedness Survey Report.

DOGAMI provided communities with updated risk assessment data to be utilized in the local planning process. DOGAMI's efforts include updating the Regional Risk Assessment of the State Natural Hazard Mitigation, completion of the HAZUS model for earthquake losses, and identification of existing state and federal hazards data on the region.

Each community was responsible for facilitating and coordinating the mitigation planning process locally, utilizing the resources provided by ONHW, DOGAMI and other state partners. The community reviewed the resources provided by the various organizations and applied local knowledge, information and data about community characteristics, assets and resources in order to identify potential mitigation actions aimed at reducing the community's overall risk. To aid in these actions, the County worked with the University of Oregon's Community Service Center to hire a full-time Resource Assistance for Rural Environments (RARE) participant to coordinate the planning process. This person (Sarah Hackney, also referred to in this document as "the Coordinator") was thus responsible for utilizing local and ONHW resources and facilitating all Plan-related meetings and workshops, in addition to primary drafting of the local elements of the Plan.

The planning process and associated resources used to create Malheur County's Natural Hazards Mitigation Plan were developed by the Community Service Center's Oregon Natural Hazards Workgroup (ONHW) at the University of Oregon.[iv] The planning process was designed to: (1) result in a plan that is DMA 2000 compliant; (2) coordinate with the State's plan and activities of the partners for Disaster Resistance and Resilience; and (3) build a network of jurisdictions and organizations that can play an active role in plan implementation. The planning process included the review and incorporation, if appropriate, of existing plans, studies, reports and technical information. In general, the following regional resources were reviewed and local resources have been cited throughout the plan.

- State of Oregon Natural Hazard Mitigation Plan – Regional Profiles and Hazard Assessments;
- Oregon Technical Resource Guide;
- Oregon Natural Hazards Workgroup Training Manual;
- The Oregon Atlas;
- The Oregon Weather Book;
- Malheur County Comprehensive Plan;
- City of Ontario Comprehensive Plan;
- City of Ontario Public Safety Master Plan;
- Malheur County Emergency Operations Plan;
- Malheur County Transportation Systems Plan;
- City of Ontario Stormwater Master Plan;
- City of Nyssa Comprehensive Plan;
- City of Adrian Comprehensive Plan;

- City of Vale Comprehensive Plan;
- City of Jordan Valley Comprehensive Plan; and
- Region 5 Household Preparedness Survey Report.

The following is a summary of major activities included in the Malheur County planning process.

Phase I: Getting Started

This section describes the specific planning activities that took place during the first quarter of the plan development process. This includes several outreach activities that occurred over the course of the planning process (as specified below).

- *Identifying and Engaging Stakeholders*
    - The Coordinator utilized local resources (interviews, meetings, existing documents, membership lists from local organizations, etc) to compile a list of local stakeholders.
    - As recommended by ONHW, the Coordinator worked with the County Planning Director (Jon Beal) and Emergency Services Commander (Craig Smith) to use the initial stakeholder list to identify individuals with significant local expertise for a Steering Committee (SC). Members were sought from diverse backgrounds and with relevant professional experience. The Coordinator used telephone, email, and in-person communication to solicit participation in the Steering Committee.

      Steering Committee members:

        - Mark Alexander, Ontario Police Dept Captain
        - Jon Beal, Malheur Co Planning Dept Director
        - Norm Collins, ODOT
        - Tom Davis, Ontario Public Works
        - Ken Freese, Malheur Co Road Dept
        - Sarah Hackney, RARE/Project Coordinator
        - Terry Mairs, Malheur Co Fire Chief
        - Jodie Marshall, American Red Cross (Boise)
        - Jim Nakano, Malheur County Court
        - Jason Simmons, Vale BLM
        - Craig Smith, Malheur Co Emergency Services Cmdr
        - Jimmy Todd, Malheur Bell (business)
    - The Coordinator met with representatives from each incorporated city in the county to provide information about the planning process and to encourage their voluntary participation. Each city decided to complete a plan addendum to the County's Plan. Addendums are included in Volume III.

      Cities with completed addendums:

        - Ontario
        - Vale
        - Nyssa
        - Adrian
        - Jordan Valley

- *Involving the Community in the Planning Process*

  This planning process involved significant community input. See Volume IV, Appendix A, for a detailed description of outreach activities. The bullet points below provide an overview of community involvement efforts.

  - Over the entire course of the planning process (Phase I-IV), the Coordinator attended numerous meetings in the community (both county and city-specific organizations and teams) to present and introduce the project and gather contacts, support, and information from the community.
    - Owyhee Watershed Council Assessment Committee
    - Malheur Watershed Council
    - Rail Lands Committee
    - GIS Development Committee
    - Planning Commission
    - County Court
    - Kiwanis of Ontario
    - Lions Club of Ontario
    - Chamber of Commerce of Ontario
    - Malheur Co Fire Chiefs
    - United Methodist Women
    - Four Rivers Hunger Awareness Coalition
    - Malheur Community Services Committee
    - Malheur Co Emergency Management Team
    - Four Rivers Healthy Community
    - Four Rivers Trails & Greenbelt Committee
  - The Coordinator arranged to have periodic news stories published in the Argus Observer, the Malheur Enterprise, and the Owyhee Avalanche to announce the project and keep the public informed of its progress and ultimate completion (Phase I-IV).
  - The Coordinator conducted interviews with local stakeholders in government, nonprofit, and private sectors ("Stakeholder Interviews") during all four phases of the planning process. Stakeholders provided local expertise and information on hazards and community resilience and vulnerability factors. See the Stakeholder Interview documentation in Volume IV, Appendix A for a full list of stakeholders,, including interview summaries and a description of the interview process.
  - The Coordinator developed and distributed a set of informational materials on the planning process to members of the public.
  - The County's project webpage, located on the Partners for Disaster Resistance and Resilience website (www.OregonShowcase.org), served as an outreach tool to the community. The webpage was used to provide local contact information and updates on the planning process. The final adopted and approved plan will be posted on the Partnership website via the University of Oregon Libraries' Scholar's Bank Digital Archive.

- As part of the regional PDM grant, ONHW implemented a region-wide household preparedness survey. The survey gauged household knowledge of mitigation tools and techniques and assessed household disaster preparedness. The survey results improve public/private coordination of mitigation and preparedness for natural hazards by obtaining more accurate information on household understandings and needs. Results of the survey are documented in an independent report in Volume IV, Appendix E.

Phase II: Risk Assessment

The plan's risk assessment is documented in three individual components within the plan. First, the community's vulnerability (in terms of community assets and resources at risk as well as existing capabilities to address mitigation) is documented in Section 2 – Community Sensitivities and Resilience. Second, hazards impacting the community are identified and profiled in Section 3 – Risk Assessment Summary. Third, each hazard addressed in the plan has an accompanying hazard annex which includes information on hazard specific ordinances, plans or studies, after-incident reports, and any relevant hazard maps that may be available.

The community utilized a 3-step process to conduct the risk assessment as recommended by the Oregon Technical Resource Guide.

- *Risk Assessment Step 1: Hazard Identification*
  - The first phase, hazard identification, involves identification of the geographic extent of a hazard, its intensity, and its probability of occurrence.
  - Hazard identification information came from three main sources:
    - Steering Committee (SC) members
    - Local stakeholders
    - Federal, state, county, and city records and resources
  - The Coordinator consulted via email with the SC to review the county hazard rankings as submitted to the state Oregon Emergency Management department. These were compared with the state hazard mitigation plan hazard rankings and local knowledge to produce a list of prioritized hazards. (See documentation of the April 17, 2007 SC meeting for further information on this event, Volume IV, Appendix A)
  - The Coordinator worked with the SC and other local stakeholders to gather all available local historical hazard data for the county, which is included in the Risk Assessment and Hazard Annexes.
  - The Coordinator worked with state and federal offices to gather any hazard and risk assessment data from their records.
  - The Coordinator consulted local planning documents such as the Malheur County Comprehensive Plan and Emergency Operations Plan to determine what hazards were included as risks in those plans.
- *Risk Assessment Step 2: Vulnerability Assessment*
  - The second phase, vulnerability assessment, combines the information from the hazard identification with an inventory of the existing (or planned) property and population exposed to a hazard, and attempts to predict how different types of property and population groups will be affected by the hazard.
  - The Coordinator facilitated a workshop with the SC in which the committee developed a list of community resources, community assets, and community vulnerabilities which might be affected by or involved in the mitigation of natural hazards.

- At the SC workshop mentioned above, SC members used county- and city-scale maps to locate critical infrastructure and community assets.
- In Stakeholder Interviews, the Coordinator queried individuals regarding known community vulnerabilities to natural hazards.

- *Risk Assessment Step 3: Risk Analysis*
  - The third phase, risk analysis, involves estimating the damage, injuries, and costs likely to be incurred in a geographic area over a period of time. Risk has two measurable components: (1) the magnitude of the harm that may result, defined through the vulnerability assessment, and (2) the likelihood or probability of the harm occurring.
  - Because of limited availability of quantitative digital data for vulnerability and for hazards, most communities in Oregon are unable to fully develop Step 3. The same is true for Malheur County.
  - DOGAMI conducted HAZUS runs for estimated seismic event risks and losses in Malheur County. This information is available in the Seismic Hazard Annex.

Phase III: Developing a Mission, Goals and Action Items

Development of the mission, goals, and action items for the Plan was done collaboratively by the Coordinator with input from public stakeholders and the Steering Committee.

- *The Mission*
  - Input from Stakeholder Interviews, Steering Committee meetings, and ONHW training sessions, including local priorities and emphases, was synthesized by the Coordinator into a Plan mission statement draft. This draft was then reviewed by the Steering Committee via email. The Coordinator incorporated committee members' comments and suggestions on content, wording, and emphasis, and the final version was approved and adopted by the Steering Committee in its second meeting.
- *Goals*
  - Input from Stakeholder Interviews, Steering Committee meetings, and ONHW training sessions was synthesized by the Coordinator into a draft set of Plan goals. Additionally, the Coordinator sought to ensure that Plan goals aligned with the community's mitigation priorities as identified in interviews and meetings. These draft goals were presented to the Steering Committee. Comments and revision suggestions from this meeting were incorporated into the goals and sent out for a second review via email. All suggested changes or corrections were made and became part of the final set of Plan goals.
- *Action Items*
  - The Coordinator led the effort to collect and document action item ideas, disperse action worksheets to stakeholders and organizations, and ultimately draft action item worksheets to present to the Steering Committee for review. Action item (AI) input was gathered through stakeholder interviews, Steering Committee meetings, jurisdiction-specific city addendum meetings, and during public presentations throughout the community made by the Coordinator. The Steering Committee was charged with the selection of draft action items to document in the plan and with providing valuable local feedback on the priority and feasibility of each draft AI.

    Two action items proposed by the Harney Electric Cooperative are also included in the Malheur County Action Item list. The Harney Electric Cooperative is the convener of the Harney County Natural Hazards Mitigation Plan. The Harney Electric Cooperative identified natural hazard issues with the Harney County Mitigation Steering committee, but their issues included service areas that extend into Lake and Malheur County. To address

these issues, the actions identified in the Harney County Mitigation Plan have also been included in Lake and Malheur's County Plans. Due to limited staff, the Harney Electric Cooperative could not participate in the planning process for all three counties. Instead they identified their issues with the Harney County Mitigation Steering Committee, which followed the same planning process as Malheur County.

Phase IV: Plan Implementation and Maintenance

Malheur County and the 5 cities created a plan maintenance schedule and an implementation process for the regional Natural Hazard Mitigation Plan.

- *Plan Implementation*
  - ONHW developed strategies for plan implementation, monitoring, and evaluation; these strategies were designed to fit with FEMA's approval and implementation guidelines, and were adopted by the Steering Committee. The Coordinator also communicated this information to each participating jurisdiction that completed a city addendum.
- *Plan Maintenance*
  - The Coordinator worked with the Steering Committee during its final meeting to establish an annual plan maintenance schedule and discuss the above implementation strategies as recommended by ONHW. The Coordinator also communicated this information to each participating jurisdiction that completed a city addendum.

How is the Plan Organized?

Each section of the mitigation plan provides specific information and resources to assist readers in understanding the hazard-specific issues facing Malheur County citizens, businesses, and the environment. Combined, the sections work in synergy to create a mitigation plan that furthers the community's mission to create a disaster resilient county by building partnerships, reducing risk, preventing loss, and protecting life, property, and the environment from future natural hazard events. This plan structure enables stakeholders to use the section(s) of interest to them.

Natural Hazard Mitigation Plan

Section 1: Introduction

The Introduction briefly describes the County and jurisdictions' mitigation planning efforts and the methodology used to develop the plan.

Section 2: Community Sensitivity and Resilience

This section documents the community's sensitivities – those community assets and characteristics that may be impacted by natural hazards, as well as community resilience – the ability to manage risk and adapt to hazard event impacts. Examples of community sensitivity factors include human populations, the local economy, critical facilities and infrastructure, cultural and historic resources, and environmental assets. Community resilience factors include existing plans, policies, programs or community organizations that influence a community's character, governance or growth trends.

Section 3: Risk Assessment Summary

This section describes the risk assessment process and summarizes the best available local hazard data. A hazard summary is provided for each of the hazards addressed in the plan. The summary includes hazard history, location, extent, probability and previous mitigation efforts.

Section 4: Mission, Goals and Action Items

This section documents the plan, vision, mission, goals, and actions and also describes the components that guide implementation of the identified mitigation strategies.

Section 5: Plan Maintenance

This section provides information on the implementation and maintenance of the plan. It describes the process for prioritizing projects, and includes a suggested list of tasks for updating the plan to be completed at the annual and 5-year review meetings.

Hazard-Specific Annexes

The purpose of the hazard-specific annexes is to provide additional resources and documentation of the hazard. Where extensive local data is available beyond the scope of information provided in Section 3, the additional local data is placed in the annex. The hazard specific annexes included with this plan are the following:

- Flood
- Drought
- Wildfire
- Severe Weather (winter storm, windstorm, thunderstorm/hail)
- Earthquake
- Landslide
- Volcanic Event

City-Specific Addendums

Each participating jurisdiction (Ontario, Vale, Nyssa, Adrian, and Jordan Valley) worked with the Coordinator to develop a city-specific addendum which describes in full any risk and resilience factors particular to the jurisdiction.

Resource Appendices

The resource appendices are designed to provide the users of the Malheur County Multi-Jurisdictional Natural Hazard Mitigation Plan with additional information to assist them in understanding the contents of the mitigation plan, and provide them with potential resources to assist with plan implementation.

Appendix A: Planning and Public Process

This appendix includes documentation of all the public processes utilized to develop the plan. It includes the Coordinator's Community Outreach Plan, invitation lists, agendas, sign-in sheets, and summaries of Steering Committee meetings as well as any other public involvement methods.

Appendix B: Economic Analysis of Natural Hazards Mitigation Projects

This appendix describes the Federal Emergency Management Agency's (FEMA) requirements for benefit cost analysis in natural hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities. This appendix was developed by the Community Service Center's Oregon Natural Hazards Workgroup (ONHW) at the University of Oregon. It has been reviewed and accepted by the Federal Emergency Management Agency as a means of documenting how the prioritization of actions shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

Appendix C: Existing Plans, Policies and Programs

This appendix describes plans and policies already in place in Malheur County and on the state level that already address mitigation in some form in the county, in addition to serving as potential tools for future mitigation projects.

Appendix D: Resource Directory

This appendix serves as a directory of potentially useful mitigation resources on a local, state, and federal level. It includes contact information where applicable.

Appendix E: Regional Household Preparedness Survey and Report

This appendix includes the survey instrument and results from the household preparedness survey implemented by ONHW throughout the region. The survey aims to gauge household knowledge of mitigation tools and techniques to assist in reducing the risk and loss from natural hazards, as well as assessing household disaster preparedness.

Independent Reports Referenced

The following reports were utilized to develop portions of the mitigation plan. These reports are not included as appendices to this mitigation plan, as they are either a component of the State's approved enhanced mitigation plan or an independent report developed by partner agencies. They are described here to give the reader an overview of their contents and explanation of their applicability to the project.

Regional Profile and Risk Assessment

This report was developed by the Community Service Center's Oregon Natural Hazards Workgroup at the University of Oregon. This report serves as the nexus between the State Natural Hazard Mitigation Plan and local plans. A component of the State Plan, the report is utilized by local communities to identify specific issues locally and to develop potential action items. Communities review and update the data in the report based on their best available local data. The updates are then incorporated into the State Plan, creating a state level plan that is built upon information and data from the local level. Using the best available data, the regional profile includes a *Demographic Profile* that discusses the population in the region, an *Infrastructure Profile* that addresses the region's critical facilities and systems of transportation and power transmission, and an *Economic Profile* that discusses the scale and scope of the regional economy with a focus on the key industries. In addition to describing characteristics and trends, each profile section identifies the traits that indicate sensitivity to natural hazards.

This report also includes the regional risk assessment that describes historical impacts, general location, extent, and severity of past natural hazard events as well as the probability of future events. This information is aggregated at the regional level and provides counties with a baseline understanding of past and potential natural hazards. These assessments were based on best available data from various state agencies related to historical events, repetitive losses, county hazard analysis rankings, and general development trends. The risk assessment was written in 2003 by the Community Service Center's Oregon Natural Hazards Workgroup at the University of Oregon as part of the State Natural Hazards Mitigation Plan.

DOGAMI Regional Risk Assessment Study

The Oregon Department of Geology and Mineral Industries (DOGAMI) provided counties with regional summaries of the flood, landslide, earthquake and volcanic hazards. Earthquake Risk studies, portraying potential damage and losses, are also provided to help identify areas of critical need. These critical needs are the basis of the action items identified for risk reduction in each county.

Oregon Technical Resource Guide

This guide provides information on how to identify, plan for, and address natural hazards. It also directs local governments to additional resources and information that may be needed to solve local problems. It presents a broad range of resources for understanding and implementing effective land use plans and natural hazard ordinances at the local level. Finally, the guide also highlights a number of land use tools and techniques currently used in Oregon communities to implement hazard mitigation strategies.

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[i] Massachusetts Department of Environmental Management. 1999. "Hazard Mitigation: Managing Risks, Lowering Costs. http://www.state.ma.us/dem/programs/whatis.htm Accessed 8/2/02

[ii] LeDuc, A. "Establishing Mitigation as the Cornerstone for Community Resilience," 2006 Risk Management Yearbook, Public Entity Risk Institute. Fairfax, VA.

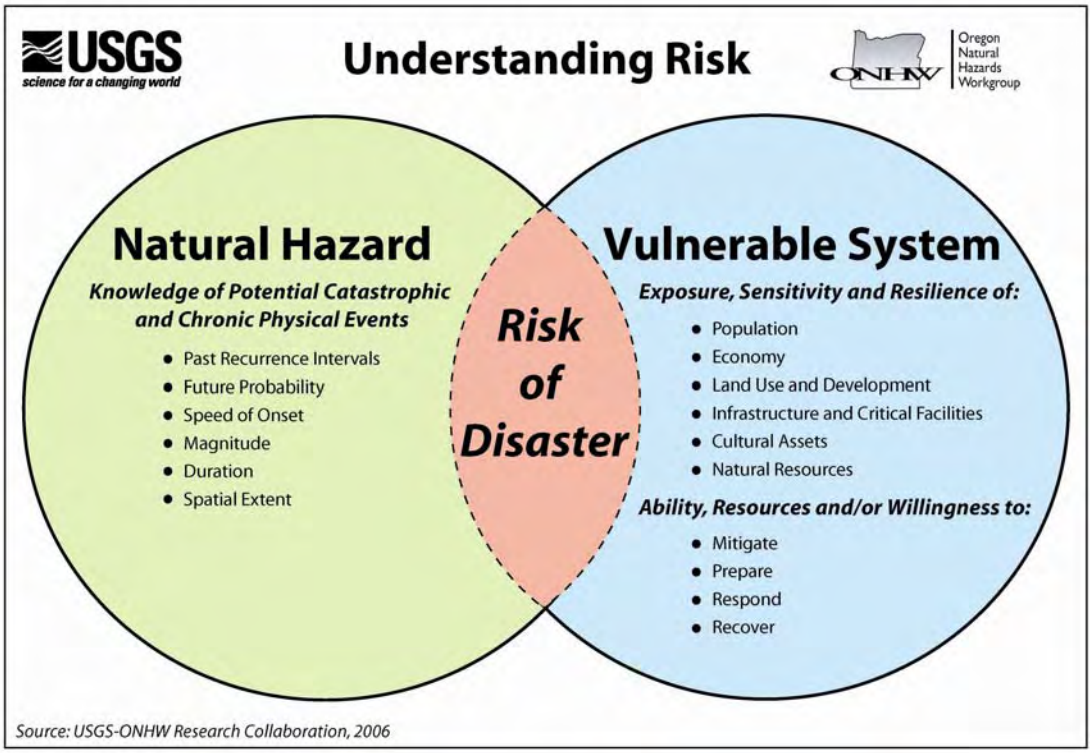
[iii] National Institute of Building Science's Mutli-hazard Mitigation Council. "Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities" 2005.

[iv] More information on the Oregon Natural Hazards Workgroup can be found at http://www.oregonshowcase.org/onhw

Section 2
Community Sensitivity and Resilience

This section documents the community's sensitivity factors, or those community assets and characteristics that may be impacted by natural hazards, (e.g., special populations, economic factors, and historic and cultural resources). It also identifies the community's resilience factors, or the community's ability to manage risk and adapt to hazard event impacts (e.g., governmental structure, agency missions and directives, and plans, policies, and programs). The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the community when the plan was developed. The information documented below, along with the findings of the risk assessment, should be used as the local level rationale for the risk reduction actions identified in Section 4 – Mission, Goals, and Action Items. The identification of actions that reduce a community's sensitivity and increase its resilience assist in reducing the community's overall risk, or the area of overlap in Figure 2.1 below.

Figure 2.1 Understanding Risk



Source: Oregon Natural Hazards Workgroup, 2006.

Community Sensitivity Factors

The following table documents the key community sensitivity factors in Malheur County, as developed by the Steering Committee in February 2007. This list includes assets which are known to be vulnerable to natural hazards (certain bridges, roads, etc) and assets which may not currently be at high risk for natural hazard damage but which are documented here for the record. Some city-specific information, as identified in Steering Committee meetings, is included here. City-specific sensitivity factors, as identified in City meetings, are located in the City Addendums, Volume III.

Population
• County demographics include a high concentration of elderly (14%), poor (18.2% below the poverty line), and non- or limited-English-speaking (9%) vulnerable populations. • As a whole the county is experiencing very slow growth (0.6% increase 2000-2005) but with future growth projected to be slightly brisker (40% increase from 2000 numbers by 2040). • Highest population density is in Ontario (pop. 11,245). The cities of Nyssa (3,163), Vale (1,976), and Adrian (147) are all located within 20 miles of Ontario. The only other incorporated city in the county is Jordan Valley (239), 84 miles to the south. There are small population clusters in several unincorporated areas as well. • There is a Paiute Indian reservation near McDermitt on border between Nevada and OR. Most of reservation is located in NV. • Ontario, Nyssa, Vale have assisted living facilities. • Many rural unincorporated communities are remote and lack such infrastructure as gas stations, grocery stores, hospitals, fire departments, and emergency shelters. They are dependent on Ontario and several cities in Idaho for many resources and supplies. • At least 800 independent or partially independent disabled persons live in the county, in addition to those needing full-time care. • Much of the housing stock is old (39% pre-1959) or otherwise vulnerable (19% mobile homes). • Rural residents have resilient attitudes and are often well-prepared with generators, food, equipment (tractors, etc) to compensate for lack of city/county resources in remote areas. Additionally, residents in rural communities are tight-knit and frequently share resources when needs arise among neighbors. • The LDS (Mormon) church has an extensive emergency preparedness network among its members. • Local area churches have a network (Love, INC) for distributing supplies to families in need, but are not equipped to respond in major emergencies. • Daytime population in Ontario is significantly higher than its residential population – from about 32,000 up to 40-70,000, some from elsewhere in the county and some from Idaho; most drive personal vehicles in for working and commerce. • Daytime population in Ontario also includes high number of transitory individuals – e.g. motorists and commercial truck drivers – due to its location on I-84 and Highway 20. If I-84 closes due to severe weather, every motel in the region fills up, in addition to the one major

freight truck stop. The county/Ontario is not equipped to house significant numbers of stranded motorists.

- Snake River Correctional Institute – the state's largest prison, it steadily operates at its capacity population of nearly 3,000 inmates.
- Tourism – there are large concentrations of individuals in remote parts of the county with limited road access during hunting, fishing seasons.
- Tourism – large numbers of individuals visit the county for rodeos, fairs, and festivals from May – August.
- Southeast Oregon Regional Food Bank serves every city in the county in addition to some unincorporated areas with 1 warehouse, 4 food pantries, and 2 affiliated meal sites. Sites stock some emergency-use food (FEMA boxes, canned goods) but not in significant quantities.
- Treasure Valley Community College - 1,000 full time students, some residential, from ID and OR, in addition to several thousand extended learning students.
- The county sex offender population is a potential disaster safety risk, as it would be a challenge to keep track of them in the event of an evacuation or in shelters to ensure child safety.
- All residents are dependent on highways and personal vehicles for transportation – there is no public transportation system. Many seniors and disabled individuals unable to drive have limited transportation options, relying on family, taxi service, or sporadic senior center van service.

Economic Assets

- Heavily agriculture/ranching-based economy with many interconnected parts: small businesses support agriculture and ranching – seeds, supplies, machinery repair and supply, veterinary services, local banks and credit unions, etc. If farmers have a bad year, the whole system has a bad year – ex. If there is a drought or other industry-wide issue, profits go down across the entire agricultureal community. Most farmers and ranchers are self-employed.
- North Ontario – new interstate interchange is under construction and will spur development – truck stop, big box stores, residential, etc. Much of this area is in the 100-year floodplain of the Snake River.
- Lots of businesses are on/near the freeway and depend on that traffic.
- Railroad – the Union Pacific line through Ontario is a major freight line. It can have problems in the event of fire or winter storms and the economic costs of an inoperable railroad line are high.
- Significant economic ties to Idaho: the local economy depends on Idaho shoppers/commuters in addition to Oregon residents. 30% of workers in Malheur County commute from Idaho.
- Many communications and utility services – including electric, television/cable, TV stations, radio stations, and some newspaper coverage – are based in Idaho.

Major employers in the county:

- County government ~175
- ORE-IDA Co. processing plant ~1100
- Eagle Picher mine and processing plant ~60
- Snake River Correctional Institute ~1000
- Oregon Trail Mushroom plant ~100
- School system ~500
- Treasure Valley Community College ~260
- Holy Rosary Medical Center ~480
- Bureau of Land Management, Vale Dist. ~90 full-time, ~700 seasonal
- Amalgamated Sugar – was ~600 in Nyssa, now down to ~50
- Cattle Feedlots – several large operations in county (figure unavailable)
- ~8000 total jobs in Ontario area, many are part-time or seasonal
- Many part-time or seasonal positions are in the agriculture industry: onion harvesting and packing, etc. These numbers are down in recent years due to automation and increasing reliance on technology.

Cultural and Historic Assets

HISTORIC FEATURES

(Items with a star (*) are listed on the National Register of Historic Places.)

There are 24 historic buildings in the county listed in the 1976 State of Oregon Inventory of Historic Sites and Buildings, in addition to several landmarks. The full 1976 list is available on file in the Malheur County Planning Department Hazard Mitigation File. Key buildings and sites as identified by the Steering Committee and all sites on the National Historic Register are listed below; this list includes both city and county landmarks. City historic landmarks are also included in the city addendums:

- Basque pelota fronton (ball playing court) (Jordan Valley)*
- Historic train depots (Nyssa and Ontario)*
- Native American artifacts on BLM range and wildlands (unincorporated)
- Rinehart Old Stone House museum (Vale)*
- Local history museum (Nyssa)
- Sheep ranch and fortified house (Arock; unincorporated)*
- Jean Baptiste Charbonneau gravesite and memorial (near Danner; unincorporated)*
- Historic cemeteries – Malheur City, Beulah, Juntura (unincorporated)
- Three Forks – site of historic army and pioneer wagon road routes (unincorporated)
- Historic Post Office building (Westfall; unincorporated)
- Boulevard Grange building (Ontario)
- Historic rural ranches (unincorporated)
- Birch Creek Ranch Historic Landscape (near Jordan Valley; unincorporated)*
- Blackaby House (Ontario)*
- First Bank of Vale (Vale)*
- Green Lantern Saloon (Nyssa)*
- Hart Stone House and Ranch (Westfall; unincorporated)*
- Hotel Western (Nyssa)*
- Oregon Trail Historic District (Vale)*
- Al Thompson's Feed and Seed Co. Building (Nyssa)*
- Vale Drug Store (Vale)*
- Vale Hotel and Grand Opera House (Vale)*
- Vinsonhaler Blacksmith Shop (Nyssa)*

CULTURAL RESOURCES

(These assets are for all-county or unincorporated areas only; for city-specific assets, please see

the city addendums)

- Owyhee Dam and its "Glory Hole"
- Four Rivers Cultural Center and its museum
- Treasure Valley Community College
- Oregon State University Agricultural Experiment Station
- THE OREGON TRAIL: informational plaques and landmarks, highway waysides, trail markers, wagon ruts at Keeney Pass, etc
- Malheur County Fairgrounds (in Ontario)

NATURAL WONDERS

- Leslie Gulch and surrounding area
- Malheur Butte
- Succor Creek canyon
- The Owyhee Breaks
- Thundereggs (geode rocks) in Nyssa
- Hole in the Ground
- Hot Springs – Bully Creek, Owyhee, Snively
- The Honeycombs
- Pillars of Rome
- Jordan Craters
- Owyhee Reservoir
- Cow Lakes

EVENTS

- Basque culture and events
- Japanese culture and events
- Seasonal festivals and community events
- Malheur County Fair
- Rodeos – Vale, Jordan Valley, Nyssa, Ontario, McDermitt

Critical Facilities & Infrastructure

ROADS

- Major: I-84, Hwy 95, 20, 26, 201, 78 all are major regional arteries; state highway 95 is the second-most traveled state highway in Oregon and the only major highway that connects to the city of Jordan Valley. Significant tourist and long-haul truck traffic travels Interstate 84 and state highway 20 as well.
- If major roads must be closed for hazard reasons (winter storm, etc), few alternate routes exist, especially in remote parts of county.
- Road districts – Malheur County, plus 4 special districts (Ontario, Nyssa, Juntura, Ironside)
- Some county roads are too narrow for safe travel for large fire equipment, and many dirt and gravel roads are not suitably graded for heavy traffic.
- Lytle Road, main access road for Owyhee Dam, is narrow and prone to rockfall and washouts in severe weather. It is also the only dam access road during winter and spring.
- County vulnerability - in the event of a long-term power outage, pumping gas would be problematic, as most pumps in county are electric and do not have generators. Critical county vehicles (fire engines, etc) do not keep significant reserves of fuel on hand.

BRIDGES AND RAILROADS

- The opening underneath the 36th street bridge is too narrow to let floodwaters and debris pass, thus acting as a bottleneck when the Malheur River is at flood stage. According to the Army Corps of Engineers, the bridge remains structurally sound.
- Lytle Blvd aka Lake Owyhee Rd – Dam access road is insufficient for heavy traffic and dangerous for large vehicles (no guard rails, very narrow).

IRRIGATION

- Overall the entire system is old and vulnerable to chronic damages as a result of severe weather, flood, and wildfire events.
- There is currently no comprehensive map or record of the county-wide irrigation system in its entirety; this makes pinpointing trouble areas and prioritizing repairs difficult on a system-wide scale.
- Multiple irrigation districts across the county (16) have jurisdiction over separate areas.
- Owyhee Dam forms Owyhee Reservoir, which provides full irrigation water supply to over 105,000 acres and supplemental supply to 13,000 acres of farm land; 78% of this land is in Oregon, the remainder is in Idaho. There are numerous other dams in the county – they are crucial for agriculture and to mitigate flood and drought hazards.
- Several dams in Idaho also affect water supply (and flood/drought conditions) in the county: Sheriff's Office has a list and copies of emergency plans for each.

WATER TREATMENT

- Each city (Ontario, Nyssa, Vale, Adrian and Jordan Valley) has its own water treatment facility.
- Residents outside of city limits use septic systems.

COMMUNICATIONS

- BLM + county + cities – can all switch their radios and communication systems if one goes down in an emergency situation.
- BLM – has its own weather stations.
- National Weather Service does weather reporting (including to weather radios located with city and county police) and has weather observation stations and water level gauges located throughout the county; would like another gauge for better flood warning on the Malheur River.
- One municipal airport (Ontario), in addition to smaller airstrips across the county (1 in Vale, proposed site near Jordan Valley).
- Malheur Bell (primary telecommunications provider) has copper and fiber optic lines for telecommunications and backup generators/priority restoration plans for critical communication lines.

OTHER

- No Red Cross shelters/infrastructure for cities or county.
- New armory being built as of 2007– will be bigger, and have good facilities for a community emergency shelter.
- BLM has management infrastructure in most communities – mobile offices, storage units, fire equipment, etc.
- Oil and natural gas transportation lines pass through the county; these aren't known to be located in hazardous areas and are generally away from cities.
- Fiber optics lines for telecommunications are in place along Highways 20, 26, and 201 throughout the county.
- Holy Rosary Medical Center serves the entire county. There are smaller health clinics in each incorporated city (except for Adrian), in addition to reduced-fee or free services for migrant workers and low-income populations.

Natural Resources

- 4.5 million acres of public lands
- 1.2 million acres of Wilderness Study Areas
- 12-17,000 acres of Wildland-Urban Interface areas
- Communities at Risk (in WUI): 14 (4 incorporated, 10 unincorporated)
- Four major rivers: Snake, Malheur, Owyhee, Payette
- Owyhee River is designated Wild and Scenic from its source to the Owyhee Dam.
- County watersheds are overseen by the Malheur Watershed Council and Owyhee Watershed Council.
- Natural Resources Conservation Service and Soil and Water Conservation District both have county offices in Ontario.

STATE PARKS

- Lake Owyhee State Park
- Succor Creek State Park
- Ontario State Park

COUNTY PARKS

- Bully Creek recreation area

CITY PARKS

- See city addendums.

BLM

- Multiple public campgrounds
- Day-use recreation sites
- Boat ramps, raft launch sites

MINES

- Eagle Picher Mine
- Westfall Mine

Land Use and Development
• The majority of the county is sparsely populated, with just over half of the county's population living in one of the 5 incorporated cities and the other half spread out across the rest of the county. • Four of the five incorporated cities in the county are located in the northeastern corner of the county, and all 5 cities are within 30 miles of the Idaho border. • Development is concentrated in the Ontario area, partially as a result of rapid growth throughout the greater Treasure Valley, which stretches from Boise, ID to Ontario. • Land use in the county is predominantly ranching: most BLM land is under grazing permits. The next biggest land uses are agriculture (irrigated) and mining. • 71% of the county is BLM land.

Community Resilience Factors

The following documents the key community resilience factors in Malheur County, including a description of the local government's structure, existing plans and policies, and community organizations and programs. Details on relevant jurisdiction-specific information are included in the city addendums.

On an overall note, as noted in the Community Sensitivity Factors, rural residents have resilient attitudes and are often well-prepared with generators, food, equipment (tractors, etc) to compensate for lack of city/county resources in remote areas. This fact does not replace the need for effective hazard mitigation strategies in remote parts of the County, but it is a sentiment that the community brought up consistently in the planning process and is documented here as a general resilience factor for the County.

Government Structure

The following are county departments that had a role in the creation of the Plan and that are responsible for disaster mitigation in the county, according to the Malheur County Emergency Operations Plan.

- County Court
- Emergency Services / Sheriff's Office
- Planning Department
- Road Department

County Court

Malheur County is one of the few Oregon counties with a County Judge who sits as the chair of the three-person Commission. The County Judge is full-time and the two commissioners are two-fifths time. The County Court is not a court of law and has no jurisdiction over legal concerns, however, the County Judge has the authority to preside over probate matters and perform weddings. According to the county's Emergency Operations Plan, County Court has the overall responsibility in any emergency situation.

County Court Commissioner Jim Nakano sat on the Plan Steering Committee.

Emergency Services / Sheriff's Office

The Malheur County Sheriff is the Emergency Manager for the County of Malheur. The Sheriff has assigned the coordination of county emergency services to the Emergency Services Division of the Sheriff's Office, which is comprised of one full-time director, the Emergency Services Commander. The ES Commander is responsible for all county emergency management, preparedness, and response activities in addition to 911 and communications systems. The ES Commander also facilitates monthly meetings with the 30+ member County Emergency Management Team, which has representatives from key county and city offices in addition to private sector and nonprofit representatives.

Emergency Services Commander Lt. Craig Smith sat on the Plan Steering Committee.

Planning Department

The Malheur County Planning Department has three positions: Planning Director, Assistant Planning Director, and Planning Clerk. The department administers state and county land use regulations and acts as staff for the County planning commission to ensure the County complies with state land use statutes. The staff assists citizens in submitting applications for zoning permits, conditional uses, site development reviews, zoning changes, and other land use actions for submission to the planning commission. The planning department staff conducts land use hearings before the planning commission and the Malheur County Court. The Planning Director is the county floodplain manager and administers the county's floodplain ordinance.

Planning Director Jon Beal sat on the Plan Steering Committee. Department staff reviewed Plan drafts and assisted the Coordinator in gathering local hazard information from local stakeholders by providing contacts and information resources.

Road Department

In Malheur County, public roads are built and maintained by a combination of the State, the County, incorporated cities, the BLM, and Road Assessment Districts. The four Road Assessment Districts are special districts with taxing authority that were created for road maintenance. They are responsible for county roads within their districts, which surround Ontario, Nyssa, Juntura, and Ironside. The County Road Department is responsible for over 1000 miles of county roads lying outside of the Road Districts. The County Road Department is not part of the County's General Fund and does not receive any local property taxes. The Road Department consists of 4 special funds: Road Fund, Major Bridge Fund, Equipment Fund, and Improvements Fund. The Road Districts have their own taxing authority in addition to the state money the county passes on to them. They can levy up to 1/4 of a percent (2.5 mils) of property value within their district each year if their board so chooses. They can also levy up to another 1/4 percent with the approval of the voters in the district.

Malheur County Roadmaster Ken Freese sat on the Plan Steering Committee.

Other Departments

The following county departments play a secondary role in advising and assisting in county hazard mitigation activities. They were involved in the hazard mitigation planning process by providing local information and technical assistance for the plan. Departments marked with a star (*) are also mentioned in the County Emergency Operations Plan as departments with a role in mitigation operations.

- Environmental Health
- Economic Development
- Assessor*
- Health Department*

- Regional Watermaster
- GIS staff

Existing Plans & Policies

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from local residents, businesses and policy makers, and can adapt to changing conditions and needs.

The Natural Hazards Mitigation Plan includes a range of recommended action items that, when implemented, will reduce the County's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the County's existing plans and policies. Linking existing plans and policies to the Plan helps identify what resources already exist that can be used to implement the action items identified in the Plan, in addition to increasing the likelihood of support for mitigation action items and maximizing community resources.

The following are existing plans and policies already in place within the community. A table further defining each of these plans has been included in Appendix (C).

Malheur County

- Emergency Operations Plan
- Comprehensive Plan
- Zoning Ordinances, including Flood Hazard Building Regulations
- Building Regulations (administered by private contractor Inspections, Inc. for all new construction in the County)
- Transportation System Plan
- NFIP Flood Insurance Rate Maps (FIRM)*

City of Ontario

- Comprehensive Plan
- Zoning Ordinances, including Flood Hazard Overlay Zone
- Public Safety Master Plan
- Stormwater Master Plan
- Building Regulations (the city of Ontario is the only city in the County which does its own building inspections)
- NFIP Flood Insurance Rate Maps (FIRM)*

City of Nyssa

- Comprehensive Plan
- Zoning Ordinances, including Flood Plain Zoning District

- Building Regulations (administered by private contractor Inspections, Inc.)
- NFIP Flood Insurance Rate Maps (FIRM)*

City of Vale

- Comprehensive Plan
- Floodplain Ordinance
- Building Regulations (administered by private contractor Inspections, Inc.)
- NFIP Flood Insurance Rate Maps (FIRM)*

City of Adrian

- Comprehensive Plan
- Floodplain Ordinance
- Building Regulations (administered by private contractor Inspections, Inc.)
- NFIP Flood Insurance Rate Maps (FIRM)*

City of Jordan Valley

- Comprehensive Plan
- Floodplain Ordinance
- Building Regulations (administered by private contractor Inspections, Inc.)
- NFIP Flood Insurance Rate Maps (FIRM)*

** Note: County and city FIRM maps have not been updated since 1986 and are in need of updating and digitization. In 2003, the Federal Emergency Management Agency (FEMA) initiated a Flood Map Modernization Program (FMMP). The goal of the national FMMP was to upgrade flood hazard data and mapping to create a more accurate digital product that would improve floodplain management across the country. In 2008, FEMA was scheduled to begin upgrading flood hazard data in Eastern Oregon. Funds, however, are not expected to continue. Communities that are able to demonstrate significant need, and/or are able to provide accurate topological data, road maps, base elevation measurements, and a description of populations at-risk will be more competitive in acquiring a portion of the remaining funds. See Section 3: Risk Assessment, Flood Hazard for more information.*

Community Organizations and Programs

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low

income). The County can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on a number of issues, one of which could be natural hazard preparedness and mitigation.

The following organizations are a sampling of those active within the community which will be potential partners for implementing mitigation actions. A table further describing the County's social service providers and community organizations is included in Appendix C.

- American Red Cross
- Chamber of Commerce (Ontario, Nyssa, Vale)
- Civic Orgs (Elks, Rotary, Kiwanis, Lions)
- Commission on Children & Families
- Four Rivers Healthy Community
- Hospital (Holy Rosary Medical Center (HRMC)
- Irrigation Districts (Vale, Owyhee)
- Newspaper (Argus Observer)
- Southeastern Oregon Regional Food Bank
- Treasure Valley Community College (TVCC)
- Watershed Council (Malheur)
- Watershed Council (Owyhee)

Methods for organizational involvement are as follows:

- Education and outreach – organization could partner with the community to educate the public or provide outreach assistance on natural hazard preparedness and mitigation.
- Information dissemination – organization could partner with the community to provide hazard-related information to target audiences.
- Implementation – organization may have plans and/or policies that may be used to implement mitigation activities or the organization could serve as the coordinating or partner organization to implement mitigation actions.

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by the community in an effort to reduce the community's overall risk to natural hazards. Documenting these efforts can assist the community in better understanding its risk and can assist in documenting successes. The list below consists of countywide efforts; city-specific mitigation activities are listed in the city addendums.

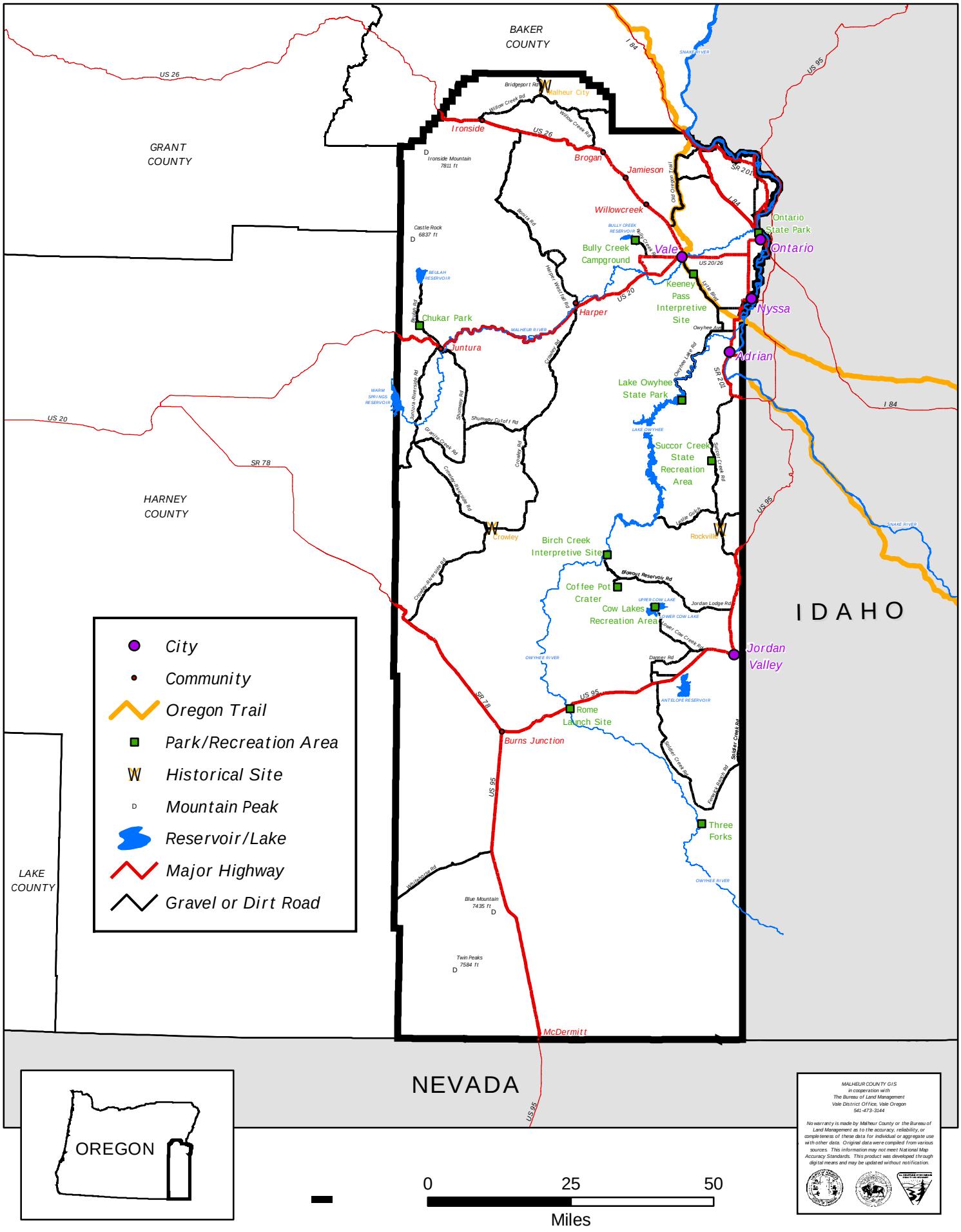
Note: OEM has not documented any state- or federally-funded mitigation projects in Malheur County (neither pre-disaster nor recovery mitigation).

- **Malheur County Planning Department**
  - Flood Hazard Building Regulations – Regulate development on floodplain areas within the county.

- **Malheur County Emergency Services**
  - Emergency Management Team – The EMT was created to foster cooperation and communication between the county, its cities, and local organizations involved in disaster response, recovery, preparedness, and mitigation. The EMT meets monthly and runs "Table Top" hypothetical disaster scenarios at each meeting to encourage teamwork and strategizing about response and recovery tactics in various situations.
- **Bureau of Land Management (BLM Vale Branch)**

  Because 71% of Malheur County is managed by the BLM, its mitigation projects have the potential to positively impact both the natural and human environment in the county. This is a summary of some of the BLM's mitigation projects in the county.
  - Fuels Reduction – Treatments have occurred in various parts of the county for cheatgrass and juniper.
  - Native grass restoration – several projects in the county are underway to re-seed native grasses, which lengthens the natural fire cycle.
  - Fire Breaks – BLM has created fire breaks along the Wildland-Urban Interface in Rome and Arock.
  - Community Assessment Reports (2002) – Comprehensively assessed fire risk and outlined mitigation activities for each community in the county.
- **Malheur & Owyhee Watershed Councils**
  - Ongoing conversion of earthen irrigation canals to sealed pipeline, reducing evaporation and contamination and mitigating drought.
- **Four Rivers Healthy Community**
  - Development of a Greenbelt Master Plan for the City of Ontario, including acreage along the Malheur and Snake Rivers that will serve as a flood mitigation action by preventing development in highly flood-prone areas along these rivers. The first phase of this project, the Malheur River Loop, is scheduled for completion in August 2007.

MALHEUR COUNTY



Section 3
Risk Assessment Summary

The foundation of the Malheur County Multi-Jurisdictional Natural Hazards Mitigation Plan is the risk assessment. Risk assessments provide information about the areas where the hazards may occur, the value of existing land and property in those areas, and an analysis of the potential risk to life, property, and the environment that may result from natural hazard events.

This section identifies and profiles the location, extent, previous occurrences, and future probability of natural hazards that can impact the community. The information in this section was paired with the information in Section 2 – Community Sensitivity and Resilience during the planning process in order to identify issues and develop actions aimed at reducing the community's risks.

In addition to local data, the information here relies upon the Regional Risk Assessment in the State Natural Hazard Mitigation Plan and the Department of Geology and Mineral Industries (DOGAMI) regional risk assessment study completed as part of the larger planning initiative. Additionally, detailed information on existing policies, programs and reports for each hazard are included in the individual hazard annexes located at the end of the plan.

This summary focuses on county-wide risk information. For details on city-specific risks, see the 5 jurisdiction addendums. As a general rule, most hazards affect cities in similar ways as they affect the County, but not always. The addendums for the 5 incorporated cities include any available information on jurisdiction-specific risks and areas where county and city risks may differ.

This summary provides an assessment of the risks from the following hazardous events for the County:

Flood

Drought

Wildfire

Severe Weather (Winter Storms, Windstorms, Thunderstorms/Hail)

Seismic events

Landslides

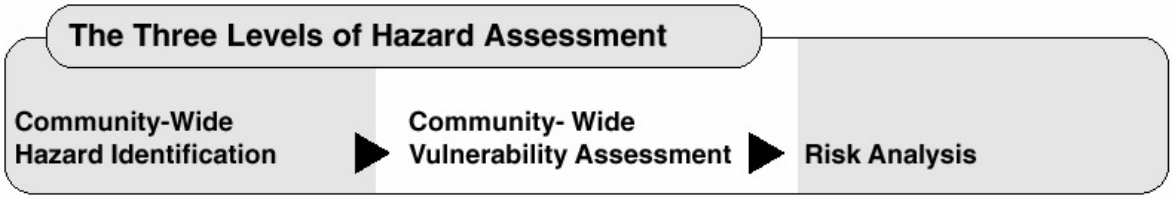
Volcanic eruption

Note: While all of the above hazards are profiled in this section in regards to their risk to the community, not all hazards have identified cost-effective hazard-specific action items; these rely instead on a multi-hazard education and outreach approach as the most cost-effective means of mitigation at this time. Hazards without hazard-specific action items are: *landslides, volcanic eruption, and some types of severe weather*. More information on each case can be found in the specific hazard summaries below.

What is a Risk Assessment?

A risk assessment consists of three phases: hazard identification, vulnerability assessment, and risk analysis, as illustrated below:

Figure 3.1 The Three Phases of a Risk Assessment



Source: Planning for Natural Hazards: Oregon Technical Resource Guide

The first phase, hazard identification, involves identification of the geographic extent of a hazard, its intensity, and its probability of occurrence. This level of assessment typically involves producing a map. The outputs from this phase can also be used for land use planning, management, and regulation; public awareness; defining areas for further study; and identifying properties or structures appropriate for acquisition or relocation.[i]

The second phase, vulnerability assessment, combines the information from the hazard identification with an inventory of the existing (or planned) property and population exposed to a hazard, and attempts to predict how different types of property and population groups will be affected by the hazard. This step can also assist communities to justify changes to building codes or development regulations, property acquisition programs, policies concerning critical and public facilities, taxation strategies for mitigation risk, and informational programs for members of the public who are at risk.[ii]

The third phase, risk analysis, involves estimating the damage, injuries, and costs likely to be incurred in a geographic area over a period of time. Risk has two measurable components: (1) the magnitude of the harm that may result, defined through the vulnerability assessment, and (2) the likelihood or probability of the harm occurring. An example of a product that can assist communities in completing the risk analysis phase is HAZUS, a risk assessment software program for analyzing potential losses from floods, hurricane winds and earthquakes. In HAZUS-MH current scientific and engineering knowledge is coupled with the latest geographic information systems (GIS) technology to produce estimates of hazard-related damage before or after a disaster occurs.

This three-phase approach to developing a risk assessment should be conducted sequentially because each phase builds upon data from prior phases. However, gathering data for a risk assessment need not occur sequentially.

Hazard Summary

This section provides an overview of the risk assessments for the natural hazards affecting Malheur County. For additional information on each hazard, see Hazard Annexes located in Volume II.

Some of the hazard description text comes from the Hazard Chapters of Oregon's Natural Hazard Mitigation Plan and the Oregon Technical Resource Guide.

Please note that information on the community's probability and vulnerability rankings in each table, listed as either, high, moderate, or low, comes from a 2007 analysis of risk conducted by county emergency services and public safety staff for Oregon Emergency Management and for this plan.

Members of the Steering Committee worked with the Coordinator to prioritize natural hazard risks. An initial e-mail discussion led to the development of a preliminary ranking:

HIGH: flood, wildfire, drought, severe weather
MODERATE: seismic events
LOW: landslides, volcanic

These preliminary rankings were followed by a second, formal assessment. As part of the planning process and based in part on this plan's hazard risk assessment, members of the Steering Committee met with the Coordinator and the county Emergency Services Commander to re-evaluate the County's probability and vulnerability rankings for 2007. These rankings, developed using risk assessment information and local knowledge, are listed as high, moderate, or low.

The probability and vulnerability scores in the hazard summaries below address the likelihood of a future major emergency or disaster within a specific period of time, as follows:

High = One incident likely within a 10 to 35 year period.
Moderate = One incident likely within a 35 to 75 year period.
Low= One incident likely within a 75 to 100 year period.

The vulnerability scores address the percentage of population or regional assets likely to be affected by a major emergency or disaster, as follows:

High = More than 10% affected.
Moderate = 1-10% affected.
Low = Less than 1% affected.

Each hazard profile also includes a "hazard risk rating," which has a maximum score of 240. This score is a composite of a given hazard's history, probability, maximum threat, and vulnerability. The full hazard matrix for each natural hazard is included in Volume II, Hazard Annexes. The hazard analysis methodology presented above was developed by the Oregon Emergency Management Agency. A more detailed summary of the methodology can be found in Volume II, Hazard Annexes.

Drought Summary

Drought can be defined in several ways. The American Heritage Dictionary defines drought as "a long period with no rain, especially during a planting season." Another definition of drought is a deficiency in surface and sub-surface water supplies. In socioeconomic terms, drought occurs when a physical water shortage begins to affect people, individually and collectively, and the area's economy. Drought is typically measured in terms of water availability in a defined geographical area. Droughts are not just a summertime phenomenon; winter droughts can have impacts that stretch into warmer months. Below average snowfall in higher elevations reduces available spring and summer water availability for irrigation, recreation, and industrial uses.

Impacts

All of Oregon is susceptible to drought conditions, but this hazard is a particularly significant risk in Malheur County due to its limited annual rainfall and economic reliance on agriculture and ranching, both of which are heavily dependent on water supply and a complex network of irrigation systems and dams spread throughout the county. The major effects of drought are economic in nature, affecting not only farmers but also trickling down to businesses, banks, and municipalities that serve and are supported by the agricultural community.

Oregon climate Zone 9 occupies the southeast corner of the state and comprises the entirety of Malheur County. With the exception of a few high-elevation mountain areas, Zone 9 receives low amounts of precipitation; the majority of the region averages less than 15 inches of precipitation per year. Valleys near the unincorporated communities of Rome and Burns Junction are the driest, averaging 7.62 and 8.04 inches per year, respectively.[iii]

Drought is a normal, recurrent feature of climate, one experienced frequently in the arid high desert of southeastern Oregon. It is a temporary condition, but its effects can accumulate slowly and last from several months to several years, even well after the termination of the drought itself. Because of this characteristic of drought, it can be difficult to fully quantify the impact of drought upon communities. Additionally, estimating drought probability and frequency is difficult: Oregon lacks long historic databases for drought, many variables contribute to the weather behavior that causes drought, and different regions are affected to varying degrees of severity based on natural features and human infrastructure.

Drought can affect all segments of a jurisdiction's population, particularly those employed in water-dependent activities (e.g., agriculture, hydroelectric generation, recreation, etc.). Also, domestic water-users may be subject to stringent conservation measures (e.g., rationing) and could be faced with significant increases in electricity rates. Facilities affected by drought conditions include irrigation systems, storage systems for potable water, sewage treatment facilities, water storage for firefighting, and hydroelectric generating plants (there are none in Malheur County but several on the Snake River just to the north of the county, which affects the region's power and water supply).

There also are environmental consequences. A prolonged drought in forests promotes an increase of insect pests, which in turn, damage trees already weakened by a lack of water. A moisture-deficient forest or grassland constitutes a significant fire hazard (see the Wildfire summary). In addition, drought and water scarcity add another dimension of stress to species listed pursuant to the Endangered Species Act (ESA) of 1973.

Most agricultural land in the county is irrigated, and in drought conditions irrigation pumping can be restricted to manage low flow conditions. The Owyhee Reservoir, created by Owyhee Dam, serves as the largest source of irrigation water for agricultural lands in the county. Reservoir capacity information is available in the Drought Hazard Annex (some reservoir information is also located in the Flood Hazard Annex) in Volume II. Ranching land (mostly BLM-managed), which comprises

the majority of the county's land use, is not irrigated, and livestock depend on water sources (including natural waterways and built reservoirs and wells) that can disappear in drought conditions.

Once drought conditions have been established, Oregon communities may request government assistance. The mechanism to trigger federal or state assistance is contained in the following definition as presented in the state *Drought Annex*:

"The Legislative Assembly finds that an emergency may exist when a severe, continuing drought results in a lack of water resources, thereby threatening the availability of essential services and jeopardizing the peace, health, safety, and welfare of the people of Oregon."

Locally, farmers may apply for assistance only when the state has declared the County a disaster area. The process for such a declaration is as follows: local County Court passes a resolution declaring the County to be in a "State of Drought Emergency," which is sent to the state Department of Agriculture for review. If the Department deems the County's production losses sufficient, it will request that the Governor designate the County a disaster area, making local farmers eligible for emergency loans and other assistance from the USDA Farm Service Agency. To receive assistance, farmers must provide documentation of crop losses and typical yields; additionally, they are only eligible for funds if this documentation reveals a 35% or greater loss in production due to drought.

Comprehensive cost estimates for droughts in Malheur County are not kept on record, but a county-wide drought declaration can incur $500,000 – 5,000,000 dollars in disaster assistance payments for farmers from the USDA. Most farmers in the county do not carry drought insurance, according to the USDA Farm Service Agency. The following chart represents the best available information on drought and its agricultural costs to Malheur County.

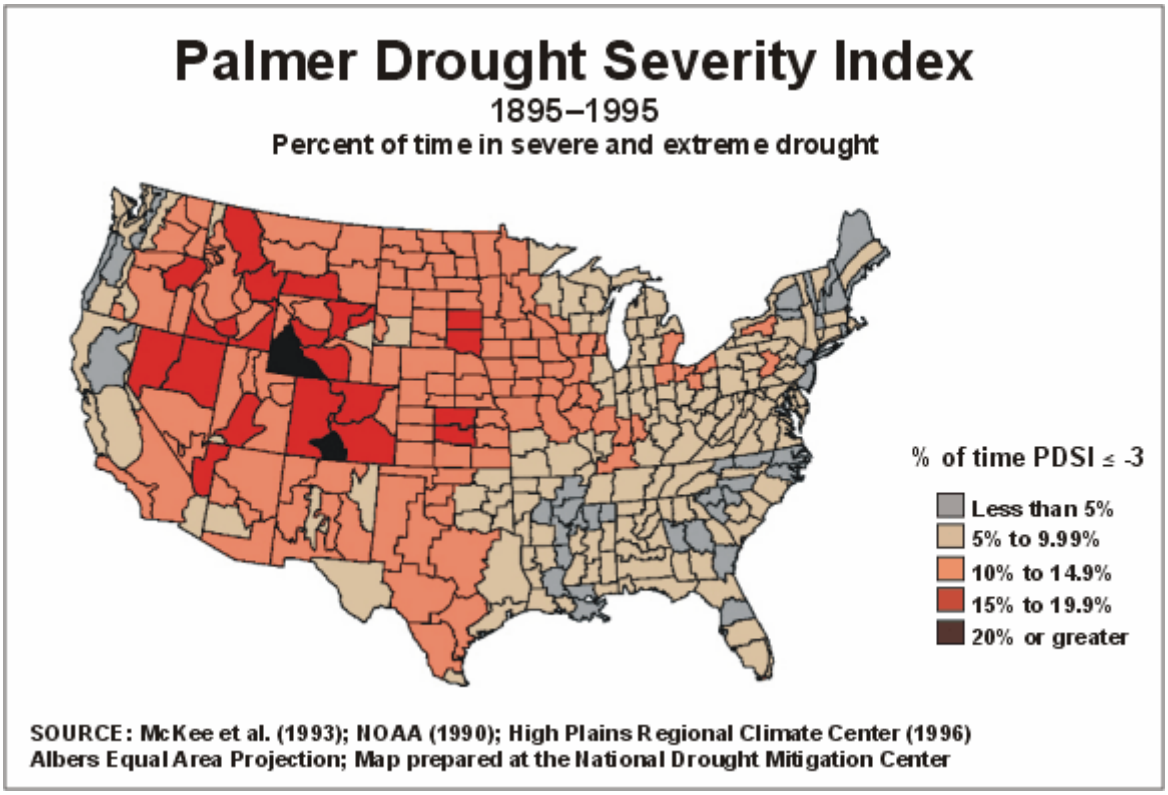
Drought-related FSA Emergency Assistance to Farmers and Ranchers

2003	2001	1999	1995	1994	1993	1992
$569,150	$1,247,463	$461,672	$1,346,691	$5,006,632	$3,181,672	$3,148,079

Source: Malheur County Farm Service Agency

The following graphic illustrates the percent of time that Malheur County (as part of Oregon Climate Zone 9) has spent in "severe" or "extreme" drought conditions from 1895-1995 – approximately 10-14.9% of that time period.

Palmer Drought Severity Index, 1895-1995



Note: Malheur County is part of Region 9, which is circled in the graphic to the right for identification:

Location of Hazard:	Extent of Hazard at the Location:
All of Malheur County is susceptible to drought. Drought can occur on a state- or region-wide scale, affecting the entire county or only selected parts of the county, depending on seasonal water supply.	Malheur County is 9,926 square miles in size, with 94% rangeland. All rangeland, in addition to irrigated farmland (exact percentage unavailable), is susceptible to negative drought impacts.

Previous Occurrences of the Hazard Within the Community:

2004: State of Drought Emergency declared in Malheur County

2003: State of Drought Emergency declared in Malheur County

2002: State of Drought Emergency declared in Malheur County

2001: State of Drought Emergency declared in Malheur County

1999: State of Drought Emergency declared in Malheur County

1995: State of Drought Emergency declared in Malheur County

1994: State of Drought Emergency declared in Malheur County

1993: State of Drought Emergency declared in Malheur County

1992: State of Drought Emergency declared in Malheur County

1991: State of Drought Emergency declared in Malheur County

1988: State of Drought Emergency declared in Malheur County

Note: drought information below is regional in scope, compiled from the state Hazard Mitigation Plan and Technical Resource Guide.

1985-1997: Generally a dry period, capped by statewide droughts in '92, '94

1939-1941: Three-year intense drought in Oregon

1917-1931: Very dry period, punctuated by brief wet spells in 1920-1 and 1927 throughout Oregon

1904-1905: Drought period of about 18 months throughout Oregon

Local Community's Self-Completed Drought Hazard Risk Rating:

240

Community's Probability of a Future Hazard Event:

High *(One incident likely within a 10 to 35 year period.)*

Community's Vulnerability to a Future Hazard Event:

High *(More than 10% affected.)*

Locally Identified Drought Issues

The list below includes countywide issues, county-city joint issues, and city-specific issues. City-specific issues are duplicated in the city addendums. Items tagged with a star (*) are issues which are considered high priority and are addressed by an Action Item in Section 4 of this plan. If an item is not tagged with a star this implies that it is currently not cost-effective or otherwise feasible to mitigate the issue locally.

- The County's irrigation system is generally functional, but much of its pumping equipment is old, and dirt canal walls are prone to collapse. Up to 30% of irrigation water is lost due to evaporation from open dirt canals. Several local organizations are working to upgrade key dirt canals to enclosed pipeline to improve efficiency and reduce agricultural runoff into waterways.*
- The county's irrigation system is divided into several irrigation districts and there is no one location for data on the entire system. The County Soil and Water Conservation District is attempting to develop a County Water Assessment that will comprehensively map the irrigation network and thus help districts work together to prioritize improvements and mitigation actions (The date of completion for this assessment is unknown).*
- Current off-stream water storage for agricultural use (reservoirs, basins) is insufficient in drought years.

Flood Summary

Floods are one of Malheur County's greatest natural hazard risks. They occur frequently and have historically caused damage to residential, commercial, and agricultural lands. Flooding in the county generally involves a rise in rivers or creeks caused by three frequently-occurring natural situations and one man-made situation:

1. Spring and summer flash floods

Flash floods usually result from intense storms dropping large amounts of rain within a brief period. They usually occur in the summer during thunderstorm season, appear with little or no warning and can reach full peak in only a few minutes. They are most common in arid and semi-arid areas of Oregon like Malheur County where there is often steep topography, little vegetation and intense but short-duration rainfall

In flash flood situations, waters not only rise rapidly, but also generally move at high velocities and often carry large amounts of debris. In these instances a flash flood may arrive as a fast moving wall of debris, mud, water or ice. Such material can accumulate at a natural or man-made obstruction and restrict the flow of water. Water held back in such a manner can cause flooding both upstream and then later downstream if the obstruction is removed or breaks free.

Malheur County experiences flash flood warnings every year. Generally these have occurred in remote, sparsely populated areas of the county and have resulted in no widespread property or infrastructure damage. Some crop damage has occurred. Additionally, flash flooding risk is exacerbated by wildfire, which destroys flood-mitigating vegetation and weakens soil, thus increasing an area's vulnerability to severe flood-induced erosion. Irrigation districts have reported chronic minor problems with debris clogging along open irrigation canals as a result of flash floods.

2. Ice Jams

Ice jams on the Snake and Malheur Rivers have created flood conditions in the past and will continue to do so due to local topography. Ice jams commonly happen during the winter and early spring, while the river is still frozen. Sudden warming at higher altitudes can melt waters resulting in increased runoff of water and ice into large reaches of frozen river below. On the way downstream, the ice can "jam" in narrow places on the river or against a road crossing, effectively damming the river, sometimes followed by a sudden breach and release of the water and ice. According to an Army Corps of Engineers report, this type of flooding is predictable, with the determining factor being a daily high temperature at Glenns Ferry, Idaho of 5 degrees F for five consecutive days. This will result in ice jams in the Ontario area. There are several bridges in the County which can jam up with ice and debris flow in the aftermath of weather events such as the freezing and melting events mentioned above.

Bridges which can be sites of ice jamming:

- 36th St Bridge outside of Ontario
- Union Pacific railroad trestle near Nyssa

3. Spring runoff (Riverine flooding)

Riverine floods occur when water levels in rivers and streams overflow their banks. Most communities located along such water bodies have the potential to experience this type of flooding after spring rains, heavy thunderstorms or rapid runoff from snow melt. Riverine floods can be slow or fast-rising, but usually develop over a period of days

Spring runoff has caused significant riverine flooding in the County, resulting in damage along the Malheur, Snake, and Owyhee Rivers, in addition to some smaller tributaries. Most spring flooding has been precipitated by a particular combination of factors: ground saturation followed by a heavy ground freeze, a heavy snowpack in higher elevations, and then spring rains and Chinook winds causing sudden snow melt.

4. Dam failure

Major flooding could also result from partial or complete failure of man-made structures constructed to restrict the flow of water on the county's waterways, either impounding reservoirs or diversion dams. There are 743 irrigation dams located in Malheur County. 43 of these dams are large enough to meet Bureau of Reclamation dam safety standards. The great majority of these dams form small, seasonal livestock ponds of one or two acre-feet of water on BLM lands. There are 6 major irrigation dams within Malheur County, 4 owned by the Bureau, the largest being the Owyhee Dam, which impounds 715,000 acre feet of irrigation water and powers a small electrical generation station. A complete failure of Owyhee Dam would inundate the cities of Ontario, Nyssa, and Adrian, in addition to residential and agricultural land along the Owyhee River and potentially the Snake and Malheur Rivers as well. The risk of dam failure was assessed by the Steering Committee according to OEM methodology, which found that while the maximum threat for dam failure was high (major disaster), the probability of such an event is low, as is vulnerability. The Malheur County Sheriff's Office keeps emergency plans on file for each major county dam in addition to those managed by Idaho which could potentially affect the county.

The Owyhee Dam was created [partially] in attempt to control flooding. A minimum of 70,000 acre-feet of space is maintained in Owyhee Reservoir through February; if the inflow forecast is large, then more space will be allocated thereafter. The reservoir has 100,000 acre feet of capacity assigned to flood control. According to the Bureau of Reclamation, the dam has provided an accumulated $33,010,000 in flood control benefits from 1950 to 1998. For information on the flood control capacity of smaller dams in the county, see Volume II, Flood Hazard Annex.

Impacts

The extent of the damage and risk to people caused by flood events is primarily dependent on the depth and velocity of floodwaters. Fast moving floodwaters can wash buildings off their foundations and sweep vehicles downstream. Roads, bridges, and other infrastructure and lifelines (pipelines, utility, water, sewer, communications systems, etc.) can be seriously damaged when high water combines with flood debris, mud and ice. Extensive flood damage to residences and other structures also results from basement flooding and landslide damage related to soil saturation. Surface water entering into crawlspaces, basements and daylight basements is common during flood events not only in or near flooded areas but also on hillsides and other areas far removed from floodplains. Most damage is caused by water saturating materials susceptible to loss (e.g., wood, insulation, wallboard, fabric, furnishings, floor coverings and appliances.)

Homes in frequently flooded areas can also experience blocked sewer lines and damage to septic systems and drain fields. This is particularly the case of residences in rural flood prone areas that commonly utilize private individual sewage treatment systems (such as septic systems). Inundation

of these systems can result in the leakage of wastewater into surrounding areas creating the risk of serious water pollution and public health threats. Rural residents who utilize private wells for drinking water are also at risk when these systems are flooded; if a well is not properly sealed it can become contaminated with wastewater or debris during flood events. According to the Malheur County Environmental Health Department, this has not been a major problem for rural county residents but has been a concern in the past and has the potential to occur in the future. Because these residents are responsible for the testing and maintenance of their own systems, there is always a need for effective education and outreach on flood safety precautions in areas with septic systems and wells.

Flood events impact businesses by damaging property and interrupting commerce. Flood events can cut off customer access and close businesses for repairs. A quick response to the needs of businesses affected by flood events can help a community maintain economic viability in the face of flood damage.

Bridges are a major concern during flood events as they provide critical links in road networks by crossing water courses. They can also become obstructions in flood-swollen watercourses and can inhibit the rapid flow of water during flood events. This is a significant issue with flooding in Malheur County, as seen in the above discussion of riverine flooding and ice jams.

Not all flood sources affect all jurisdictions in the County; see the city addendums for city-specific flood concerns. Principal flood sources in Malheur County are, according to FEMA's Malheur County Flood Insurance Study: Snake River, Malheur River, Owyhee River, Bully Creek, Willow Creek, Jordan Creek, Indian Creek, Clover Creek, and Cottonwood Creek.

The National Weather Service tracks water levels on the Malheur River and Owyhee River via gauges. The following table describes the frequency of "moderate" to "severe" flooding on these rivers according to gauge measurements. For information on NWS impact predictions for flood states, see the flood hazard annex.

NWS Gauge Stations in or near Malheur County

River	***Flood State***	***Years Measured***	***# of Floods***	***Frequency***
Malheur at Vale	11 ft	1926-2006	5	Once every 16.2 years
Owyhee below Dam	11.9 ft	1929-2006	5	Once every 13 years
Owyhee at Rome	N/A	1949-2006	3	Once every 19 years
Snake at Weiser	12 ft	1924-2006	9	Once every 9.1 years

Source: National Weather Service files.

As mentioned in Section 2: Community Sensitivity and Resilience, the County's FIRM floodplain maps and FEMA Q3 data are currently not available in digital form. The same is true for the 5 cities. FIRM maps have not been updated since 1986. This means that assessing flood risk to specific buildings and localized infrastructure is approximate at best. In 2008, FEMA was scheduled to begin upgrading flood hazard data in Eastern Oregon. However, funds are not expected to continue. Communities that are able to demonstrate significant need, and/or are able to provide accurate topological data, road maps, base elevation measurements, and a description of populations at-risk will be more competitive in acquiring a portion

of the remaining funds. More information on the paper FIRM maps is located in the flood hazard annex and in jurisdiction-specific addendums.

The county and 5 cities participate in the National Flood Insurance Program (NFIP). However, no comprehensive county or city records are available as to how many total structures are located on floodplains. For information on cities' participation in NFIP, see the jurisdiction-specific addendums.

NFIP Participation in Malheur County (unincorporated areas)

Policies	*Value*	*Single Losses*	*Cost*	*Repetitive Losses*	*Cost*
93	$10,824,900	15	$30,229	0	$0

Source: Oregon Emergency Management

Location of Hazard:	**Extent of Hazard at the Location:**
• Ontario, Vale, Nyssa, Jordan Valley, and Adrian all have parts of their UGB within 100- and 500-year floodplain areas for the Snake, Malheur, and/or Owyhee Rivers. • Residential areas immediately downstream of Owyhee Dam and other dams/reservoirs in the county. • The Snake, Malheur, and Owyhee rivers are bordered by unincorporated residences and agricultural operations.	• See floodplain maps: the hazard is primarily located on 100- and 500-year flood zones defined by county FIRM maps. • See attached map of major dams/reservoirs in flood hazard annex.

Previous Occurrences of the Hazard Within the Community:

Year	*River*	*Location*	*Cost**	*Description*
2006, January, April	Malheur, Owyhee	Vale, below Owyhee Dam, Nyssa	$5,000	Moderate flooding, roads blocked by high water, minor roadway damage, agricultural fields flooded
1998, June	N/A	N/A	$10,000	Flooding and mudslides throughout the county
1993, March	Malheur, Owyhee	Vale, Harper, Ontario	$550,000	Moderate flooding in cities and unincorporated areas; damage to county roads, Highway 20 under water, erosion, 4 houses evacuated, 36th St bridge in Ontario damaged. "Flood of Record" on Owyhee River.
1990, August	N/A	N/A	$27,500	Severe weather, minor flooding
1989	N/A	Nyssa	N/A	Flash flood, high winds, crops damaged

1986, February, September	Owyhee	N/A	N/A	Moderate flooding
1985	Snake	Ontario to Farewell Bend	N/A	40 miles of ice on Snake River between Farewell Bend and Ontario. At least 35 people evacuated
1984, March, April	Owyhee	N/A	$2,750,000	Moderate flooding
1983, March	Malheur	Vale	N/A	Mild flooding; one house surrounded by water
1982, February	Malheur	Vale, Ontario	N/A	Moderate flooding; one bridge damaged, 4 homes flooded, agricultural fields flooded
1978, April	Malheur, Owyhee, Bully Creek	Jordan Valley, Antelope Res., Vale, Bully Creek Res.	$46,000	Moderate flooding; roads washed out around JV, several homes inundated near Bully Creek Res., agricultural fields flooded, Hwy 26 under water.
1972, April	Owyhee	N/A	N/A	Moderate flooding
1971, January	Malheur	Vale area	N/A	Moderate flooding
1964, December	N/A	Eastern Oregon	N/A	Flooding throughout region
1963, February	Malheur	Vale area	$1,527.78	Winter weather, flooding
1959	Jordan Creek	Jordan Valley	N/A	Flooding
1957, February	Malheur, Jordan Creek	Vale, Jordan Valley	N/A	Severe flooding; Vale business district inundated, agricultural fields flooded, irrigation canals destroyed, cattle drowned, 2 bridges washed out, 40 homes inundated.
1952, March, April	Malheur, Owyhee, Jordan Creek	Jordan Valley, Vale	N/A	Severe flooding; bridges and railroads under water, 6 families evacuated.
1910	Malheur	Vale	N/A	Severe “Flood of Record”
1904	Malheur	Vale	N/A	Severe flooding
* Data compiled from R8 Regional Assessment, National Weather Service files, the Argus Observer, local				

stakeholders, and the Sheldus Database. * Costs not adjusted for inflation.
Local Community's Self-Completed Flood Hazard Risk Rating:
185
Community's Probability of a Future Flood Event:
High *(One incident likely within a 10 to 35 year period.)*
Community's Vulnerability to a Future Flood Event:
Low *(Less than 1% affected.)*

Locally Identified Flood Issues

This list includes countywide issues, county-city joint issues, and city-specific issues. City-specific issues are duplicated in the city addendums. Items tagged with a star (*) are issues which are considered high priority and are addressed by an Action Item in Section 4 of this plan. If an item is not tagged with a star this implies that it is currently not cost-effective or otherwise feasible to mitigate the issue locally.

- The county floodplain ordinance is outdated and insufficient for ensuring that structures built on the floodplain are safe. City floodplain ordinances have the same issue, with the exception of the city of Ontario, which is in the process of updating its floodplain ordinance as of June 2007.*
- The area around the 36th St. Bridge near Ontario is prone to repetitive flooding.*
- The 36th St. Bridge near Ontario, which crosses the Malheur River, is too narrow and acts as a bottleneck during flood conditions.*
- County/city participation rates in NFIP are unknown; landowners and homeowners in floodplain areas may not be adequately insured against flood hazards.*
- The city of Ontario has some minor issues with stormwater drainage in flood conditions and has a list of recommended repairs/upgrades in its 2003 Stormwater Management Plan.*
- Ontario and Vale are working toward developing greenbelts for riverfront property as a flood mitigation tool.*
- Given the frequent occurrence of floods in the County and this hazard's high priority ranking, digital maps would greatly help the County plan flood mitigation actions. When and if County FIRM maps become available in digital form, local GIS and planning staff will be able to determine how much infrastructure is located in floodplain areas and determine how best to reduce those areas' flood risks on a localized level. *

Wildfire Summary

NOTE: As of August 2007, Malheur County is in the process of developing a Community Wildfire Protection Plan. This plan is scheduled to be complete in 2008. Upon completion it will serve as the wildfire section of the Natural Hazard Mitigation Plan, as the CWPP process includes a comprehensive risk assessment and mitigation planning. Until the plan is complete, the text below will serve as an interim placeholder wildfire risk summary for the County. Information from this interim summary came from local sources and from the Oregon NHMP Region 8 wildfire summary. The full county CWPP will contain a much more comprehensive quantitative and qualitative risk assessment for the county. When complete, the full county CWPP will be included in this plan. in the Wildfire Hazard Annex and mitigation actions from the CWPP will be formally incorporated into this plan.

Wildfire is defined as an uncontrollable burning of forest, brush, or grassland. Fire has always been a part of high desert Western ecosystems and can have devastating effects. Eastern Oregon has a lengthy history of wildfire in both wildlands and in wildland-urban interface (WUI) areas. In contrast to other parts of this region, Malheur County is notable for a relative lack of forested land and the predominance of high desert grasslands. Both the forests and grasslands of the County are highly susceptible to wildfire and many of the county's cities and unincorporated communities, in addition to rangelands and agricultural lands, are vulnerable to its effects. Wildfires are an annual occurrence in the county and have varied in size from under 10 acres to over 100,000 acres.

As mentioned above, Malheur County wildlands are predominantly high desert sagebrush and grassland environments. The County's only forested area is located in the northwestern corner of the county near the unincorporated community of Ironside, in addition to scattered small patches in the southern portion of the County.

The hilly or mountainous topography of much of the County also exacerbates wildfire hazards: these areas can cause a wildfire to spread rapidly and burn larger areas in a shorter period of time, especially as fires migrate uphill. Wildfire has been known to move at speeds of 30 mph or higher on grasslands in the County.

Communities in the county located in a wildland-urban interface (WUI) are at increased risk to wildfire hazards. The WUI occurs where man-made structures meet or intermix with wildland vegetation. According to the BLM, there are 14 communities at risk in WUI areas in the County, as listed below (incorporated cities are noted with a star):

- Adrian*
- Arock
- Danner
- Jordan Valley*
- Ontario Heights
- Oregon Slope
- Rome
- McDermitt
- Brogan
- Harper
- Jamieson
- Burns Junction
- Nyssa*
- Vale*

In 2002, the Vale BLM office completed "Communities-at-Risk" (CAR) wildland fire risk assessments for several WUI areas in the county: McDermitt, Jordan Valley, Rome, Arock, Adrian,

Vale, Ontario Heights, and Ontario Slope. These CAR reports contain documentation on each community's risk for wildfire and list proposed mitigation actions as determined by BLM, its contractors, and the local communities. The reports will be utilized in the Community Wildfire Protection Plan development process. More information on these reports is available in the Wildfire Annex.

Conditions Contributing to Wildfires

Ignition of a wildfire may occur naturally from lightning or from human causes such as debris burns, arson, careless smoking, and recreational activities or from an industrial accident. Once started, four main conditions affect the fire's intensity and behavior: fuel load and distribution (how much flammable plant material is present and what type it is), topography, weather, and development.

Fuel is the material that feeds a fire. Fuel is classified by volume and type. Oregon is prone to wildfires due to its prevalent conifer, brush and rangeland fuel types; rangeland and brush dominate in Malheur County.

Topography influences the movement of air and directs a fire's course. Slope and hillsides are key factors in fire behavior.

Weather is the most variable factor affecting wildfire behavior. High risk areas in Oregon, like Malheur County, share a hot, dry season in late summer and early fall with high temperatures and low humidity.

The increase in residential *development* in interface areas has resulted in greater wildfire risk. Fire can sweep through vegetation that is adjacent to a combustible home, and some rural parts of Malheur County do not have fire protection services for privately owned structures.

Impacts

The ecosystems of most forest and wildlands depend upon fire to maintain various functions. These benefits can include, depending upon location and other circumstances, reduced fuel load, disposal of slash and thinned tree stands, increased forage plant production, and improved wildlife habitats, hydrological processes and aesthetic environments. The effects of fire on ecosystem resources can include damages, benefits, or some combination of both. Despite these potential benefits, fire has historically been suppressed for years because of its effects on rangelands, recreation areas, agricultural operations, and the obvious significant threat to property and human life. The effects of a wildfire on the built environment, particularly in the face of a major wildfire event, can be devastating to people, homes, businesses and communities.

In Malheur County, where the majority of BLM land is leased for ranching operations, large wildfires can have significant economic impacts on ranchers' stock and range allotments, as burned land is unfit for grazing use for several years after a fire.

Location of Hazard:	**Extent of Hazard at the Location:**
All of Malheur County, including both wildland and urban areas, is at risk for wildfire.	WUI communities and any structures or assets located near fire-prone wildlands or rangelands are at particular risk, as are the rangelands and wildlands themselves, which is where most fires in the county burn.
Previous Occurrences of the Hazard Within the Community:	
Small- to moderate- or large-size wildfires (100 to 10,000+ acres) burn every year in	

Malheur County and often damage structures and rangeland. The county does not keep incident records on the smaller fires. BLM keeps detailed records of all fires that occur on federal ground; these records are being compiled for the county's Community Wildfire Protection Plan and will be available in this Plan in 2008 when the CWPP process is completed. The county has not had any wildfire disaster declarations since 2000. 2000: "Jackson" fire. Over 100,000 acres burned; $800,000 damages, several buildings and outbuildings destroyed. Farm Service Agency disaster declaration.
Local Community's Self-Completed Wildfire Hazard Risk Rating:
170
Community's Probability of a Future Wildfire Event:
High *(One incident likely within a 10 to 35 year period.)*
Community's Vulnerability to a Future Wildfire Event:
Moderate *(1-10% affected.)*

Locally Identified Wildfire Issues

The following list includes countywide issues, county-city joint issues, and city-specific issues. City-specific issues are duplicated in the city addendums. This list is not a comprehensive list of wildfire issues in the county – it is a list of locally identified issues as part of the mitigation planning process. A full assessment of wildfire vulnerabilities and mitigation strategies on a more comprehensive scale will be carried out through the Community Wildfire Protection Plan development process, and that assessment will replace this brief summary. Items below may be later developed into Action Items through the CWPP process.

- Road access – some county roads and remote bridges are unsuitable for fire vehicle access. No full inventory of these roads exists; with an inventory, the county could prioritize these roads for upgrades.
- Road access – many privately owned driveways and bridges are unsuitable for fire vehicle access, which raises residents' fire risk considerably. BLM has done some community outreach and conducted free home inspections on this issue, but some residents remain unaware of their risk.
- Not all county and city offices have fire safety information available for residents seeking to build or move into the area. Offices such as the county planning dept. would like to have information to hand out to residents.
- Fuel reduction on BLM and private lands is an ongoing mitigation task.
- Several parts of unincorporated Malheur County lack fire service protection. The CWPP process will work with the community to examine potential solutions for this issue.

Severe Weather Summary

(Winter Storms, Windstorms, Thunderstorms, Hail)

This section contains information on the major types of severe weather for which Malheur County is at risk. Often these events occur in conjunction with one another or exacerbate other natural hazards (such as floods). They are profiled here as separate events for the sake of clarity, but many of these hazards would benefit from a multi-hazard mitigation approach.

Winter Storm Overview

Malheur County can have and has had harsh winters with frequent and severe winter storms. Winter storms can slow or halt traffic, damage power lines, and kill livestock. Specific characteristics of winter storms vary by temperature, wind velocity, ground saturation, and snowpack. While severe winter weather is a frequent occurrence in the county, no major disruptions in services have been recorded in recent history, as county and city resources are annually budgeted to ensure that storms can be dealt with. Disruptions such as road closures and power outages are frequent but do not always create serious disasters.

Elevation in the county varies from just above 2,000 feet above sea level (Ontario) to nearly 8,000 feet above sea level (the Trout Creek Mountains in the southern portion of the County). As such, winter weather varies by location. There are, however, only two Oregon Climate Service Stations in the County.

Average Annual Snowfall at Oregon Climate Service Stations in Malheur County

Ontario	20.3 in
Rome (unincorporated)	13.5 in

Source: State of Oregon Natural Hazard Mitigation Plan

Impacts

Winter storms which bring snow, ice and high winds can cause significant impacts on life and property. Many severe winter storm deaths in the West occur as a result of traffic accidents on icy roads and hypothermia from prolonged exposure to the cold. The temporary loss of home heating can be particularly hard on the elderly, young children and other vulnerable individuals.

Property is at risk due to flooding that may result if there is a heavy snowmelt in late winter or early spring. Additionally, ice, wind and snow can affect the stability of trees, power and telephone lines and TV and radio antennas. Such damages in turn can become major obstacles to providing critical emergency response, police, fire and other disaster recovery services.

Severe winter weather also can cause the temporary closure of key roads and highways, businesses, schools, government offices and other important community services. Below freezing temperatures can also lead to breaks in uninsulated water lines serving schools, businesses, and individual homes. All of these effects, if lasting several days, can create significant economic impacts for the communities affected as well for the surrounding region. In the rural unincorporated areas of Oregon, severe winter storms can isolate small communities, farms and ranches and create serious problems for open range cattle operations.

Windstorm Overview

Windstorms are a frequent occurrence in Malheur County. While less likely to cause catastrophic damage like that caused by wildfire or flood, these events can have negative effects on agricultural,

residential, and commercial property. Although rare, tornadoes can and do develop as an offshoot of windstorms in this region.

Impacts

Windstorms can have significant impacts on life and property. Debris carried along by extreme winds can contribute directly to injury and loss of life and indirectly through the failure of protective structures (i.e., buildings) and infrastructure. In Malheur County windstorms have historically damaged or destroyed roofs and outbuildings of residences and local infrastructure such as schools.

High winds can topple trees and break limbs which in turn can result in power outages and disrupt telephone, computer, and TV and radio service. High winds near I-84 and other major highways can and have hindered traffic and caused accidents. In addition to the immediate effects of wind damage, the loss of power due to windstorms can have widespread impacts on business and economic activity. A sustained loss of power can also seriously strain provision of emergency services and the operation of water and sewer facilities and transportation systems.

Windstorms can occur in conjunction with other severe weather (thunderstorms, snow, hail, etc) or separately. Windstorms can compound wildfire in the county, causing the fire to spread faster and hindering response efforts due to downed trees and power lines and low visibility. Depending on the time of year in which they occur, windstorms may also draw in significant quantities of dust (topsoil, detritus, etc), which also compounds the hazard.

Cairo Junction, an unincorporated community between Ontario and Nyssa, is considered particularly vulnerable to the effects of windstorms due to a wind tunneling effect that results in higher than average winds in this part of the county.

Thunderstorm and Hail Overview

Because Malheur County is located in an arid high desert region, severe thunderstorms with significant quantities of rain are not as frequent an occurrence as in other parts of the state. However, when these events do occur, they can exacerbate or cause other hazards, including landslides and flash floods. Lightning is another significant concern that stems from thunderstorms, as it is a primary source of wildfires in the summer fire season.

Microbursts are another thunderstorm-related hazard. A microburst is a *localized* column of rapidly sinking air, producing damaging divergent and straight-line winds, often with precipitation, sized 4 km or less. Microbursts are similar to tornadoes and can produce winds of over 75 mph. Winds from microbursts have been recorded up to 49 mph in the county.

Another thunderstorm-related hazard in the county is tornadoes. While infrequent, they have occurred historically in the county and have caused damages to property (no injuries or deaths have been recorded).

Impacts

Thunderstorms with hail are predominantly an economic concern for the County's agricultural community. If a storm strikes during the growing season, damages to row crops can be economically devastating, especially to the uninsured.

Microbursts have damaged buildings and have contributed to instances of several inches of rain falling in an hour or less.

Severe thunderstorms occurring after a recent wildfire can wash out canals and waterways stripped of undergrowth by fire, which then exacerbate flood issues and can damage roads and irrigation infrastructure.

When lightning from a thunderstorm starts a rangeland fire, there can be significant consequences for the community. See the Wildfire Summary for a discussion of this.

Location of Hazards:	Extent of Hazards at the Location:
• All of Malheur County is susceptible to severe weather.	• Areas most vulnerable to windstorm damage are concentrated near the 5 incorporated cities and the unincorporated communities. • Cairo Junction is particularly vulnerable to windstorms due to wind tunneling.

Previous Occurrences of the Hazards Within the Community:

Winter Storms

No comprehensive local records are available for severe winter storms. The list below is from the SHELDUS database, which is incomplete but the best source of information. Each winter season typically includes at least one if not several large winter storms which can cause damage and strain county and city resources. The costs listed below for major events do not include the standard yearly costs that the County and cities sustain for smaller events.

(losses below are approximate; not adjusted for inflation)

December 12, 2001: Severe winter weather; $25,000 crop and property damage

February 1, 1989: Severe winter weather; $13,888 crop and property damage

November 1, 1984: Severe winter weather; $15,277 crop and property damage

December 19, 1983: Severe winter weather; $15,277 crop and property damage

January 17, 1964: Severe winter weather; $15,277 crop and property damage

February 1, 1963: Severe winter weather; $15,277 crop and property damage

November 21, 1961: Severe winter weather; $277 crop and property damage

January 18, 1960: Severe winter weather; $1,470 crop and property damage

Windstorms

No comprehensive local records are available for severe windstorms. The list below is from local stakeholder information and the local newspaper, which is incomplete but the best source of information available. It should be noted that many of the historic thunderstorm events listed in the thunderstorm section also involved high winds. (losses below are approximate; not adjusted for inflation)

August 10, 2006: Windstorm in Treasure Valley area; power lines and trees downed, several wildfires started or exacerbated due to the storm.

July 11, 2004: Windstorm in Ontario area uproots numerous trees across town on public and private property.

Summer 2003: Windstorm in Treasure Valley area; roof of city golf course clubhouse

damaged; $1,375 damages

February 8, 1999: Windstorm outside of Ontario in Cairo Junction; roof of Cairo Elementary gym damaged; $5,000 property damage.

Tornados

No comprehensive local records are available for tornados. The list below is from the NOAA database, which is incomplete but the best source of information.

(losses below are approximate; not adjusted for inflation)

June 17, 1997: Tornado; F0 Magnitude

April 30, 1997: Tornado; F1 Magnitude

April 23, 1974: Tornado; F1 Magnitude, $25,000 property damage

June 21, 1967: Tornado; F0 Magnitude, $250,000 property damage

August 25, 1966: Tornado; F1 Magnitude, $25,000 property damage

Thunderstorms / Hail

No comprehensive local records are available for severe thunderstorms or hail. The list below is from the SHELDUS database and from local newspaper archives, which are incomplete but the best source of information. Each summer season typically includes at least one if not several large thunderstorms (some with hail) which cause damage to row crops and have an economic impact on the community. A large, extensively damaging event like the one listed below in 2003 is more rare. (losses below are approximate; not adjusted for inflation)

May 29, 2005: Severe thunderstorm, hail; $3,000 crop and property damage

July 26, 2003: Severe thunderstorm, hail; $2.8 million in crop damage

July 4, 1998: Severe thunderstorm, hail, wind; $1,000,000 crop / property damage

June 17, 1997: Severe thunderstorm, hail, wind; $3,000,000 crop /property damage

May 15, 1994: Severe thunderstorm, hail, wind; $25,000 crop /property damage

July 13, 1991: Severe thunderstorm, wind; $50,000 crop /property damage

August 20, 1990: Severe thunderstorm, hail; $27,500 crop / property damage

January 7, 1990: Severe thunderstorm, wind; $152,776 crop / property damage

November 1, 1984: Severe thunderstorm, wind; $14,027 crop / property damage

July 29, 1975: Severe thunderstorm, wind; $5,000,000 crop / property damage

June 9, 1972: Severe thunderstorm, hail; $550,000 crop / property damage

January 16, 1970: Severe thunderstorm, wind; $13,888 crop / property damage

August 14, 1961: Severe thunderstorm, hail; $1,527 crop / property damage

July 14, 1961: Severe thunderstorm, hail; $6,250 crop / property damage

June 17, 1961: Severe thunderstorm, hail; $2,777 crop / property damage

February 8, 1961: Severe thunderstorm; $14,027 crop / property damage
July 30, 1960: Severe thunderstorm, hail; $25,250 crop / property damage
September 3, 1960: Severe thunderstorm, hail; $152 crop / property damage
Local Community's Self-Completed Severe Weather Hazard Risk Rating:
WINTER STORMS: 163
WINDSTORMS: 117
THUNDERSTORMS/HAIL: 127
Community's Probability of a Future Severe Weather Event:
WINTER STORMS: Moderate *(One incident likely within a 35 to 75 year period.)*
WINDSTORMS: High *(One incident likely within a 10 to 35 year period.)*
THUNDERSTORMS/HAIL: High *(One incident likely within a 10 to 35 year period.)*
Community's Vulnerability to a Future Severe Weather Event:
WINTER STORMS: High *(More than 10% affected.)*
WINDSTORMS: Low *(Less than 1% affected.)*
THUNDERSTORMS/HAIL: Low *(Less than 1% affected.)*

Locally Identified Severe Weather Issues

This list includes countywide issues, county-city joint issues, and city-specific issues. City-specific issues are duplicated in the city addendums. Items tagged with a star (*) are issues which are considered high priority and are addressed by an Action Item in Section 4 of this plan. If an item is not tagged with a star this implies that it is currently not cost-effective or otherwise feasible to mitigate the issue locally.

All Severe Weather

- Not all residents maintain 72-hour kits for emergency severe weather situations when they may be cut off from power, water, heat, or transportation resources for several days. Additional outreach is needed to encourage people to prepare these kits.*
- Small businesses and nonprofits would benefit from outreach designed to help them plan and prepare for potential damages after a severe weather event (or other natural hazard such as flooding).*

Winter Storms

- The City of Jordan Valley does not have sufficient backup generator power for its city well in the event of power outages.*
- Because of their lack of city resources and (often) geographic distance from resources, unincorporated communities are particularly vulnerable to road closures and lack of access to services after major storm.
- The County road department and special road districts have limited equipment and resources for major winter storm events. Much of the County's equipment is aging.

Windstorms

- Several private and publicly owned buildings, including one area school, have sustained roof damage from windstorms. Building codes are more stringent for new construction, but some old buildings are vulnerable to roof damage.

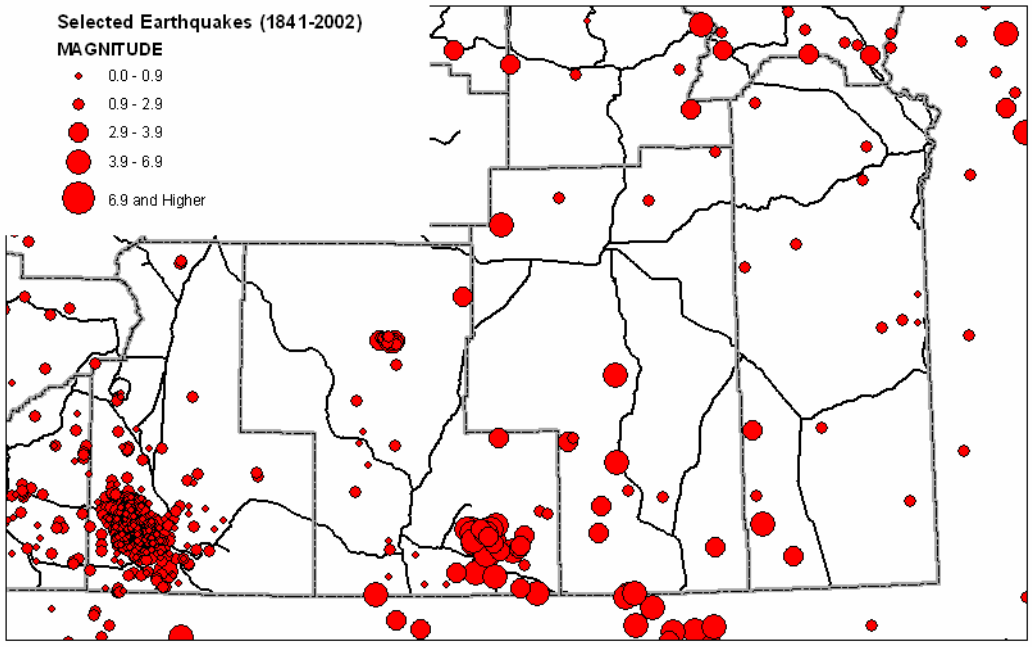
Thunderstorms/Hail

- Some open-air earthen irrigation canals in the county that have been weakened by gopher burrowing are especially vulnerable to washouts after thunderstorm activity.
- Some rural county roads are subject to washouts or blockage after a large storm event, which can affect residential and commercial traffic and limit residents' access to emergency resources.
- Hail during the growing season (spring-summer) can seriously damage row crops throughout the county and impact businesses such as car dealerships.

Earthquake Summary

Earthquakes occur in Oregon every single day. The Pacific Northwest Seismic Network documents over 1000 earthquakes greater than magnitude 1.0 in Washington and Oregon each year. Of these, only approximately two dozen are large enough to feel, but they serve as an indicator of the region's high seismic activity.

Like the rest of the state of Oregon, Malheur County is susceptible to earthquakes from three sources: the offshore Cascadia Subduction Zone (CSZ), deep intra-plate events within the subducting Juan de Fuca Plate, and shallow crustal events within the North America Plate. A great potential hazard comes from subduction zone earthquakes in the CSZ, which could produce earthquakes with magnitudes of 9.0 or greater (albeit from a distance of several hundred miles from Malheur County). However, due to its relatively higher frequency of occurrence, shallow crustal fault activity is considered more likely to produce "devastating earthquakes" in the foreseeable future for this County and the larger Eastern Oregon region.[iv] A map of known faults in the County is included in the Earthquake Annex. The map below indicates selected earthquakes in the region.



Map of selected earthquakes in the region from 1841-2002 (Niewendorp, C.A., Neuhaus, M.E., 2003. Map of Selected Earthquakes for Oregon, 1841 through 2002. Oregon Department of Geology and Mineral Industries Open File Report 03-02).

For more reference information on the effects that a typical earthquake can have on a geographic area, including ground shaking, surface faulting, and liquefaction, see the Earthquake Annex (Volume II).

Though no earthquakes have been recorded on the offshore Cascadia Subduction Zone (CSZ) during Oregon's brief 200-year historical record, studies have found widespread

evidence that the CSZ has generated earthquakes as recently as 300 years ago. Evidence indicates that CSZ earthquakes occur within intervals of 200 to 1,000 years.

Malheur County must also consider crustal seismic activity coming from Idaho: in 1983 the 6.9-magnitude Borah Peak earthquake occurred in Idaho and resulted in damage in Vale and Ontario.

DOGAMI has developed two earthquake loss models for Oregon based on the above two most likely sources of seismic events (CSZ and crustal events). Both models are based on HAZUS, a computerized program, currently used by FEMA as a means of determining potential losses from earthquakes.

The model CSZ event is based on a potential 8.5 earthquake generated off the Oregon coast. The 500-year crustal model does not look at a single earthquake (as in the CSZ model); it encompasses many faults, each with a 10% chance of producing an earthquake in the next 50 years. The model assumes that each fault will produce a single "average" earthquake during this time. Neither model takes unreinforced masonry buildings (URMs) into consideration, which means that these estimates almost certainly underestimate damage to County structures. These models contain a high degree of uncertainty and are intended only for general planning purposes to provide approximate estimates of damage. For the full HAZUS run results for Malheur County, see the Earthquake Annex.

HAZUS Earthquake Loss Estimates for Malheur County (in millions)

Model	Losses (Building-related)	Losses (Transportation)	Losses (Utilities)
CSZ 6.5 Model	$143.37	$47.0	$19.68
Crustal 6.9 Model	$453.47	$114.1	$36.82

Source: Malheur County HAZUS Global Reports for Crustal and Probabilistic Scenarios, DOGAMI, 2007. Full text available in the Earthquake Hazard Annex.

Finally, it should be noted that DOGAMI has conducted a Rapid Visual Assessment (RVA) of all critical infrastructure in each of Oregon's counties and assessed these structures' resilience to seismic activity in relation to their relative seismic risk. The results of this report are included in the Earthquake Hazard Annex and should be reviewed as part of a continuing mitigation strategy for Malheur County. Should any critical Malheur County infrastructure (schools, county offices, emergency shelters, etc) be determined in need of seismic retrofitting, such an action should be assessed by the county and any appropriate jurisdictions and included in this Plan as well.

Currently, no reliable scientific means exists to predict earthquakes. Identifying seismic-prone locations (through the DOGAMI survey mentioned above), enforcing building codes, conducting community outreach and awareness activities, and using other mitigation techniques are essential to reducing risk from seismic hazards in Malheur County.

Impacts

Oregon is rated third highest in the nation for potential losses due to earthquakes. This is due in part to the fact that until recently Oregon was not considered to be an area of high seismicity, and consequently the majority of buildings and infrastructure were not designed to withstand the magnitude of ground shaking that would occur in conjunction with a major seismic occurrence. Experts predict that in the event of a magnitude 8.5 Cascadia Subduction Zone earthquake, losses in the Cascadia Region (Northern California, Oregon, Washington and British Columbia) could exceed $12 billion, 30,000 buildings could be destroyed, and 8,000 lives lost.

The degree of damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event. Buildings, airports, schools, dams, levees and lifelines including water, sewer, storm water and gas lines, and utility and communication networks are particularly at risk. Also, damage to roads and water systems will make it difficult to respond to post-earthquake fires.

Earthquake damage to roads and bridges can be particularly serious by hampering or cutting off the movement of people and goods and disrupting the provision of emergency response services. Such effects in turn can produce serious impacts on the local and regional economy by disconnecting people from work, home, food, school and needed commercial, medical and social services. A major earthquake can separate businesses and other employers from their employees, customers, and suppliers thereby further hurting the economy. Finally, following an earthquake event, the cleanup of debris can be a huge challenge for the community.

Special note also needs to be made of a 2004 earthquake swarm experienced by Jordan Valley and its surrounding vicinity. This swarm occurred in an area devoid of seismic activity for 20 years and without local monitoring equipment. Since this occurrence USGS has installed monitoring equipment, as the swarm originated beneath Antelope Reservoir and is thus a potential concern for the Antelope Reservoir dam. More information is available in the Jordan Valley City Addendum.

Location of Hazard:	**Extent of Hazard at the Location:**
All of Malheur County can be considered within the range of seismic activity.	See the DOGAMI map for locations of known crustal fault lines in the county (Earthquake Hazard Annex). CSZ seismic activity would indirectly affect the entire county.
Previous Occurrences of the Hazard Within the Community:	
*Record of historical earthquake events was compiled from stakeholder and steering committee interviews, the Malheur County Emergency Operations Plan, USGS records, and the Pacific Northwest Seismograph Network.**	
April/May 2004: Jordan Valley and the surrounding vicinity experienced a swarm of small earthquakes of magnitude 1.0 – 3.4.	
October 28, 1984: Borah Peak earthquake in Idaho also felt in Oregon; minor damages recorded in Ontario, Adrian; tremors felt throughout much of eastern Malheur County (from Malheur County Emergency Operations Plan).	
July 12, 1944: Central Idaho hit by an earthquake also felt in Oregon.	

May 12, 1916: Boise hit by an earthquake also felt in Oregon. November 11, 1905: A shock in southern Idaho is felt in Oregon. *USGS Idaho earthquake history: http://earthquake.usgs.gov/regional/states/idaho/history.php* *PNSN (for Jordan Valley swarm): http://www.pnsn.org/REPTS/Quarterly2004B.pdf*
Local Community's Self-Completed Earthquake Hazard Risk Rating:
127
Community's Probability of a Future Hazard Event:
Moderate *(One incident likely within a 35 to 75 year period.)*
Community's Vulnerability to a Future Hazard Event:
Low *(Less than 1% affected.)*

Locally Identified Earthquake Issues

The following list includes countywide issues, county-city joint issues, and city-specific issues. City-specific issues are duplicated in the city addendums. Items tagged with a star (*) are issues which are considered high priority and are addressed by an Action Item in Section 4 of this plan. If an item is not tagged with a star this implies that it is currently not cost-effective or otherwise feasible to mitigate the issue locally.

- Some of the County and cities' critical infrastructure is built from unreinforced masonry, the most vulnerable building material to earthquake damage. When the DOGAMI critical infrastructure assessment is released, the County will need to review it and take appropriate steps for mitigation.*
- Local information on protecting one's home and property in the event of an earthquake is nonexistent; community outreach could help.*
- Antelope Reservoir was the site of seismic activity in 2004; little is known about its ability to withstand future activity.*

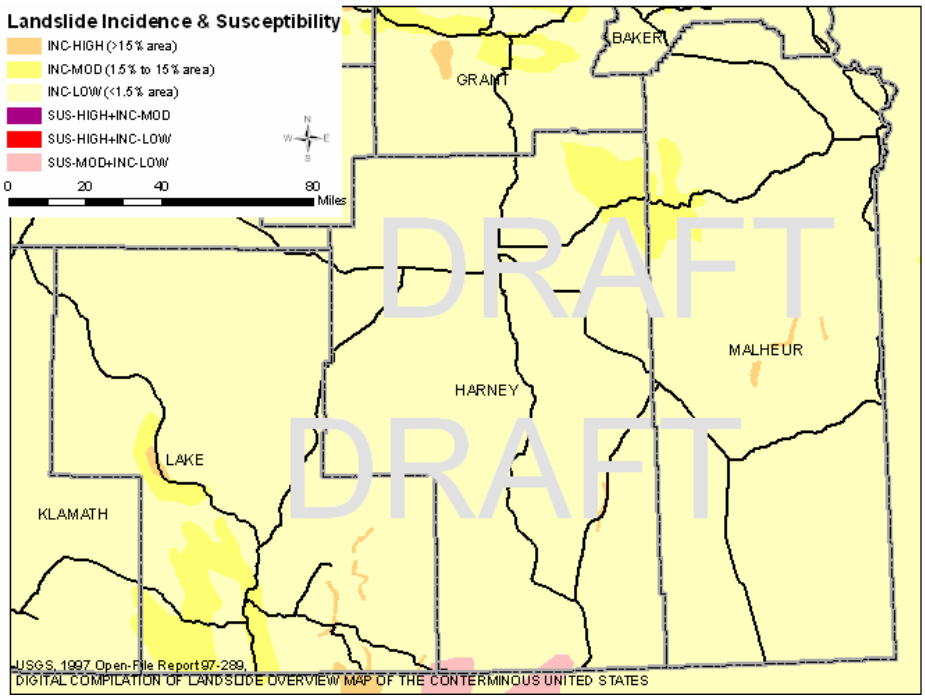
Landslides Summary

Compared to other natural hazards with the potential to affect Malheur County and a proven history of past damages, landslides are not considered a major hazard. However, several areas in the county are vulnerable to landslides and thus they are considered enough of a concern to be included in this plan.

The general term *landslide* refers to a range of geologic failures including slides, flows, falls, topples, and spreads. Most slope failures in the region are complex combinations of these distinct types, but the generalized groupings provide a useful means for framing discussion of slide characteristics, identification methods, and potential mitigation alternatives. These basic types are combined with the type of geologic material to from the common landslide names such as debris flow and rock fall.

Landslides can be grouped as "on-site" and "off-site" hazards. An "on-site" slide is one that occurs on or near a development site and is slow moving. On-site landslide hazards include features called slumps, earthflows and block slides. "Off-site" slides typically are rapid moving and begin on steep slopes at a distance from homes and development. For more detailed information on the specific types of landslides that may occur in Malheur County, see the Landslide Annex.

The below USGS map shows the vast majority of the county to be at "low" risk for landslide activity, with the exception of a small area along the Owyhee Reservoir and an area along the western border of Malheur and Harney Counties, including the unincorporated community of Juntura, which sits on the heavily-traveled Highway 20. [v] Historically, no severe landslide events have occurred, and community members did not identify any events other than some small-scale chronic rock fall and areas with unstable ground (see Locally Identified Landslide Issues, below) but USGS has record of some minor activity – see the "Identified Landslides" map in the Landslide Annex.



U.S. GEOLOGICAL SURVEY, DIGITAL COMPILATION OF "LANDSLIDE OVERVIEW MAP OF THE CONTERMINOUS UNITED STATES" By Dorothy H. Radbruch-Hall, Roger B. Colton, William E. Davies, Ivo Lucchitta, Betty A. Skipp, and David J. Varnes, 1982 by Jonathan W. Godt1. 1997. Open-File Report 97-289

Impacts

Landslides can occur on their own or in conjunction with other hazards, such as flash flooding, when the damage is likely to compound. Depending upon the type, location, severity and area affected, severe property damage, injuries and loss of life can be caused by landslide hazards. Landslides can damage or temporarily disrupt utility services, block off or damage roads, critical lifeline services such as police, fire, medical, utility and communication systems, and emergency response. Were a significant landslide to occur along the Owyhee Reservoir, it could cause spillover flooding over the dam or other problems with the current dam and irrigation system.

Increasing the risk to people and property from the effects of landslides are the following factors:

- Allowing development on or adjacent to existing landslides or known landslide-prone areas raises the risk of future slides regardless of excavation and drainage practices. Sites at greatest risk are those situated against the base of very steep slopes, in confined stream channels (small canyons), and on fans (rises) at the mouth of these confined channels. Home siting practices do not cause these landslides, but rather put residents and property at risk of landslide impacts. There are some of these structures in Malheur County but none have reported significant landslide problems in recent history.

Location of Hazard:	**Extent of Hazard at the Location:**
Landslides could potentially occur nearly anywhere in Malheur County with slopes, but the risk in most locations is low. The greatest risk is located in areas with steep slopes or weak geologic material.	The following areas in the county are at greater landslide risk due to steep slopes and unstable ground: along the banks of Lake Owhyee (Owyhee Reservoir), the westernmost 20-30 miles of Highway 20 near Juntura, and the area around the Nyssa water tower. Also, Highway 201 north of the unincorporated community of Annex is called "The Slides" due to its past propensity for unstable ground.
Previous Occurrences of the Hazard Within the Community:	
There is no local record of major landslide events.	
Local Community's Self-Completed Landslide Hazard Risk Rating:	
107	
Community's Probability of a Future Landslide Event:	
Moderate *(One incident likely within a 35 to 75 year period.)*	
Community's Vulnerability to a Future Landslide Event:	
Low *(Less than 1% affected.)*	

Locally Identified Landslide Issues

The following list includes countywide issues, county-city joint issues, and city-specific issues. City-specific issues are duplicated in the city addendums. Items tagged with a star (*) are issues which are considered high priority and are addressed by an Action Item in Section 4 of this plan. If an item is

not tagged with a star this implies that it is currently not cost-effective or otherwise feasible to mitigate the issue locally.

- Lytle Boulevard, which is the only major access road for Owyhee Dam, experiences chronic minor rockfall and debris due to the steepness of the slope into which the road was constructed. The county road department maintains this road and if serious rockfall or landslide activity occurred, access to and from the dam could be completely cut off until the debris was cleared. No such serious incidents have occurred.
- Owyhee Dam is also vulnerable in certain places along the reservoir and its canal system to landslides and debris flow – a major landslide into Owyhee Dam when full could cause spillover and temporary flooding. One area at the dam site prone to chronic minor landslides has been reinforced and thus far has had no further landslide activity.
- A portion of Oregon Highway 201 near the northern border of the County (known locally as "The Slides") experiences chronic ground instability and must be re-coated with asphalt annually at a cost of $30,000/yr to ODOT. However, it is a low-volume road and is not slated for major repair efforts on the state or local level, so while it is documented as a concern, no Action Items have been developed for this concern at this time.
- The city of Nyssa's 3-million gallon water storage tank sits atop a hillside adjacent to Main Street (highway 26) that is prone to erosion from irrigation of nearby fields. It this erosion continues without reinforcing the tank and hillside, it is at risk of damaging 2 nearby houses and blocking Highway 26.*

Volcanic Event Summary

Like the rest of Oregon, Malheur County has some risk of being impacted by volcanic activity in the Cascade Range. The principal hazards are linked to Newberry Crater and the Three Sisters Region in Deschutes County and Mount St. Helens in Washington State. Because of its geographic distance from these volcanic sites, Malheur County is not at risk for proximal hazards such as lava flows. However, it is at risk for distal hazards, primarily ash fall (tephra). The location, size, and shape of the area affected by tephra fall is determined by both the vigor and duration of the eruption and the wind direction at the time of eruption, making prediction of the area to be affected impossible more than a few hours in advance.

Additionally, Jordan Craters, about 14 miles northwest of the city of Jordan Valley, is thought to have extruded lava as recently as 3200 years ago. According to DOGAMI, however, it is not considered a cause for concern for future activity.

Impacts

The effects of a major volcanic event can be widespread. The Cascade Range in Washington, Oregon and northern California is one of the most volcanically active regions in the United States. Volcanoes produce a wide variety of hazards that can destroy property and kill people. Large explosive eruptions can endanger people and property hundreds of miles away and even affect the global climate.

It takes only 0.5 to 1.0 centimeters of tephra to halt traffic and close businesses for up to a week. Tephra can clog vehicle engines, short-circuit power lines, and even spawn lightning, which then creates an additional risk of wildfire. Malheur County has approximately a 1 in 5,000 chance annually of receiving this quantity of tephra from any of the Cascade Range volcanoes.[vi] If the county were to receive tephra fall, the short-term impacts could be significant due to the high daily traffic volume on I-84 and Highway 20 and the entire county's dependence on automobile transportation.

Because of the highly uncertain nature of distal volcanic hazards and the lack of prior volcanic events affecting Malheur County, this plan does not include any formal mitigation actions for volcanic hazards. Distal hazards are a minor risk for the county and are documented here as such, but currently community consensus is that no actions need to be taken at this time. This judgment is subject to review should regional volcanic conditions change and increase the County's risk of damages from volcanic activity.

Location of Hazard:	Extent of Hazard at the Location:
All of Malheur County could experience impacts from volcanic activity.	Depending on weather variables, i.e. wind direction, all of Malheur County could be affected by tephra should an eruption occur in the Cascade Range.
Previous Occurrences of the Hazard Within the Community:	
None recorded.	
Local Community's Self-Completed Volcanic Event Hazard Risk Rating:	
69	
Community's Probability of a Future Volcanic Event:	
Low *(One incident likely within a 75 to 100 year period.)*	
Community's Vulnerability to a Future Volcanic Event:	
Low *(Less than 1% affected.)*	

Locally Identified Volcano Issues

- None identified.

Risk Footnotes

[i] *Burby, R. 1998. Cooperating with Nature. Washington, DC: Joseph Henry Press. Pg. 126.*

[ii] *Burby, R. 1998. Cooperating with Nature. Washington DC: Joseph Henry Press. Pg. 133.*

[iii] *http://www.ocs.orst.edu/county_climate/Malheur_files/Malheur.html*

[iv] *Oregon State Natural Hazard Mitigation Plan, Region 8 Regional Profile*

[v] *Oregon State Natural Hazard Mitigation Plan, Region 8 Regional Profile*

[vi] *Oregon State Natural Hazard Mitigation Plan, Region 8 Regional Profile*

Section 4: Missions, Goals, and Action Items

This section describes the components that guide implementation of the identified mitigation strategies and is based on strategic planning principles. This section also provides information on the process used to develop a mission, goals and action items for the plan.

- *Mission*— The mission statement is a philosophical or value statement that answers the question "Why develop a plan?" In short, the mission states the purpose and defines the primary function of the County's Natural Hazards Mitigation Plan. The mission is an action-oriented statement of the plan's reason to exist. It is broad enough that it need not change unless the community environment changes.
- *Goals*— Goals are designed to drive actions and they are intended to represent the general end toward which the County effort is directed. Goals identify how the community intends to work toward mitigating risk from natural hazards. The goals are guiding principles for the specific recommendations that are outlined in the action items.
- *Action Items*— The action items are detailed recommendations for activities that local departments, citizens and others could engage in to reduce risk.

Mitigation Plan Mission

The mission of the Malheur County Multi-Jurisdictional Natural Hazard Mitigation Plan is to:

…create a disaster resilient county by building partnerships, reducing risk, preventing loss, and protecting life, property, and the environment from future natural hazard events.

Developing the Mission

Input from Stakeholder Interviews, Steering Committee meetings, and ONHW training sessions, including local priorities and emphases, was synthesized by the Coordinator into a Plan mission statement draft. This draft was then reviewed by the Steering Committee via email over the week of January 22, 2007. The Coordinator incorporated committee members' comments and suggestions on content, wording, and emphasis, and the final version was approved and adopted by the Steering Committee in its second meeting on February 27, 2007.

Mitigation Plan Goals

The plan goals help guide the direction of future activities aimed at reducing risk and preventing loss from natural hazards. The goals listed here serve as checkpoints as agencies and organizations begin implementing mitigation action items.

Developing the Goals

Input from Stakeholder Interviews, Steering Committee meetings, and ONHW training sessions was synthesized by the Coordinator into a draft set of Plan goals. Additionally, the Coordinator sought to ensure that Plan goals aligned with the community's mitigation priorities as identified in interviews and meetings. These draft goals were presented to the Steering Committee during its fourth meeting on May 15, 2007. Comments and revision suggestions from this meeting were incorporated into the goals and sent out for a second review via email during the week of May 21, 2007. All suggested changes or corrections were made and became part of the final set of Plan goals.

Plan Goals

The following 5 statements are the goals for the Malheur County Multi-Jurisdictional Natural Hazard Mitigation Plan. The format of the goals is as follows:

0. *Goal Statement*
    - *Objective of the goal statement*

1. Protect Infrastructure, Safeguard Economy
    - Implement projects and activities to: lessen the impacts of natural hazards on infrastructure and property, protect the local economy, and reduce economic hardship in post-disaster situations.

2. Increase Education, Outreach, and Awareness
    - Implement education programs to increase awareness of hazards and risk-reduction practices for citizens, government, and business.

3. Strengthen Organizational and Community Capacity
    - Develop, strengthen, and sustain community partnerships among public and private sector stakeholders to build upon local resources for mitigation efforts.

4. Reduce the Threat to Life Safety
    - Minimize the threat to life in disaster events through mitigation activities that improve community notification and preparation.

5. Protect Natural and Cultural Resources
    - Strengthen land use planning and natural resource management to protect natural systems and allow them to serve mitigation functions; develop measures to protect cultural resources from natural hazard risks.

Mitigation Plan Action Items

Short and long-term action items (AIs) identified through the planning process are an important part of the mitigation plan. Action items are detailed recommendations for activities that local departments, citizens and others could engage in to reduce risk. They both address multi-hazard (MH) and hazard-specific issues. Action items can be developed through a number of sources. The figure below illustrates some of these sources. A description of how the plan's mitigation actions were developed is provided below.

Figure 4.1 Action Item Sources

Source: Oregon Natural Hazards Workgroup, 2006

Developing the Action Items

The Coordinator led the effort to collect and document action item ideas, disperse action worksheets to stakeholders and organizations, and ultimately draft action item worksheets to present to the Steering Committee. Action item input was gathered through stakeholder interviews, Steering Committee meetings, jurisdiction-specific city addendum meetings, and during public presentations throughout the community made by the Coordinator. The Steering Committee was charged with the selection of draft action items to document in the plan and with providing valuable local feedback on the priority and feasibility of each draft AI. The Steering Committee met on May 15, 2007 to review AIs and decide which to adopt and prioritize. The Coordinator then refined and updated the AIs according to these recommendations and further individual meetings as needed with coordinating organizations and internal and external partners on specific AIs.

How Does This Form Work?

Each action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The sections below describe in detail the various sections of the Action Item Forms used in this plan. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below. These action item worksheets are located at the end of this section.

Rationale or Key Issues Addressed

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. AIs can be developed at any time during the planning process and can come

from a number of sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment.

Ideas for Implementation:

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the AIs is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure. This section should also include a description of how the mitigation activity may be implemented through existing community plans, policies and programs.

Coordinating Organization:

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

Internal and External Partners:

The internal and external partner organizations listed in the action item worksheets are potential partners recommended by the project Steering Committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the County that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

Plan Goals Addressed:

The plan goals addressed by each AI are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals following implementation.

Timeline:

AIs include both short and long-term activities. Each action item includes an estimate of the timeline for implementation. *Short-term AIs* (ST) are activities that may be implemented with existing resources and authorities in one to two years. *Long-term AIs* (LT) may require new or additional resources and/or authorities, and may take from one to five years to implement.

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Source: Oregon Natural Hazards Workgroup, 2006

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from a number of sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment.

Ideas for Implementation:

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the AIs is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure. This section should also include a description of how the mitigation activity may be implemented through existing community plans, policies and programs.

Coordinating Organization:

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

Internal and External Partners:

The internal and external partner organizations listed in the action item worksheets are potential partners recommended by the project Steering Committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

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External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

Plan Goals Addressed:

The plan goals addressed by each AI are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals following implementation.

Timeline:

AIs include both short and long-term activities. Each action item includes an estimate of the timeline for implementation. *Short-term AIs* (ST) are activities that may be implemented with existing resources and authorities in one to two years. *Long-term AIs* (LT) may require new or additional resources and/or authorities, and may take from one to five years to implement.

Drought # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Support the Malheur County Soil and Water Conservation District (SWCD) in its countywide water assessment project. [COUNTY]	Protect Infrastructure, Safeguard Economy; Strengthen Organizational and Community Capacity; Protect Natural and Cultural Resources

Rationale for Proposed Action Item:

The Malheur County SWCD is currently working to secure funding for a countywide irrigation water system assessment; this project will help county irrigation districts increase efficiency, reduce vulnerability to drought, and prioritize improvements/repairs.

The Disaster Mitigation Act of 2000 requires communities to develop comprehensive actions to reduce the impacts of natural hazards on their community [201.6(c)(3)(ii)]. Supporting the Malheur County SWCD in their countywide water assessment project will help to increase efficiency for county irrigation districts and reduce vulnerability to drought.

Ideas for Implementation:

- Work with Lance Phillips, Malheur County Soil and Water Conservation District.
- Supply drought hazard information as needed.
- Seek potential FEMA funding sources for water assessment project.

Coordinating Organization:	Malheur Co Soil and Water Conservation District

Internal Partners:		**External Partners:**
Malheur and Owyhee Watershed Councils, all county Irrigation Districts		FEMA
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
X		

Form Submitted by:	

Drought # 2

Proposed Action Item:	**Alignment with Plan Goals:**
Support the Malheur & Owyhee Watershed Councils' ongoing efforts to convert dirt irrigation canals into pipes. [COUNTY]	Protect Infrastructure, Safeguard Economy; Strengthen Organizational and Community Capacity; Protect Natural and Cultural Resources

Rationale for Proposed Action Item:

Both the Malheur and Owhyee Watershed Councils, which together oversee the two major watersheds in the county, are working on projects to convert aging, inefficient dirt irrigation canals into pipes.

Dirt canals typically have a 20-30% inefficiency rate of delivery due to evaporation, seepage, and damages from gophers and debris. Converting these canals into closed pipes removes the inefficiency and thus increases the amount of water available to farmers in the event of a water shortage or drought.

The Disaster Mitigation Act of 2000 requires communities to develop comprehensive actions to reduce the impacts of natural hazards on their community [201.6(c)(3)(ii)]. Project will help to increase efficiency for county irrigation districts and reduce vulnerability to drought. This project may also have water quality benefits for the region by reducing agricultural runoff.

Ideas for Implementation:

- Work with irrigation districts to identify and prioritize key canals for piping.
- Work with Malheur Watershed Council and Owyhee Watershed Council to determine organizational priorities for piping.

Coordinating Organization:	Malheur Watershed Council

Internal Partners:		**External Partners:**
Owyhee Watershed Council, all county irrigation districts, Soil and Water Conservation District		FEMA
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
X		

Form Submitted by:	

Flood # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Update County and City floodplain ordinances. [COUNTY, VALE, JORDAN VALLEY]	Protect Infrastructure, Safeguard Economy; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

A stronger floodplain ordinance would help the County and cities manage floodplain areas to reduce flood risks.

The current County floodplain ordinance is outdated and insufficient for flood protection for new construction. The same goes for Vale, Nyssa, Adrian, and Jordan Valley. The cities of Vale and Jordan Valley are definitely interested in working with the County to update their floodplain ordinances. Adrian and Nyssa are potential partners. The City of Ontario has completed a revised floodplain ordinance as of summer 2007.

The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Updating County and city floodplain ordinances will provide more accurate floodplain information that will reduce the impact of flooding on new buildings.

Ideas for Implementation:

- Ontario's floodplain ordinance regulations and standards could serve as a model for the other cities and the county. The County and/or Ontario could provide technical assistance to the 4 smaller cities.
- Use other county floodplain ordinances to serve as a model ordinance for Malheur County.
- The county will need to determine the extent of the update; whether funding and community support allows for updated text only or updated text and maps.
- Reference "Oregon Model Flood Damage Prevention Ordinance." See Vol. IV, Appendix D, p. D-9.

Coordinating Organization:	Malheur County Planning Department

Internal Partners:	**External Partners:**
City of Ontario, City of Vale, City of Jordan Valley, City of Nyssa, City of Adrian	FEMA, DLCD

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
X		

Form Submitted by:	

Flood # 2

Proposed Action Item:	**Alignment with Plan Goals:**
Acquire flood-prone parcels near 36th St. bridge across the Malheur River. [COUNTY]	Protect Infrastructure, Safeguard Economy; Reduce the Threat to Life Safety; Protect Natural and Cultural Resources

Rationale for Proposed Action Item:

Several properties in the immediate vicinity of this bridge, some of which are currently privately owned with homes and other structures present, flood frequently due to their proximity to the Malheur River and the 36th Street Bridge, which bottlenecks during flood events and exacerbates flooding issues. These properties cost the County money by needing frequent sandbagging in all high water events.

According to Oregon Natural Hazard Technical Resource Guide, while buyout of land in the floodplain may be the most expensive method of mitigation, it is also the most effective in terms of a flood mitigation strategy. Once the land in the floodplain is purchased outright by a local government entity, all development can be prohibited, and the land can be officially designated as open space.

The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Acquiring flood-prone parcels near 36th Street across the Malheur River will reduce the vulnerability of existing buildings to floods and avoid future development in flood-prone areas.

Goal 7 of Oregon's Statewide Planning Goals and Guidelines states that local governments "adopt or amend, as necessary, based on the evaluation of risk, plan policies and implementing measures …[to avoid] development in hazard areas where the risk to people and property cannot be mitigated."

Ideas for Implementation:

- Consult County tax lot maps to determine the number and ownership of at-risk parcels.
- Work with property owners to determine appropriate next steps toward acquisition.
- The Oregon Technical Resource Guide provides four different types of buyouts to acquire flood-prone parcels:
    1. Basic Buyouts which have no relocation element
    2. Buyout and infill programs which encourage the relocation of structures outside the floodplain.
    3. Buyout and reorganization plans which create new subdivisions where moved structures are relocated.
    4. Buyout and complete relocation of buildings in the floodplain.
- Funding sources for buyouts include FEMA's Hazard Mitigation Grant Program administered by the Oregon Office of Emergency Management.

Coordinating Organization:	Malheur County Planning Department

Internal Partners:	**External Partners:**
Malheur County Road Department, Emergency Services	Adjacent Landowners, FEMA

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
	X	

Form Submitted by:	

Flood # 3

Proposed Action Item:	**Alignment with Plan Goals:**
Retrofit/modify 36th St. bridge and river channel to reduce repeated flood issues on the Malheur River. [COUNTY]	Protect Infrastructure, Safeguard Economy; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

This bridge, which crosses the Malheur River just outside of the City of Ontario, is too narrow and bottlenecks during high water events, causing upstream flooding and often blocking road access. The river channel itself is also narrow, which exacerbates the flooding issues. The bridge is considered structurally sound aside from flooding issues.

The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Modifying the 36th Street bridge and river channel will reduce flood issues on the Malheur River and protect critical infrastructure.

Ideas for Implementation:

- Work with county Emergency Services and Road Department to compile information on the frequency, cost, and detailed impacts of flood events at the bridge.
- Work with Army Corps of Engineers to widen bridge and channel to reduce bottlenecking.
- Work with FEMA to find funding sources.

Coordinating Organization:	Malheur County Planning Department

Internal Partners:	**External Partners:**
Malheur County Road Department, Rural Road Assessment District #3 (Ontario Road District)	Adjacent Landowners, Army Corps of Engineers, FEMA

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
	X	

Form Submitted by:	

Flood # 4

Proposed Action Item:	**Alignment with Plan Goals:**
Explore the potential for Malheur County to participate in the Community Rating System (CRS) of the National Flood Insurance Program (NFIP). [COUNTY]	Protect Infrastructure, Safeguard Economy; Increase Education, Outreach, and Awareness; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

County and city homeowner participation in NFIP is currently spotty. There are no designated repetitive-loss properties in the county, but most floodplain areas have had some NFIP claims within the past 20 years. See Section 3: Flood Hazard Summary for a list of historic flood events in Malheur County.

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, insurance premiums under the NFIP are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance.

The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Inclusion into the Community Rating System program can help communities in Malheur County to enhance mitigation efforts and decrease the vulnerability to floods.

Ideas for Implementation:

- Determine CRS eligibility requirements
- Work with city and county to determine the best means of outreach to floodplain residents (mailing? Public meeting? Other methods?)
- Coordinate with the Department of Land Conservation and Development (DLCD) and FEMA to join the Community Rating System.
- Educate businesses and homeowners currently under the NFIP program about the CRS program and any mitigation actions they can implement to reduce their insurance premiums.

Coordinating Organization:	

Internal Partners:	**External Partners:**
	FEMA, DLCD

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	N/A
	X	

Form Submitted by:	

Flood # 5

Proposed Action Item:	**Alignment with Plan Goals:**
Implement stormwater improvement measures as identified in the 2003 City of Ontario Stormwater Master Plan. [ONTARIO]	Protect Infrastructure, Safeguard Economy

Rationale for Proposed Action Item:

Ontario's Stormwater Master Plan (SMP), adopted in 2003, identifies several infrastructure improvements that would mitigate flood risks for the city in addition to improving the overall stormwater system.

SMP Recommendations:

- Adopt a city policy to limit post-development stormwater runoff to pre-development conditions. (Reduces surcharge and flood risk)
- Establish an annual pipeline replacement program and eventually replace all pipelines with at least 12-inch diameter pipelines. (better outflow, reduced risk of surcharges)
- Review and update interagency agreements between the City and irrigation districts to outline each entity's responsibilities in regards to water quality, stormwater runoff, and maintenance of jointly used facilities. (improve efficiency)
- Kmart Drainage Basin – several pipe upsizings and a cleanout. (Reduce surcharges during storm events)
- Heinz Frozen Foods Basin – correct an adverse pipeline grade. (Reduce surcharge during storm events)
- Park Boulevard Drainage Basin – combine this basin with the Double Trunk Line and Downtown Ontario Drainage Basin; upsize, connect, redirect, and limit inflow of several lines; add desiltation basins. (All of these measures would be to reduce surcharges during storm events)
- Verde Road Basin – fix a collapsing 30-inch pipe
- SW 4th Ave Drainage Basin – construct a desiltation basin for agricultural runoff
- Construct retention basins for several drainage areas. (Reduced flood risk, water filtration)
- Preserve land identified in Fig 21 (see Flood Hazard Annex) for future water quality treatment needs.

(A copy of the full text of these recommendations is attached to the Ontario city addendum.)

Ideas for Implementation:

- Coordinate efforts with the Ontario Public Works Department to implement storm water improvement measures.
- Work with FEMA to identify funding sources.

Coordinating Organization:	City of Ontario Public Works

Internal Partners:	**External Partners:**
City of Ontario, Ontario Planning Dept	FEMA

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
	X	

Form Submitted by:	

Flood # 6

Proposed Action Item:	**Alignment with Plan Goals:**
Identify flood-prone riverfront property for potential acquisition as part of the ongoing greenbelt space project. [ONTARIO]	Reduce the Threat to Life Safety; Protect Natural and Cultural Resources

Rationale for Proposed Action Item:

As of 2007, the city of Ontario is creating a greenbelt (public access, with walking trails) along the Malheur and Snake Rivers around the border of the city. As part of this process, the city will identify parcels of riverfront land (flood prone; located on the rivers' floodplains) that can serve a dual purpose for greenbelt use and flood mitigation (if purchased and set into a conservation easement, this greenbelt land would not be developed but could be used for greenbelt recreation purposes).

There is currently one parcel of land on the first phase of the greenbelt (the "Malheur River Loop") that is not under city ownership.

The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Acquiring flood-prone riverfront property for potential acquisition will not only reduce the vulnerability of floods, but help in the development of the greenbelt space project.

Goal 7 of Oregon's Statewide Planning Goals and Guidelines states that local governments "adopt or amend, as necessary, based on the evaluation of risk, plan policies and implementing measures …[to avoid] development in hazard areas where the risk to people and property cannot be mitigated." Acquiring flood-prone riverfront property for acquisition in the greenbelt space project will avoid future development in the flood-prone properties, fulfilling Goal 7's requirements.

Ideas for Implementation:

- For the one parcel of non-city owned land on the Malheur River Loop, initiate contact with the landowner to discuss usage and possible sale options.
- Work with city planning department to identify parcels on the proposed greenbelt route not owned by the city; initiate contact with landowners.
- Research potential ownership and easement options for greenbelt/flood mitigation parcels not owned by the city.

Coordinating Organization:	City of Ontario Parks & Recreation Department

Internal Partners:	**External Partners:**
City of Ontario Planning Department	Oregon Department of Parks & Recreation, FEMA

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
X		

Form Submitted by:	

Flood # 7

Proposed Action Item:	**Alignment with Plan Goals:**
Conduct a Base Flood Elevation study on the area immediately surrounding the new I-84 overpass in Ontario. [ONTARIO]	Protect Infrastructure, Safeguard Economy; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

The City of Ontario is experiencing significant growth on the north end of town in the immediate vicinity of a new interstate overpass which is estimated to be complete by 2008. This area is also located in the floodplain of the Snake River and may be more vulnerable to flood damage when fully built out. Current permits are being issued with Base Flood Elevations designed around a floodplain without any pre-existing development.

The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Conducting a base-flood elevation study around the I-84 overpass will make new development in that area less vulnerable to flooding events and protect future buildings in that neighborhood.

Ideas for Implementation:

- Review current floodplain maps to determine area in need of new BFE.
- Coordinate efforts with FEMA to conduct a base flood elevation study and to seek funding sources, potentially through FEMA's Map Modernization program.
- Note: This area may be photographed with LIDAR aerial photography in late 2007, which would aid in providing FEMA with sufficient information to revise the BFE.

Coordinating Organization:	City of Ontario Planning Dept

Internal Partners:		**External Partners:**
Malheur County Planning Dept		FEMA
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	N/A
X		

Form Submitted by:	

Flood # 8

Proposed Action Item:	Alignment with Plan Goals:
Install USGS river gauges on Bully Creek and/or the Malheur River upstream of Vale. [COUNTY, VALE]	Increase Education, Outreach, and Awareness; Strengthen Organizational and Community Capacity

Rationale for Proposed Action Item:

The Boise National Weather Service and the USGS would like to see two additional river gauges installed in the county: one on Bully Creek below Bully Creek Dam, and one on the Malheur River upstream of Vale, as the only current gauge is located downstream of Vale. An upstream gauge would allow for greater lead time for flood data in the event of a large flood event on the Malheur River, which would expedite response measures (evacuation, etc). A gauge on Bully Creek would allow for greater lead time for flood data on Bully Creek, which has a history of flooding and can also impact Malheur River flood levels where it flows into the river (9 miles northwest of Vale).

During periods of flooding, NWS uses river gauge information to issue forecasts for the height of the flood crest, the date and time when the river is expected to overflow its banks, and the date and time when the river is expected to recede to within its banks. More information on how NWS and USGS use the gauges is at: http://pubs.er.usgs.gov/usgspubs/fs/fs20995

The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Installing a second river gauge will help reduce the impact of a flooding event by providing greater lead time to evacuate an area in a flood and will help in response efforts.

Ideas for Implementation:

- The Bully Creek gauge is on a USGS priority list for inclusion into the National Streamflow Information Program (NSIP), which, if Bully Creek were selected, would provide full federal funding for the gauge.
- The Malheur River gauge would need joint funding resources from USGS and the county. 60/40 (federal/county) cost-share funding for installation and operation is sometimes available from USGS.
- Portland USGS office would oversee construction and setup; Boise USGS would conduct long-term operations. County would have access to real-time information online or through Boise USGS / NWS offices.
- Contact: Tom Herrett, Portland USGS, 503-251-3239
- Keep in contact with Portland USGS about potential NSIP funding availability.
- http://water.usgs.gov/nsip/

Coordinating Organization:	

Internal Partners:	External Partners:
	NWS, USGS

Timeline:		If available, estimated cost:
Short Term (0-2 years)	Long Term (2-4 or more years)	Installation: $15,000 Annual operating costs: $14,580
	X	

Form Submitted by:	

Flood # 9

Proposed Action Item:	Alignment with Plan Goals:
Obtain digital GPS floodplain maps for the county and cities. [COUNTY, ONTARIO, VALE, NYSSA, ADRIAN, JORDAN VALLEY]	Increase Education, Outreach, and Awareness; Strengthen Organizational and Community Capacity

Rationale for Proposed Action Item:

Given the frequent occurrence of floods in the County and this hazard's high priority ranking, digital maps would greatly help the County plan flood mitigation actions. When and if County FIRM maps become available in digital form, local GIS and planning staff will be able to determine how much infrastructure is located in floodplain areas and determine how best to reduce those areas' flood risks on a localized level.

The current floodplain maps for the county and all 5 cities are only available in hard copy paper format and were last updated in 1986. The county and 5 cities have experienced enough development in the last 20 years that these maps may not have accurate Base Flood Elevations and other measurements, thus exacerbating the flood risk.

As was noted in Section 2: Community Sensitivity and Resilience, in 2008, FEMA was scheduled to begin upgrading flood hazard data in Eastern Oregon. However, funds are not expected to continue. Communities that are able to demonstrate significant need, and/or are able to provide accurate topological data, road maps, base elevation measurements, and a description of populations at-risk will be more competitive in acquiring a portion of the remaining funds.

The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Obtaining GPS floodplain maps will enable communities in Malheur County to improve assessments of flood risks and implement appropriate flood mitigation activities to reduce the vulnerability of floods in the county.

Ideas for Implementation:

- Coordinate with FEMA to acquire digital GIS floodplain maps for the county and cities in Malheur County. Overlay digital FIRM maps against current property maps. Count and document the number of structures lying within the floodplain.
- Work with Malheur County GIS staff to determine what local topological and base elevation data may already be available to aid in the digitization process.
- Count the types and numbers of existing buildings, infrastructure, and critical facilities located in the floodplain.

Coordinating Organization:	Malheur County Planning Department

Internal Partners:	External Partners:
Malheur County GIS staff	FEMA

Timeline:		If available, estimated cost:
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
	X	

Form Submitted by:	

Flood #10

Proposed Action Item:	**Alignment with Plan Goals:**
Replace faulty flapper valve and head gate valve in storm drain near the city school bus shed. [VALE]	Protect Infrastructure, Safeguard Economy

Rationale for Proposed Action Item:

Vale Public Works Director reported a flood hazard in the city due to a faulty flapper valve and head gate valve on a storm drain on the south side of the city near the aquatic center and the school district bus shed.

In flood events, these valves do not work properly and allow water to back up through the storm drain, where it can flow out into the bus shed. This has happened during most flood events in the past 20 years. Thus far the water has not risen enough to force the school district to move the buses, but it is a concern for the district and for the public works department.

The city is currently only able to employ stopgap measures (plywood and gravel laid over the drain) until the valves can be replaced.

Ideas for Implementation:

- Replace faulty flapper valve and head gate valve to allow proper storm water drainage into the Malheur River.

Coordinating Organization:	Vale Department of Public Works

Internal Partners:	**External Partners:**
City of Vale	FEMA

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	*N/A*
X		

Form Submitted by:	

Multi-Hazard # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Conduct Business Continuity Plan Development Workshops for small businesses and potentially local nonprofits and human services organizations. [COUNTY, ONTARIO, VALE, NYSSA, ADRIAN, JORDAN VALLEY]	Increase Education, Outreach, and Awareness; Strengthen Organizational and Community Capacity

Rationale for Proposed Action Item:

The local economy is dependent on small business; most business owners do not have disaster plans in place. Similarly, many local nonprofits and human service providers do not have plans in place and are crucial support systems for vulnerable community populations.

According to Daniel Alesch from the Public Entity Risk Institute, business continuity plans assist businesses in planning for future recovery efforts. In addition, research has shown that most small businesses are unable to recover after a disaster. Business continuity plans allow businesses and their employees to be better prepared for a disaster. Having plans in place may reduce the impact on the business, allowing employees to continue to work or get back to work faster.

Ideas for Implementation:

- Use Institute for Business and Home Safety toolkit materials
- Work with Chamber of Commerce for small businesses, Malheur Community Services committee for human services nonprofits.
- Coordinate efforts with ONHW to conduct workshops with local businesses to develop business Disaster Plans.

Coordinating Organization:	

Internal Partners:		**External Partners:**
Chambers of Commerce, Malheur Community Services Workgroup		**ONHW**
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
	X	

Form Submitted by:	

Multi-Hazard # 2

Proposed Action Item:	**Alignment with Plan Goals:**
Work with Southeast Oregon Regional Food Bank to develop a plan/system for stocking and distributing emergency food boxes at all county food pantry locations for disaster situations. [COUNTY, ONTARIO, VALE, NYSSA, ADRIAN, JORDAN VALLEY]	Increase Education, Outreach, and Awareness; Strengthen Organizational and Community Capacity

Rationale for Proposed Action Item:

The local low income population depends on food banks for food security; many do not keep 72-hour kits or extra food supplies on hand for emergencies.

The Disaster Mitigation Act of 2000 requires communities to identify a comprehensive list of actions that reduce the impacts of natural hazards on the community [201.6(c)(3)(ii)]. Developing a plan with the Southeast Oregon Regional Food Bank for stocking and distributing emergency food boxes to food pantry locations will provide a continued service to families in need and may help the larger community in a potential disaster situation.

Each city in the county has access to a food pantry [Adrian shares with Nyssa].

Ideas for Implementation:

- Work with SE Oregon Regional Food Bank and partner agencies to determine what kind of system would work best for their respective pantries and programs, as each has different storage and usage capabilities.

Coordinating Organization:	SE Oregon Regional Food Bank

Internal Partners:	**External Partners:**
Four Rivers Hunger Awareness and Prevention Coalition	

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
	X	

Multi-Hazard # 3

Proposed Action Item:	**Alignment with Plan Goals:**
Develop an education program for Malheur County to raise awareness of natural hazards and potential mitigation activities. [COUNTY]	Increase Education, Outreach, and Awareness

Rationale for Proposed Action Item:

Local residents are often unaware of how to reduce their hazard risks, and could benefit from the availability of educational materials and workshops, especially residents in vulnerable areas (WUIs, floodplains, etc). Rather than take a piecemeal, ad-hoc approach, the county could benefit from an organized effort to present mitigation and preparedness activities that businesses and the public can implement to reduce the impact of those hazards

The Disaster Mitigation Act of 2000 requires communities to identify comprehensive actions that will reduce the impact of a natural hazard [201.6(c)(3)(ii)]. Developing education programs for Malheur County will help raise awareness of natural hazards and potential mitigation actions residents can implement to reduce the impact of those hazards.

Ideas for Implementation:

- Research ways to create and disseminate a message that will cause people to act to reduce individual risk to natural hazards. Target education and outreach actions to reach marginalized or especially vulnerable populations. Potential dissemination strategies: county website, mailings, public workshops, newspaper articles.
- Utilize already available mitigation materials from IBHS, BLM, NFIP and other organizations:
  - *Encourage implementation of non-structural earthquake retrofits in homes, businesses, and medical and care facilities. (IBHS Homeowners Guide to Non-structural Retrofit materials)*
  - *Encourage fire-resistant building and landscaping for property owners. (Firewise materials)*
  - *Encourage water conservation and drought resistance strategies for property owners and farmers. (materials from USDA Farm Service Agency and other offices)*
  - *Encourage flood protection measures for homes and businesses (NFIP materials)*

- Identify local government department offices as locations for educational material distribution.
  - *Potential sites: Malheur Co Planning Dept, Vale City Hall, Nyssa City Hall, Jordan Valley City Hall, Ontario City Hall, Adrian City Recorder's Office*

Coordinating Organization:	Malheur Co Emergency Management Team

Internal Partners:	**External Partners:**

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
	X	

Form Submitted by:	

Multi-Hazard # 4

Proposed Action Item:	**Alignment with Plan Goals:**
Update the mission of the Malheur County Emergency Management Team to include the maintenance and review of the Natural Hazard Mitigation Plan. [COUNTY]	Strengthen Organizational and Community Capacity

Rationale for Proposed Action Item:

The Malheur County Emergency Management Team (EMT), to which several Steering Committee members belong, will oversee mitigation plan maintenance once the plan is adopted. The EMT will provide continuity to the process and an avenue for other stakeholders to provide input on the plan.

The Disaster Mitigation Act of 2000 requires Mitigation Plans to include provisions for describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle [201.6(c)(4)(i)]. Updating the mission of the Malheur County Emergency Management Team will ensure that procedures are in place for maintaining and reviewing the plan and action items.

Ideas for Implementation:

- See Volume I, Plan Implementation and Maintenance, for details on how plan maintenance will be managed by the EMT.
- Gain official County Court recognition (via resolution or other means) of the EMT as the body that will maintain and update the NHMP.

Coordinating Organization:	Malheur County Emergency Management Team

Internal Partners:	**External Partners:**
	FEMA

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**No cost**
X		

Form Submitted by:	

Multi-Hazard # 5

Proposed Action Item:	**Alignment with Plan Goals:**
Identify historic structures that represent a significant cultural resource for the community, and identify mitigation to protect them from natural hazards. [COUNTY]	Reduce the Threat to Life Safety; Protect Natural and Cultural Resources; Protect Infrastructure, Safeguard Economy

Rationale for Proposed Action Item:

The county has several historic structures that are culturally significant and potentially vulnerable to hazards, especially unreinforced masonry buildings. A list may be found in Section 2, Community Sensitivity and Resilience. These could be prioritized for retrofits and renovations.

Because several of the cities in Malheur County are located along the historic Oregon Trail, tourism is a component of Malheur County's economy. Identifying mitigating actions to help preserve these historic and cultural resources from damaging hazard events will preserve the cultural heritage of the county and maintain heritage tourism as a component in the County's economy.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6(c)(3)(ii)]. Inventorying important historic and cultural resources and identifying their vulnerability to natural hazards will help to develop mitigation actions that reduce their overall vulnerability to natural hazards.

Ideas for Implementation:

- Identify significant cultural and historic resources, whether on the national register or not, that are worthy of additional protection
- Determine vulnerabilities of these resources to natural hazards
- Identify appropriate mitigation measures to help preserve historic and cultural resources.

Coordinating Organization:	

Internal Partners:	**External Partners:**
	Oregon State Historic Preservation Office (SHPO)

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
	X	

Form Submitted by:	

Multi-Hazard #6

Proposed Action Item:	**Alignment with Plan Goals:**
Install arsenic removal equipment on municipal wells #7 and 9 to provide backup drinking water supply out of the floodplain. [NYSSA]	Protect Infrastructure, Safeguard Economy; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

The city of Nyssa has 5 main municipal wells that are all located in the Snake River's floodplain. In the event of a flood event, these wells are at risk of inundation, leaving the city with no potable municipal drinking water. The city's other 2 wells, located west of town and above the floodplain, do not have arsenic removal equipment and are thus unusable. Equipping these wells for that purpose would allow for a backup water supply in the event of a flood event in the city.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6(c)(3)(ii)]. Installing arsenic removal equipment on Nyssa municipal wells #7-9 will reduce the community's vulnerability to flood and drought hazards.

Ideas for Implementation:

- Install arsenic removal equipment on municipal wells #7 and 9.
- Coordinating with FEMA to identify funding sources for the equipment.

Coordinating Organization:	City of Nyssa Public Works Department

Internal Partners:	**External Partners:**
City of Nyssa	FEMA

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	N/A
	X	

Form Submitted by:	

Earthquake # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Inventory and identify critical facilities for seismic retrofit based on findings from the 2007 DOGAMI Seismic Assessment report. [COUNTY, ONTARIO, VALE, NYSSA, ADRIAN, JORDAN VALLEY]	Protect Infrastructure, Safeguard Economy

Rationale for Proposed Action Item:

In 2007 DOGAMI completed an assessment of county infrastructure for its vulnerability to seismic events and this information will need to be evaluated and incorporated into mitigation planning for the county. Much of the county's critical infrastructure is housed in unreinforced masonry buildings, which are especially vulnerable to earthquakes.

A summary of seismically vulnerable infrastructure in Malheur County, in addition to information on where to access the entire DOGAMI assessment, is available in Volume II: Earthquake Hazard Annex.

Oregon Senate Bill 3 (2005) enables the Oregon Office of Emergency Management to develop a grant program to seismically rehabilitate critical public facilities. While the grant program is still being developed, conducting an inventory of critical facilities early will assist communities in obtaining funding once the grant program is in place.

The Disaster Mitigation Act of 2000 requires communities to identify comprehensive actions that reduce the effects of hazards on the community, particularly to new and existing buildings [201.6(c)(3)(ii)]. Seismically retrofitting existing critical facilities will help communities in Malheur County reduce their vulnerability to seismic events.

Ideas for Implementation:

- When renovations occur on county buildings, increasing seismic resilience could be built in as a priority for vulnerable infrastructure.
- Use DOGAMI's Seismic Needs Assessment of buildings in Malheur County to identify and prioritize buildings vulnerable to seismic events.
- Coordinating with OEM and FEMA to determine funding for conducting seismic retrofit of buildings.

Coordinating Organization:	

Internal Partners:		**External Partners:**
		FEMA, OEM, Structure/property owners
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
	X	

Earthquake # 2

Proposed Action Item:	Alignment with Plan Goals:
Research opportunities for a seismic study of Antelope Reservoir. [COUNTY, JORDAN VALLEY]	Protect Natural and Cultural Resources; Increase Education, Outreach, and Awareness

Rationale for Proposed Action Item:

Antelope Reservoir is located on a seismically active area in the southern portion of the county near the city of Jordan Valley (13 miles away) and the unincorporated communities of Rome, Arock, and Danner. It is the site of the most recent seismic activity in the county; discussions should be held with site managers and state/federal agencies to determine if further study is warranted.

A higher-magnitude seismic event emanating from underneath the reservoir could potentially destroy its earthen dam, which would have major impacts on irrigation in the area and potential flood concerns as well. Antelope Reservoir drains into Jordan Creek, which abuts the city, and then into the Owyhee River. It is regulated to hold 69,000 acre feet of water and has a capacity of 70,000 acre feet of water.

The dam is owned by Jordan Valley Irrigation District. The manager of this site as of August 2007 is Bob Eakin; Mr. Eakin will be the first contact in working on this potential mitigation action. The state geology departments of Oregon and Idaho may also have some information on this site: as of August 2007, DOGAMI in Oregon does not, but Idaho Geology may. Requests for information were not fulfilled by the time of this plan's completion.

The Disaster Mitigation Act of 2000 requires communities to identify actions that reduce the effects of hazards on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Conducting a seismic study of Antelope Reservoir will enhance understanding of the reservoir's vulnerability to earthquakes and potential mitigation actions that can be used to protect the reservoir.

Ideas for Implementation:

- Contact Bob Eakin, Jordan Valley Irrigation District, to determine this organization's position on the dam and reservoir's earthquake hazard risk.
- Contact Idaho Geology to obtain any seismic data from the 2004 swarm.
- Coordinate with FEMA and OEM to determine funding sources for a seismic retrofit.

Coordinating Organization:	Jordan Valley Irrigation District

Internal Partners:	External Partners:
	FEMA, DOGAMI, Idaho Geology

Timeline:		If available, estimated cost:
Short Term (0-2 years)	Long Term (2-4 or more years)	N/A
	X	

Form Submitted by:	

Severe Weather # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Acquire 35 kW generator to serve as a backup power source for the city of Jordan Valley's municipal well. [JORDAN VALLEY]	Protect Infrastructure, Safeguard Economy; Strengthen Organizational and Community Capacity; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

Jordan Valley does not have sufficient backup generator power for its city services, which include the city well and wastewater treatment plant (this facility has partial generator power for its lift stations).

Winter power outages are a chronic problem for the community due to fog freezing on power lines along Marsing Grade north of town. This location is steep and rocky and it would be prohibitively expensive to underground the power lines. The city has a high elderly population, many of whom are especially vulnerable to power outages and lack backup sources of heat and water.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6(c)(3)(ii)]. Acquiring additional generator power for Jordan Valley will reduce its vulnerability to power outages in the case of severe winter weather.

Ideas for Implementation:

- Seek funding sources for the purchase of a generator.

Coordinating Organization:	City of Jordan Valley

Internal Partners:	**External Partners:**
	Idaho Power, FEMA

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
X		

Form Submitted by:	

Severe Weather # 2

Proposed Action Item:	Alignment with Plan Goals:
Replace primary electrical overhead lines to mountaintop communication services with underground lines.	Protect Infrastructure, Safeguard Economy

Rationale for Proposed Action Item:

Overhead electrical lines are subject to high winds and winter storm damage. The risk is higher on the lines going to a mountaintop or peak. Most of the services at the top are communication sites. The communication sites are used by ODOT, State Police, county sheriff, emergency services, telephone utilities and cell phone companies. During a disaster the sites are vital for communication. During winter storm access to the line by the utility is difficult and this difficulty delays the time for restoration of power to the services. The utility company has experienced costs each year to repair and maintain the lines. Changing the lines to underground would remove the risk of damage from wind and winter storm.

The Disaster Mitigation Act of 2000 requires communities to develop comprehensive actions to reduce the impacts of natural hazards, with an emphasis on new and existing buildings and infrastructure.[201.6(c)(3)(ii)] Replacing primary electrical overhead lines to mountaintop communication services with underground lines will reduce the impact of severe weather on power lines, and will continue power service to rural customers as well as ODOT, State Police, county sheriff, emergency services, telephone utilities, and cell phone companies.

The five incorporated cities in Malheur County –Adrian, Jordan Valley, Nyssa, Ontario, and Vale—rely on the county for certain services and public facilities. Because the cities rely on the County for services, this action is considered to be a multi-jurisdictional action since it benefits both the County and all the participating cities.

The Harney Electric Cooperative's power lines extend from Harney County into Malheur and Lake Counties to provide services to rural areas in these counties. This action item addresses hazards that affect Harney Electric's power lines in Malheur County as well as Harney and Lake Counties. This action item is also included in the Harney County Natural Hazards Mitigation Plan and was developed through the 2007 Harney County Pre-Disaster Mitigation (PDM) Planning process, similar to the PDM planning process that took place in Malheur County in 2007.

Ideas for Implementation:

The utility company would be responsible to identify all the mountaintops and apply for grants to put the lines underground.

Coordinating Organization:	Harney Electric Cooperative, Inc.

Internal Partners:	External Partners:
Malheur County	Companies which are served by the utility and the utility company, Lake County, Harney County

Timeline:		If available, estimated cost:
Short Term (0-2 years)	Long Term (2-4 or more years)	**n/a**
	3-4 years	

Form Submitted by:	Fred Flippence, Office Manager, Harney Electric Cooperative, Inc.

Severe Weather # 3

Proposed Action Item:	Alignment with Plan Goals:
Shorten spans and anchor poles on utility lines in high wind or heavy icing areas.	Protect Infrastructure, Safeguard Economy

Rationale for Proposed Action Item:

High wind storms or winter icing storms can cause damage to long spans between power poles and create power outages during storms. If poles are inserted between spans this reduces the risk of outages. Also by anchoring certain poles this can reduce the amount of line which would go down in a storm. Both items reduce the cost of repair and replacement.

Winter storms have a significant impact on the Harney County Electric Cooperative, causing power outages when ice forms on the power lines. This is especially a problem with older power lines constructed in the 1950s that have a larger line span between poles. Placing intermediary poles between these spans cuts the span in half and reduces the likelihood of a power line breaking.

The Disaster Mitigation Act of 2000 requires communities to develop comprehensive actions to reduce the impacts of natural hazards, with an emphasis on new and existing buildings and infrastructure.[201.6(c)(3)(ii)] Shortening the spans between long lines and anchoring poles will reduce the likelihood of lines breaking during wind and winter icing storms.

The five incorporated cities in Malheur County –Adrian, Jordan Valley, Nyssa, Ontario, and Vale— rely on the County for certain services and public facilities. Because the cities rely on the County for services, this action is considered to be a multi-jurisdictional action since it benefits both the County and all the participating cities.

The Harney Electric Cooperative's power lines extend from Harney County into Malheur and Lake Counties to provide services to rural areas in these counties. This action item addresses hazards that affect Harney Electric's power lines in Malheur County as well as Harney and Lake Counties. This action item is also included in the Harney County Natural Hazards Mitigation Plan and was developed through the 2007 Harney County Pre-Disaster Mitigation (PDM) Planning process, similar to the PDM planning process that took place in Malheur County in 2007.

Ideas for Implementation:

The utility company would be responsible to identify high wind and icing areas from previous outages and apply for grants to strengthen the areas by pole inserts and anchoring.

Coordinating Organization:	Harney Electric Cooperative, Inc.

Internal Partners:	External Partners:
Malheur County	Lake County, Harney County

Timeline:		If available, estimated cost:
Short Term (0-2 years)	Long Term (2-4 or more years)	N/A
	2-4 years	

Form Submitted by:	**Fred Flippence, Office Manager, Harney Electric Cooperative, Inc.**

Wildfire # 1

Proposed Action Item:	**Alignment with Plan Goals:**
When complete, review and incorporate mitigation actions from the Malheur County Community Wildfire Protection Plan into the NHMP. [COUNTY, ONTARIO, VALE, NYSSA, ADRIAN, JORDAN VALLEY]	Protect Infrastructure, Safeguard Economy; Strengthen Organizational and Community Capacity

Rationale for Proposed Action Item:

Incorporating mitigation actions from the Malheur Community Wildfire Protection Plan will ensure that both the NHMP and the CWPP contain compatible actions, and that the NHMP provides a comprehensive range of actions as required by the Disaster Mitigation Act of 2000 [201.6(c)(3)(ii)].

Ideas for Implementation:

- When the Malheur County CWPP is complete, convene the NHMP Coordinating Body (Emergency Management Team) to review and approve inclusion of CWPP wildfire mitigation actions into the NHMP Wildfire section.

Coordinating Organization:	Malheur County Emergency Management Team

Internal Partners:	**External Partners:**
Malheur County Emergency Services	Oregon Dept of Forestry, FEMA

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	

Form Submitted by:	

Landslide #1

Proposed Action Item:	**Alignment with Plan Goals:**
Reinforce the hillside underneath Nyssa's water storage tank to prevent erosion and a possible landslide and tank collapse. [NYSSA]	Protect Infrastructure, Safeguard Economy; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

The city of Nyssa has a 3-million gallon water storage tank located on a hillside near Highway 26, Main Street. The hillside on which this tank sits is unstable and subject to erosion from adjacent agricultural fields. The tank is vulnerable to a potential erosion-induced landslide or seismic activity-induced landslide. Were the tank to fall from its location it could damage several residential homes at the base of the hill and block Highway 26, in addition to leaving the city without a backup water source.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6(c)(3)(ii)]. Securing this municipal water storage tank will reduce the threat of damage to citizens and infrastructure in the event of a landslide or seismic activity.

Ideas for Implementation:

- Stop erosion coming from nearby agricultural fields by working with adjacent farmers and landowners to change runoff patterns.
- Install terracing or another reinforcement measure on the hillside
- Work with FEMA to identify funding sources for reinforcement.

Coordinating Organization:	City of Nyssa Public Works Department

Internal Partners:	**External Partners:**
City of Nyssa	Local landowners, FEMA

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	*N/A*
	x	

Form Submitted by:	

Section 5: Plan Implementation and Maintenance

This section details the formal process that will ensure that the Malheur County Multi-Jurisdictional Natural Hazards Mitigation Plan remains an active and relevant document. The plan implementation and maintenance process includes a schedule for monitoring and evaluating the Plan annually, as well as producing an updated plan every five years. This section also includes an explanation of how the County intends to incorporate the mitigation strategies outlined in the Plan into existing planning mechanisms and programs such as the County comprehensive land use planning process, capital improvement planning process, and building codes enforcement and implementation. Finally, this section describes how the County will integrate public participation throughout the plan maintenance and implementation process.

Implementing the Plan

After the Plan is locally reviewed and deemed complete, the Oregon Natural Hazards Workgroup will be responsible for submitting it to the State Hazard Mitigation Officer at Oregon Emergency Management. Oregon Emergency Management will then submit the Plan to the Federal Emergency Management Agency (FEMA Region X) for review. This review will address the federal criteria outlined in the FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA, the County will adopt the Plan via resolution. At that point the County will gain eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program, and Flood Mitigation Assistance.

Convener

The community has designated two agencies to be jointly responsible for the implementation and maintenance of the Plan. These joint conveners will be the County Emergency Services Department of the Sheriff's Office and the County Planning and Zoning Department. Staff in these departments who will hold the chief convener responsibilities are the Emergency Services Commander and the Planning Director. Summary profiles of these agencies are available in Section 2 of this Plan. The role of the co-conveners is to:

- *Coordinate Steering Committee member notification, meeting dates, times, locations, and agendas;*
- *Document outcomes of meetings;*
- *Coordinate any necessary communication with Plan stakeholders regarding updates or changes;*
- *Identify emergency management-related funding sources for natural hazard mitigation projects;*
- *Incorporate, maintain, and update the County's natural hazard risk data elements; and*
- *Utilize the Risk Assessment as a tool for prioritizing proposed natural hazard risk reduction projects.*

Coordinating Body

The Malheur County Emergency Management Team (EMT), of which the Planning Director and Emergency Services Commander are members, will serve as the coordinating body for the mitigation Plan. Most individual members of the Steering Committee (SC) already serve on this EMT and will provide valuable continuity to the process. Those SC members who were not already members of the EMT should plan to attend EMT meetings when the Plan is up for review. This organization (EMT) is profiled in Section 2 of the Plan. The roles and responsibilities of this coordinating body include:

- Serving as the local evaluation Committee (or having some members of the EMT serve on a sub-Committee for this purpose) for funding programs such as the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds;
- Documenting successes and lessons learned;
- Evaluating and updating the Natural Hazards Mitigation Plan in accordance with the prescribed maintenance schedule; and
- Developing and coordinating ad hoc or standing subcommittees as needed.

Members

The following organizations were represented and served on the Steering Committee during the development of the Malheur County Multi-Jurisdictional Natural Hazard Mitigation Plan. These organizations will continue to a part of the planning update and review process by serving on the Coordinating Body as well.

- Ontario Police Department
- Malheur County Planning Department
- Oregon Department of Transportation
- Ontario Public Works Department
- Malheur County Road Department
- Malheur County Fire Department
- American Red Cross (Boise)
- Malheur County Court
- Vale Bureau of Land Management
- Malheur County Emergency Services
- Malheur Bell

City officials who worked with the Coordinator on City Addendums will be included on the Coordinating Body in Malheur County's future meetings. (See Volume III for a listing of these persons).

- Ontario
- Vale
- Nyssa
- Adrian

- Jordan Valley

To make the coordination and review of the Malheur County Hazard Mitigation Plan as broad and useful as possible, the Emergency Management Team will encourage additional stakeholders and other relevant hazard mitigation organizations and agencies to participate in the Coordinating Body's future meetings. A full list of stakeholders who were interviewed in the development of the Plan is available in Appendix A. These individuals' contact information is on file with the co-conveners and they will be notified of all Plan-related review processes.

Plan Maintenance

Plan maintenance is a critical component of the natural hazard mitigation plan. Proper maintenance of the Plan will ensure that this plan will maximize the County's efforts to reduce the risks posed by natural hazards. This section was developed with assistance from the University of Oregon's Oregon Natural Hazards Workgroup and includes a process to ensure that a regular review and update of the Plan occurs. The Coordinating Body (through the Emergency Management Team and local staff) will be responsible for implementing this process, in addition to maintaining and updating the plan through a series of meetings outlined in the maintenance schedule below.

Annual Meetings

The Coordinating Body will meet on an annual basis to complete several plan maintenance tasks intended to keep the plan up to date and ensure that the community has opportunities to take advantage of mitigation grant funding cycles. During these annual meetings the Coordinating Body will:

- Review existing action items to determine appropriateness for funding;
- Identify issues that may not have been identified when the plan was developed; and
- Prioritize potential projects using the methodology described below.
- Educate and train new members on the plan and mitigation in general
- Review existing and new risk assessment data;
- Discuss methods for continued public involvement; and
- Document successes and lessons learned during the year.

Additional meetings may be called throughout the year when certain mitigation grant funding cycles open. The co-conveners will be responsible for documenting the outcome of the annual meetings. The process the Coordinating Body will use to prioritize mitigation projects is detailed in the section below. The plan's format allows the County to review and update sections of the plan when new data becomes available. New data can be easily incorporated, resulting in a natural hazards mitigation plan that remains current and relevant to Malheur County.

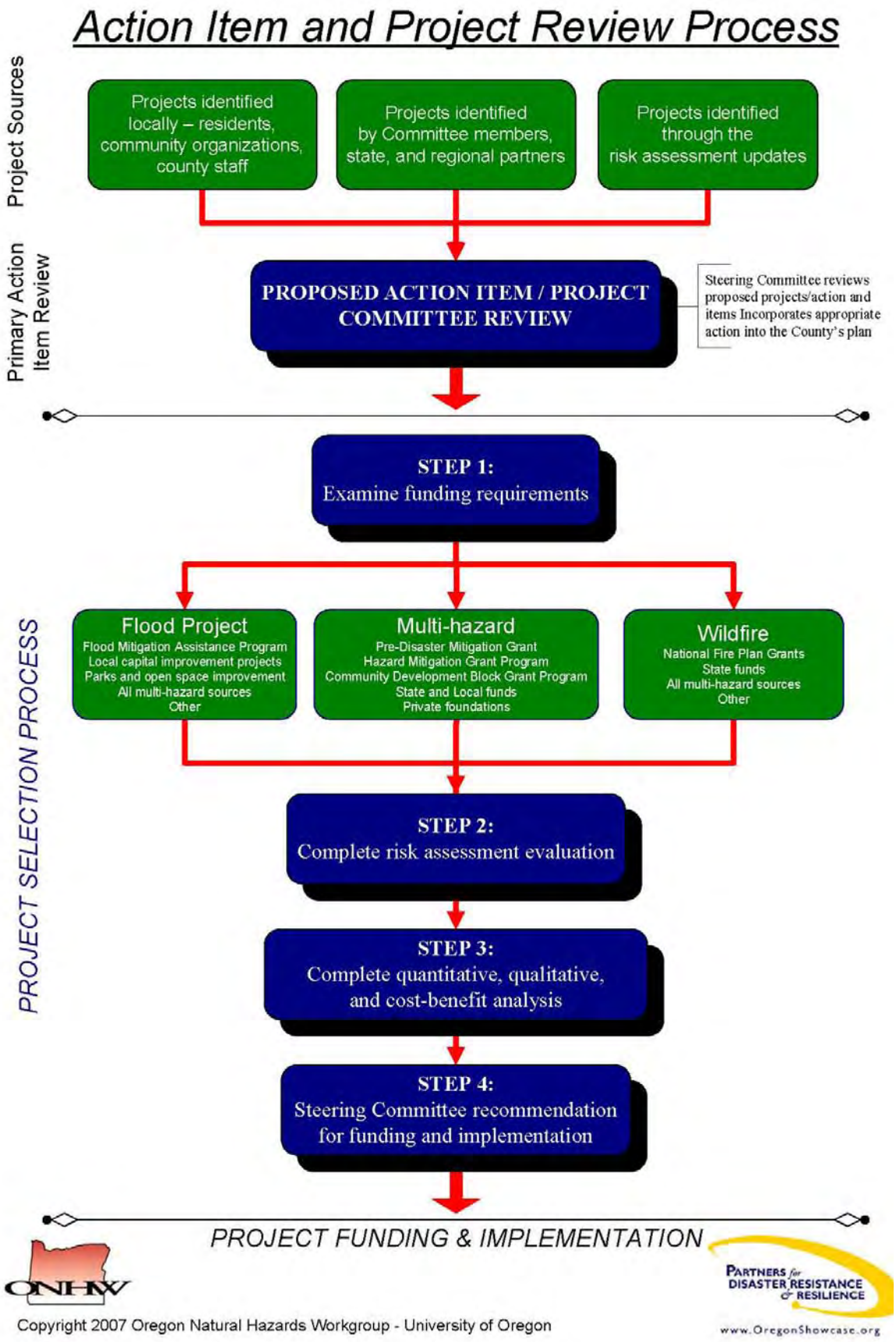
Project Prioritization Process

The Disaster Mitigation Act of 2000 (via the Pre-Disaster Mitigation Program) requires that the County identify a process for prioritizing potential actions. Potential mitigation activities will often come from a variety of sources; therefore the project prioritization process needs to be flexible. Projects may be identified by committee members, local government staff, other planning documents, or the risk assessment. The prioritization process that Malheur County will use for its Action Items is based on several factors, including feasibility, funding, risk, cost-benefit analysis, and community support. There is no formal 'list' of actions in numerical order of

priority; rather, each Action Item may be individually considered based upon the factors mentioned above through the process described below.

Depending on the potential project's intent and implementation methods, several funding sources may be appropriate. Examples of mitigation funding sources include, but are not limited to: FEMA's Pre-Disaster Mitigation competitive grant program (PDM), Flood Mitigation Assistance program (FMA), National Fire Plan (NFP), Community Development Block Grants (CDBG), local general funds, and private foundations. Some of these examples are used in Figure 5.1 on the next page to illustrate the project development and prioritization process.

Figure 5.1: Project Prioritization Process



Step 1: Examine funding requirements

The Steering Committee will identify how best to implement individual actions within the appropriate existing plan, policy, or program. The Committee will examine the selected funding stream's requirements to ensure that the mitigation activity would be eligible through the funding source. The Committee may consult with the funding entity, Oregon Emergency Management, or other appropriate state or regional organizations about the project's eligibility. Depending on the potential project's intent and implementation methods, several funding sources may be appropriate. Examples of mitigation funding sources include, but are not limited to: FEMA's Pre-Disaster Mitigation competitive grant program (PDM), Flood Mitigation Assistance program (FMA), National Fire Plan (NFP), Community Development Block Grants (CDBG), local general funds, and private foundations. Some of these examples are used in Figure 5.1 to illustrate the project development and prioritization process.

Step 2: Complete risk assessment evaluation

The second step in prioritizing the plan's action items is to examine which hazards they are associated with and where these hazards rank in terms of community risk. The Committee will determine whether or not the plan's risk assessment supports the implementation of the mitigation activity. This determination will be based on the location of the potential activity and the proximity to known hazard areas, historic hazard occurrence, vulnerable community assets at risk, and the probability of future occurrence documented in the Plan. To rank the hazards, the community's natural hazard risk assessment was utilized. The risk assessment identified various hazards that may threaten community infrastructure and population and ranked them accordingly into the following categories:

- Low
- Medium
- High

Each of the action items in the Plan addresses risk from one or more of the hazards affecting Malheur County. The rank ordering of hazards for Malheur County is as follows:

Drought

Flood

Wildfire

Severe Weather

Earthquake

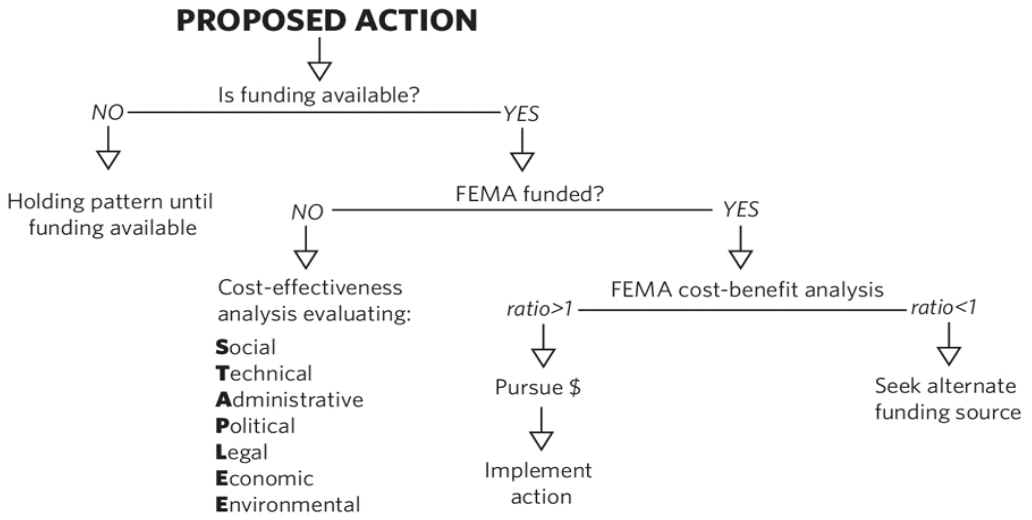
Landslide

Volcano

Step 3: Complete quantitative / qualitative assessment and economic analysis

The third step is to identify the costs and benefits associated with natural hazard mitigation strategies, measures or projects. Two categories of analysis that are used in this step are: (1) benefit/cost analysis, and (2) cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards can provide decision makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Figure 5.2 shows decision criteria for selecting the method of analysis.

Figure 5.2: Project Prioritization Process Overview



Source: Community Service Center's Oregon Natural Hazards Workgroup at the University of Oregon, 2006.

If the activity requires federal funding for a structural project, the Committee will use a Federal Emergency Management Agency-approved cost-benefit analysis tool to evaluate the appropriateness of the activity. A project must have a benefit/cost ratio of greater than one in order to be eligible for FEMA grant funding.

For non-federally funded or nonstructural projects, a qualitative assessment will be completed to determine the project's cost effectiveness. The Committee may use a multivariable assessment technique called STAPLE/E to prioritize these actions. STAPLE/E stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Assessing projects based upon these seven variables can help define a project's qualitative cost effectiveness. The STAPLE/E technique has been tailored for use in natural hazard action item prioritization by the University of Oregon's Oregon Natural Hazards Workgroup. See Economic Analysis of Natural Hazard Mitigation Projects Appendix for a description of the STAPLE/E evaluation methodology.

Step 4: Committee Recommendation

Based on the steps above, the Committee will recommend whether or not the mitigation activity should be moved forward. If the Committee decides to move forward with the action, the coordinating organization designated on the action item form will be responsible for taking further action and documenting success upon project completion. The Committee will convene a meeting to review the issues surrounding grant applications and to share knowledge and/or resources. This process will afford greater coordination and less competition for limited funds.

The Committee and the community's leadership have the option to implement any of the action items at any time, (regardless of the prioritized order). This allows the Committee to consider mitigation strategies as new opportunities arise, such as funding for action items that may not be of the highest priority. This methodology is used by the Committee to prioritize the plan's action items during the annual review and update process.

Implementation through Existing Programs

The Natural Hazard Mitigation Plan includes a range of action items that, when implemented, will reduce loss from hazard events in the County. Within the plan, FEMA requires the identification of existing programs that might be used to implement these action items. Malheur County currently addresses statewide planning goals and legislative requirements through its comprehensive land use plan and mandated standards and building codes. Each jurisdiction in the County has its own set of existing programs as well. All bodies will work to incorporate the recommended mitigation action items into existing programs and procedures.

Many of the Natural Hazards Mitigation Plan's recommendations are consistent with the goals and objectives of the County's existing plans and policies. Where possible, Malheur County should implement the Natural Hazard Mitigation Plan's recommended actions through existing plans and policies. Plans and policies already in existence have support from local residents, businesses, and policy makers. Implementing the Natural Hazard Mitigation Plan's action items through such plans and policies increases their likelihood of being supported and implemented. See the Plan Section 2 – Community Sensitivity and Resilience – for a list of existing plans and policies in both the County and its five cities.

Continued Public Involvement & Participation

Malheur County is dedicated to involving the public directly in the continual reshaping and updating of the Natural Hazard Mitigation Plan. Although members of the Steering Committee represent the public to some extent, the greater public will also have the opportunity to provide feedback about the Plan.

During plan development, public participation was incorporated into every stage of the plan and development process. See the Community Outreach Plan and documentation in Appendix A. To ensure that these opportunities will continue, the County will use several strategies:

- Annual Plan Review Meetings: These meetings are open to the public; stakeholders interviewed during the planning process will be invited back via email to contribute to the review process.
- An updated copy of the plan, including city addendums, will be kept on file at the Malheur County Library.
- A copy of the plan will be available for viewing and comment at the Malheur County Fair in the Public Safety Tent.

In addition to the involvement activities listed above, the county's mitigation plan will also be archived and posted on the Partnership website via the University of Oregon Libraries' Scholar's Bank Digital Archive.

Five-Year Review of Plan

This Plan will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During this plan update, the following questions should be asked to determine what actions are necessary to update the Plan. The convener will be responsible for posing the following questions to the Coordinating Body:

- Are the Plan's goals still applicable?
- Do the Plan's priorities align with State priorities?
- Are there new partners that should be brought to the table?
- Are there new local, regional, state or federal policies influencing natural hazards that should be addressed?

- Has the community successfully implemented any mitigation activities since the Plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Do existing actions need to be reprioritized for implementation?
- Are the actions still appropriate, given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the Plan accurately address the impacts of this event?

The questions above will help the Committee determine what components of the mitigation Plan need updating. The Committee will be responsible for updating any deficiencies found in the Plan based on the questions above.

Drought
Hazard Annex

This annex covers the drought hazard and includes detailed information on the hazard that is specific to the County. The annex includes some actual documents when digital copies were available; other resources are on file with the Malheur County Planning Department in its Multi-Jurisdictional Natural Hazards Mitigation Plan File and can be accessed upon request, as the county does not have the ability to scan these documents. Annex materials may include existing ordinances; supplemental information for Section 3 hazard vulnerabilities, and potential losses when local data is available.

Hazard Resources

This section documents the existing resources that were used to develop the risk assessment for this hazard. They include:

- *Newspaper articles*
  - A newspaper article from August 2007 is included in this annex as an illustrative example of the process of declaring a drought emergency in the county and also to show typical costs to farmers in a drought emergency.
- *After Incident Reports (Emergency Services)*
  - The County Emergency Services department maintains files on significant droughts that include County Court declarations of emergency and any other relevant information. At the time of this report, files were only available for 2002 and 2003 and are available on file in the Malheur County Emergency Services Department.
- *USDA Farm Service Agency records*
  - The Malheur County Farm Service Agency (FSA) maintains records on how much drought disaster assistance it has paid to county farmers severely impacted by drought conditions. Records go back to 1992 only. Available on file at the Malheur Co. FSA.
- *State Natural Hazard Risk Assessment: Drought*
  - The state risk assessment for drought provides a useful overview of drought in Oregon and documents statewide historic events back to 1902. This assessment also outlines several state-scale action items that are relevant to drought mitigation in Malheur County. Available online; see Appendix D.
- *National Drought Mitigation Center: Drought Impact Reporter*
  - This national database includes a limited database of known reporting on past impacts on the County (or region, or state) due to severe droughts. See Appendix D.
- *Maps*
  - See attached “Mean Annual Precipitation” map from the Oregon Natural Hazards Mitigation Plan.

Hazard Vulnerability

All of Oregon is susceptible to drought conditions, but this hazard is a particularly significant risk in Malheur County due to its limited annual rainfall and economic reliance on agriculture and ranching, both of which are heavily dependent on water supply and a complex network of irrigation systems and dams spread throughout the county. Most hazard vulnerability information is located in Section 3: Drought Hazard Summary. The information here is intended as a supplement to that section.

Major Dams and Reservoirs in the County

Owyhee Dam and Reservoir

- 715,000 acre feet capacity
- 31 miles southwest of Nyssa

Warm Springs Dam and Reservoir

- 192,400 acre feet capacity
- 13 miles southwest of the unincorporated community of Juntura

Agency Valley Dam and Beulah Reservoir

- 59,900 acre feet capacity
- 15 miles north of the unincorporated community of Juntura

Bully Creek Dam and Reservoir

- 31,650 acre feet capacity
- 10 miles west of Vale

Additional Dams and Reservoirs in the County (not operated by the federal Bureau of Reclamation; owned and operated by irrigation districts)

Antelope Reservoir

- 70,000 acre feet capacity
- 11 miles southwest of Jordan Valley

Malheur Reservoir

- 94,000 acre feet capacity
- Located 18 miles east of the unincorporated community of Ironside

Warm Springs, Agency Valley, and Bully Creek Dams and Reservoirs make up the Bureau of Reclamation's Vale Project, which is designed to furnish irrigation water to the land along the Malheur River and Willow Creek in Malheur County.

Vale Project Data (as of 1992)

Total Irrigable Land	Crop Value	Population Served
34,993 acres	$4,565,949	1,269

Source: U.S. Bureau of Reclamation (http://www.usbr.gov/dataweb/html/pnvalprjdata.html)

The Owyhee Dam and Reservoir make up the Bureau of Reclamation's Owyhee Project, which is designed to furnish irrigation water to the land along the Snake River in Malheur County (and in Idaho).

Owyhee Project Data (as of 1992)

Total Irrigable Land	Crop Value	Population Served
118,249 acres	$90,248,378	9,516

Source: U.S. Bureau of Reclamation (http://www.usbr.gov/dataweb/html/pnowyprjdata.html)

Potential Losses

Currently the County does not have sufficient data to calculate comprehensive potential drought losses. This is due both to the unpredictability of drought severity/length and limited local records. For an estimate, see the listed value of crops under the Vale and Owyhee Projects above. Farm Service Agency Records, as listed in Volume I, Section 3: Drought Hazard Summary, also provide estimates of economic losses to farmers during drought conditions. These figures do not, however, factor in additional economic impacts to the community when a drought occurs.

TUESDAY AUGUST 21, 2007 Last modified: Friday, August 10, 2007 11:23 AM PDT

County court declares emergency

By Larry Meyer ? Argus Observer

VALE ? The Malheur County Court Wednesday declared a state of emergency in Malheur County because of severe and continuing drought conditions, setting the stage for assistance from state agencies and possibly the federal government to stricken livestock producers.

The court action occurred after drought conditions, combined with high temperatures and wildfires during the past month, wrecked rangeland grazing and hammered alfalfa and grass crops in certain portions of Malheur County.

In the resolution delivered by the court Wednesday, elected leaders requested the governor declare a ?Drought and Fire Emergency, in Malheur County,? making assistance from state agencies available.

The resolution also asks the United States Secretary of Agriculture to declare an emergency for Malheur County, making affected livestock producers eligible for federal assistance and programs.

The court based its request on the loss estimates submitted by the Malheur, United States Department of Agriculture County Emergency Board. The emergency board?s findings were:

? A 50 percent reduction in the availability of rangeland grazing.

? A 33 percent loss in alfalfa hay in areas without irrigation reservoir water storage.

? A 15 percent loss in yield of grass hay in those areas without irrigation water storage.

? An 80 percent loss in fall irrigated pastures.

?Approximately 55 ranches have estimated crop losses greater than 30 percent in 2007 because of drought and wildfires,? Raymond Dunten, chairman of the Malheur U.S. Department of Agriculture County Emergency

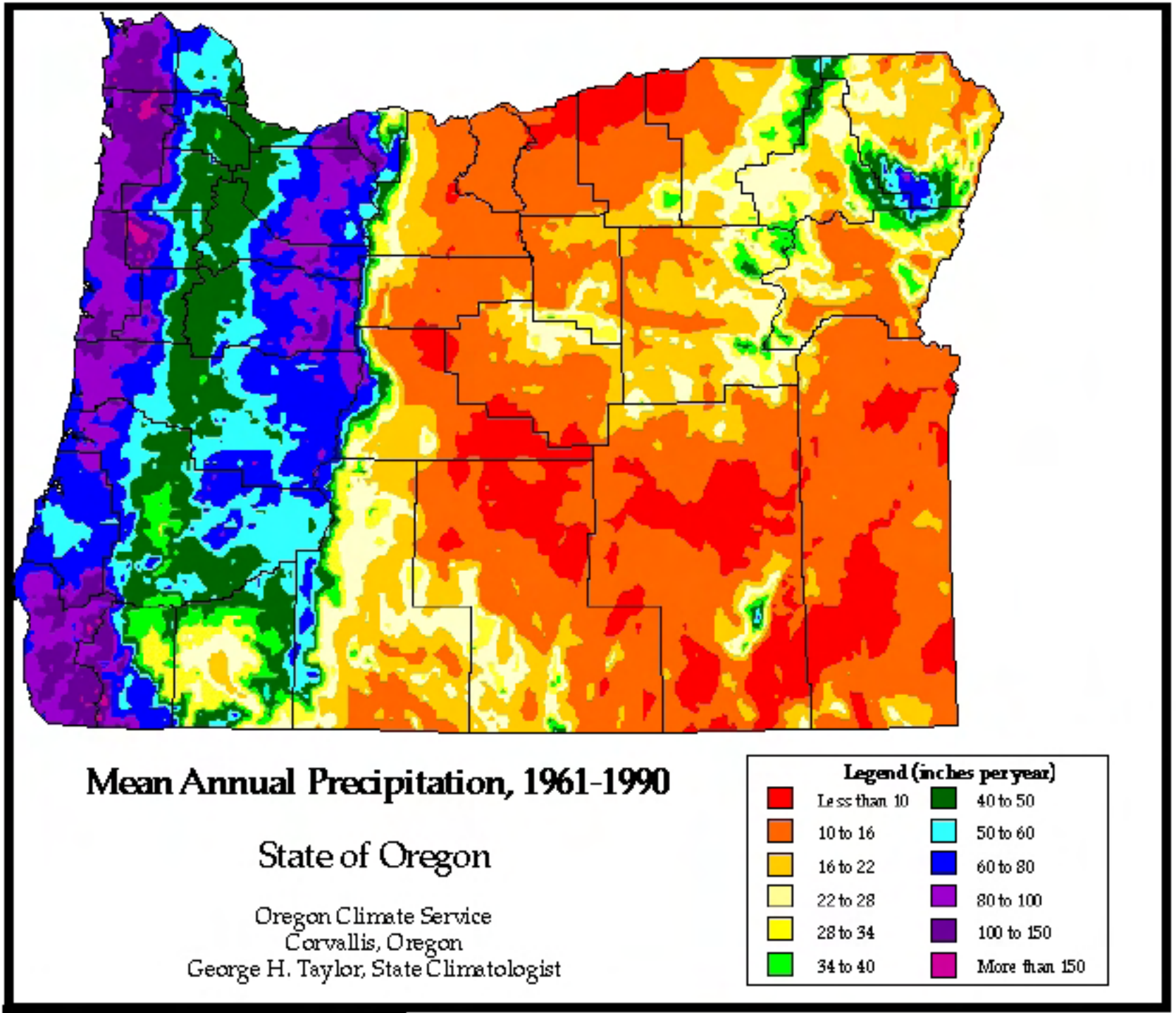
Board said in a letter to the County Court. ?In addition, several head of livestock and a small number of farm service buildings were lost to the fires.?

Malheur County Judge Dan Joyce said conditions in portions of the county are severe.

?It was a 100 percent loss in some areas,? Malheur County Judge Dan Joyce said, including those areas burned by fires. According to information provided to the emergency board by the National Weather Service, Malheur County has received only 57 percent of normal rainfall for the last six months and total rainfall for the water-year to date ? October 2006 to June 2007 ? was 60 percent of normal. The Vale District office of the U.S. Bureau of Land Management reported the amount of acreage in the district burned to date is abut 80,000 acres, with a month and a half left in the fire season. The normal acreage is about 56,000 acres, according to the BLM.

The BLM reported that live fuel moisture are at the lowest level on record, since the agency has been measuring fuel moisture since 1991.

The emergency board?s findings, and the accompanying resolution, was presented to the court by Malheur County Emergency Coordinator Craig Smith.


Mean Annual Precipitation, 1961-1990
State of Oregon
Oregon Climate Service
Corvallis, Oregon
George H. Taylor, State Climatologist
Legend (inches per year)
Less than 10
10 to 16
16 to 22
22 to 28
28 to 34
34 to 40
40 to 50
50 to 60
60 to 80
80 to 100
100 to 150
More than 150

Earthquake
Hazard Annex

This annex covers the earthquake hazard and includes detailed information on the hazard that is specific to the County. The annex includes some actual documents when digital copies were available; other resources are on file with the Malheur County Planning Department in its Multi-Jurisdictional Natural Hazards Mitigation Plan File and can be accessed upon request, as the county does not have the ability to scan these documents. Annex materials may include existing ordinances; supplemental information for Section 3 hazard vulnerabilities, and potential losses when local data is available.

Hazard Resources

This section documents the existing resources that were used to develop the risk assessment for this hazard. They include:

- *Ordinances*
  - Malheur County contracts with a private firm to administer state building codes, including those for seismic resistance on new structures. Ordinances are available on file in the Malheur County Planning Department.
- *Studies/Reports*
  - The USGS Open File Report for Quaternary Faults and Folds in Oregon contains a listing of documented faults in Malheur County and their basic geologic properties. It also notes that none have shown activity within the timeframe of Oregon's historical record (but have been active in the distant geologic past). It is attached.
  - In 2007, DOGAMI prepared HAZUS Global Reports for Crustal and Probabilistic Scenarios for Malheur County. These reports provide a comprehensive cost assessment of two potential earthquake scenarios which could impact the county. The full text of the report is attached.
  - In 2007, DOGAMI released the Statewide Seismic Needs Assessment Using Rapid Visual Screening (RVS), which contains a preliminary assessment of the seismic resilience of critical infrastructure in each Oregon County. A spreadsheet of Malheur County buildings is attached to this annex. For more information on the document and how to read it, see http://www.oregongeology.com/sub/projects/rvs/default.htm
- *State Natural Hazard Risk Assessment*
  - The state earthquake risk assessment provides an overview of seismic risk in Oregon and documents the most significant earthquakes in Oregon's recorded history. It includes several mitigation actions in which Malheur County has been included (see below). See Appendix D for information on how to access this document.

- *Technical Resource Guide*
  - This guide lists basic mitigation strategies for earthquakes, including examples from other communities in Oregon. See Appendix D for information on how to access this document.
- *Maps*
  - The USGS Open File Report for Quaternary Faults and Folds in Oregon is accompanied by a map of these seismic features. A cropped selection from that map, featuring the County, is included in this annex.
  - The HAZUS report from DOGAMI also contains several useful maps of the county, including liquefaction and ground shaking amplification susceptibility zones.

Hazard Vulnerability

The Pacific Northwest has a short written history of less than 200 years, which is much shorter than the recurrence intervals of most active crustal faults. In addition, many parts of Oregon have had no seismic monitoring equipment until recently. However, even given these limitations, many large and small earthquakes have been documented across the state, including Malheur County.

Most hazard vulnerability information is located in Section 3: Earthquake Hazard Summary. The information here is intended as a supplement to that section.

The 2004 Jordan Valley Swarm

In 2004, as mentioned in Section 3, Jordan Valley and the vicinity experienced an earthquake swarm. This swarm occurred in an area devoid of seismic activity for 20 years and without local monitoring equipment. Since this occurrence USGS has installed monitoring equipment, as the swarm originated beneath Antelope Reservoir and is thus a potential concern for the Antelope Reservoir dam.

From Idaho Disaster Services: "Boise State University seismologist James Zollweg has reported a swarm of small earthquakes near Antelope Reservoir southwest of Jordan Valley, Oregon. The swarm began April 22, and over 100 events have been recorded so far, with the largest at Magnitude 3.6. While not large enough to be damaging, the activity has not been observed before, and only a few isolated small events have be recorded in the last 20 years. There are several active faults in the area which seismologists believe are capable of producing damaging earthquakes, so we are monitoring the situation."

Potential Losses

DOGAMI has developed two earthquake loss models for Oregon based on the above two most likely sources of seismic events (CSZ and crustal events). Both models are based on HAZUS, a computerized program, currently used by FEMA as a means of determining potential losses from earthquakes.

The model CSZ event is based on a potential 6.5 earthquake generated off the Oregon coast. The 500-year crustal model does not look at a single earthquake (as in the CSZ model); it

encompasses many faults, each with a 10% chance of producing an earthquake in the next 50 years. The model assumes that each fault will produce a single “average” earthquake during this time. Neither model takes unreinforced masonry buildings (URMs) into consideration, which means that these estimates almost certainly underestimate damage to County structures. These models contain a high degree of uncertainty and are intended only for general planning purposes to provide approximate estimates of damage.

See the attached HAZUS Global Reports for Crustal and Probabilistic Scenarios for the comprehensive damage and cost estimates.

Malheur County

Crustal Earthquake Scenario Details and Ground Motion Map

Probabilistic Earthquake Scenario Details and Ground Motion Map

Relative Ground Shaking Amplification Susceptibility Map

Relative Liquefaction Hazard Susceptibility Map

Relative Earthquake Induced Landslide Susceptibility Map

Identified Landslide Areas Map

HAZUS Global Reports for Crustal and Probabilistic Scenarios

Crustal Earthquake Scenario Details

Crustal Earthquake Scenario: A magnitude 6.5 earthquake on an Arbitrary Crustal Fault.

For the magnitude 6.5 earthquake on the Arbitrary Fault scenario, we defined the fault source using the "Arbitrary Seismic Source" option within HAZUS (Figure ?-1) (FEMA, 2005). The fault and earthquake event was chosen by examination of USGS data and data in the Geomatrix report (1995) titled *S eismic Design Mapping State of Oregon* prepared for the Oregon Department of Transportation (USGS, 2004). In general, a likely worst-case scenario was selected. Figure ?-1 has the location of the fault, shown as the maroon line. Figure ?-2 displays the PGA for the crustal scenario.

Scenario Name	Malheur Arbitrary Crustal M6.9
Type of Earthquake	Source
Fault Name	Malheur_Arbitrary
Historical Epicenter ID #	-
Probabilistic Return Period	NA
Longitude of Epicenter	-117.0750
Latitude of Epicenter	51.0505
Earthquake Magnitude	6.9
Depth (km)	0.00
Rupture Length (km)	51
Rupture Orientation (degrees)	0.00
Attenuation Function	WUS Shallow Crustal Event Extensional

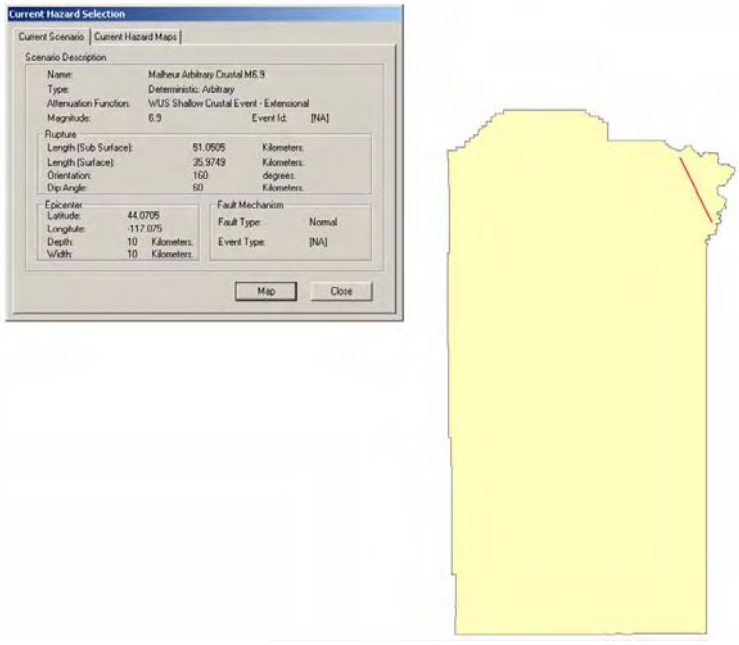


Figure ?-1. Arbitrary Fault details from HAZUS-MH (FEMA, 2005)

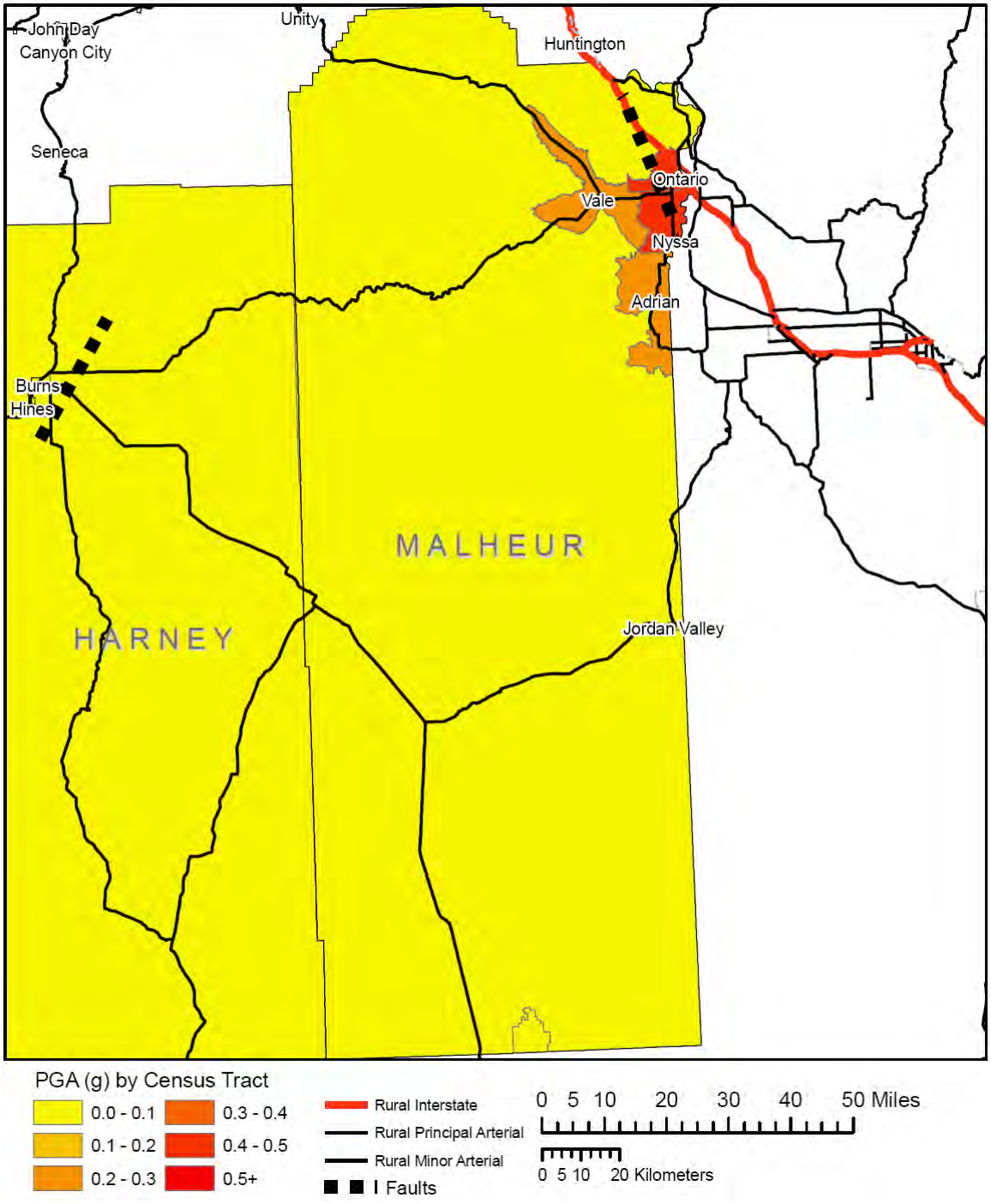


Figure ?-2. Peak ground acceleration (PGA) by census tracts map for crustal scenario, Malheur County, Oregon (FEMA, 2005).

Probabilistic Earthquake Scenario Details

Probabilistic Earthquake Scenario: A 2500 year mean return period probabilistic earthquake scenario was selected.

For the probabilistic earthquake scenario, we used the "Pre-defined event" option within HAZUS to incorporate ground motion maps developed by USGS to model damage and loss from a magnitude 6.5 driving probabilistic earthquake scenario (Figure ?-3). The maps were developed based on ground motion data provided by the U.S. Geological Survey. The Methodology includes probabilistic seismic hazard contour maps developed by the USGS for the 2002 update of the National Seismic Hazard Maps (Frankel et al., 2002). The USGS maps provide estimates of PGA and spectral acceleration at periods of 0.3 second and 1.0 second, respectively.

Ground shaking with a 2500 year mean return period or 2% probability of being exceeded in 50 years was used. Figure ?-4 displays the PGA for the probabilistic scenario.

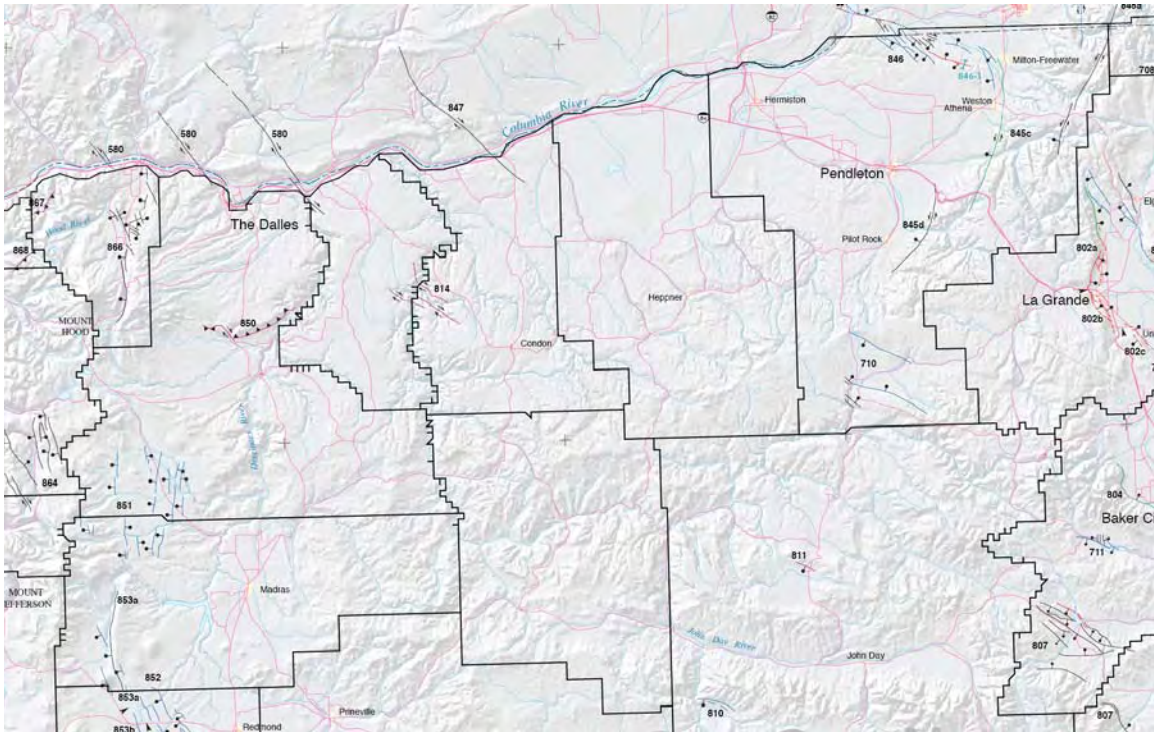


Figure ?-3. Location of the primary faults used to develop the 2500 year return ground motion maps (USGS, 2002).

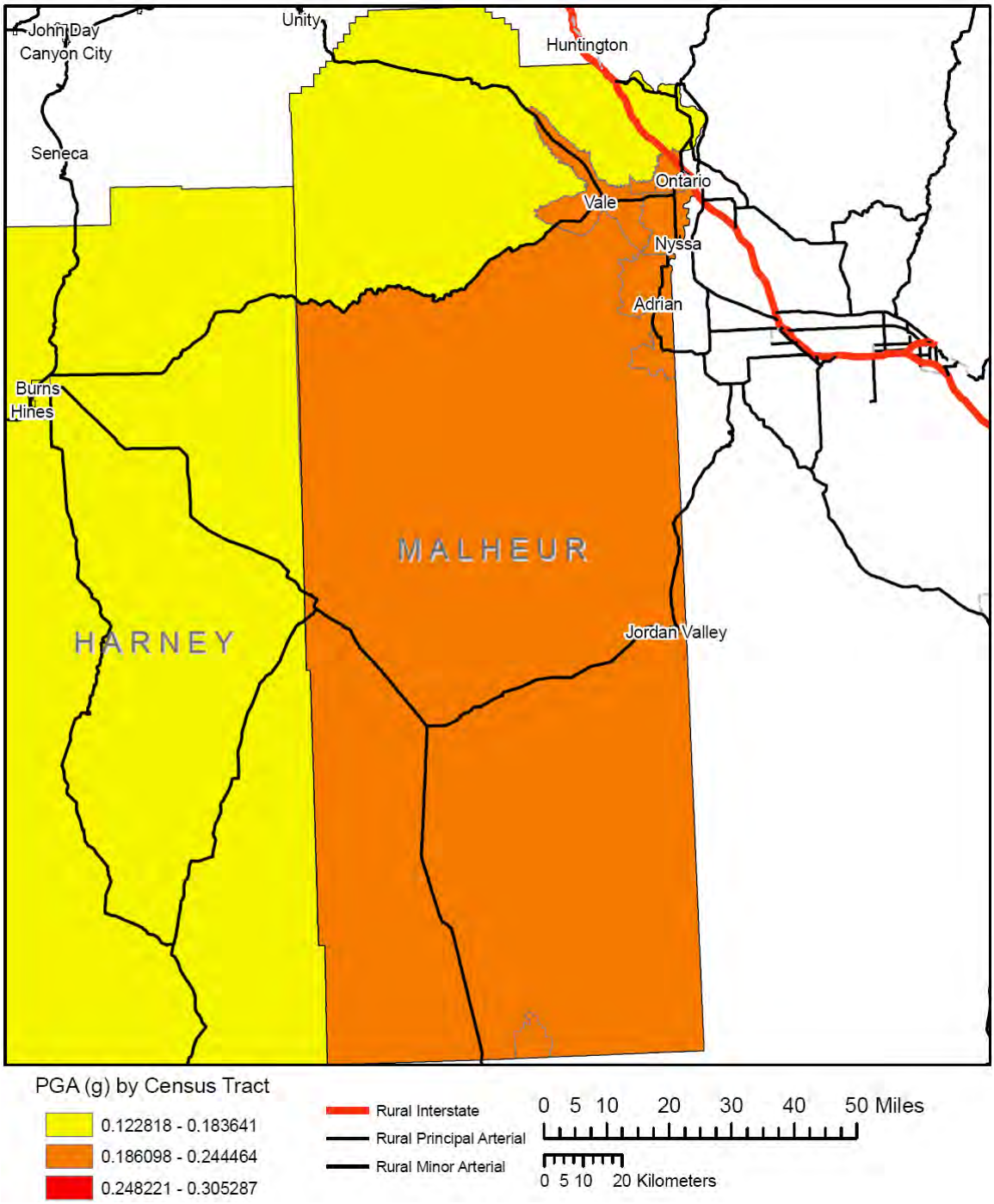


Figure ?-4. Peak ground acceleration (PGA) by census tracts map for probabilistic scenario, Malheur County, Oregon (FEMA, 2005).

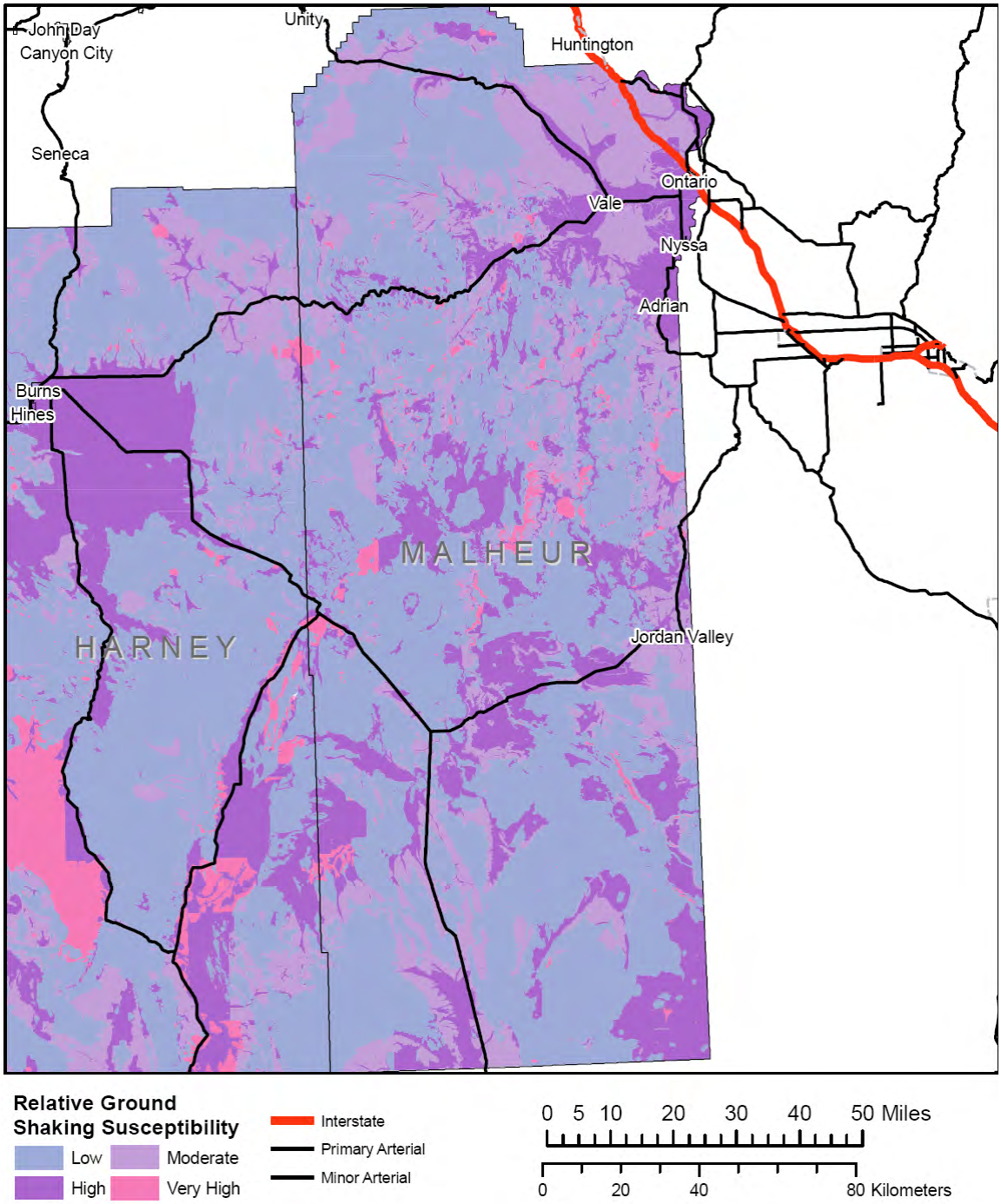


Figure ?-5. Relative ground shaking amplification susceptibility map for Malheur County, Oregon.

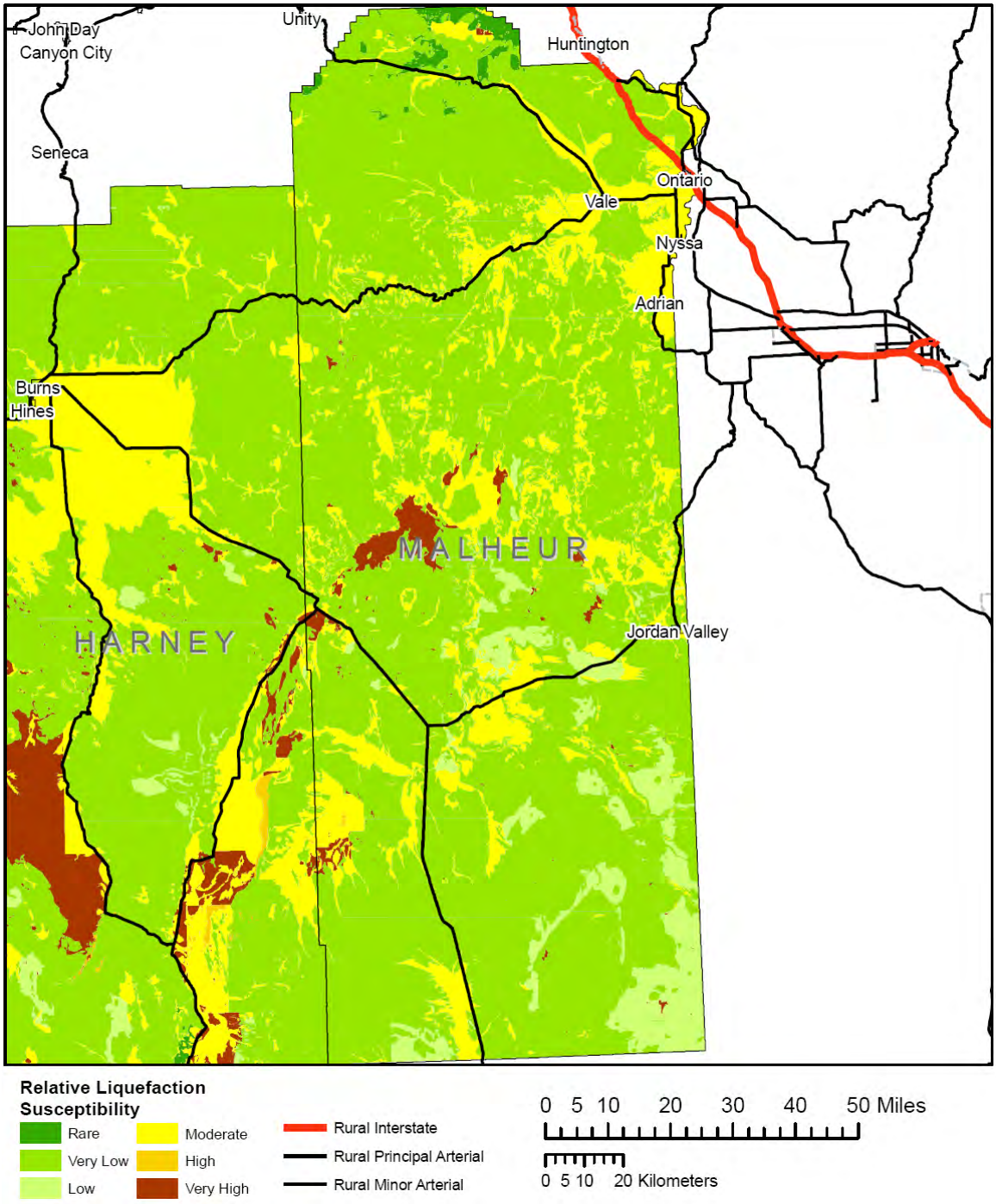


Figure ?-6. Relative liquefaction susceptibility map for Malheur County, Oregon.

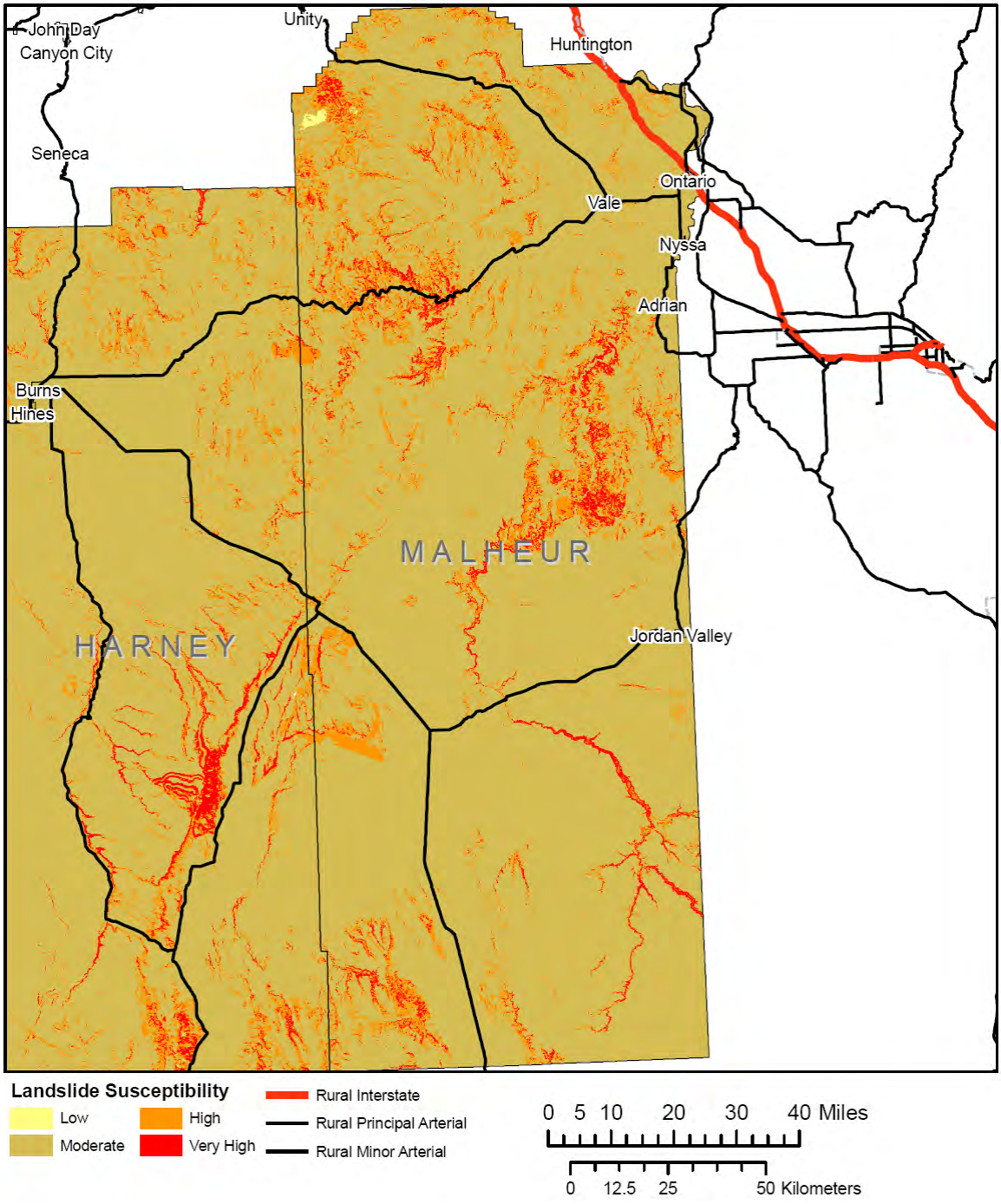


Figure ?-7. Relative earthquake induced landslide susceptibility map for Malheur County, Oregon.

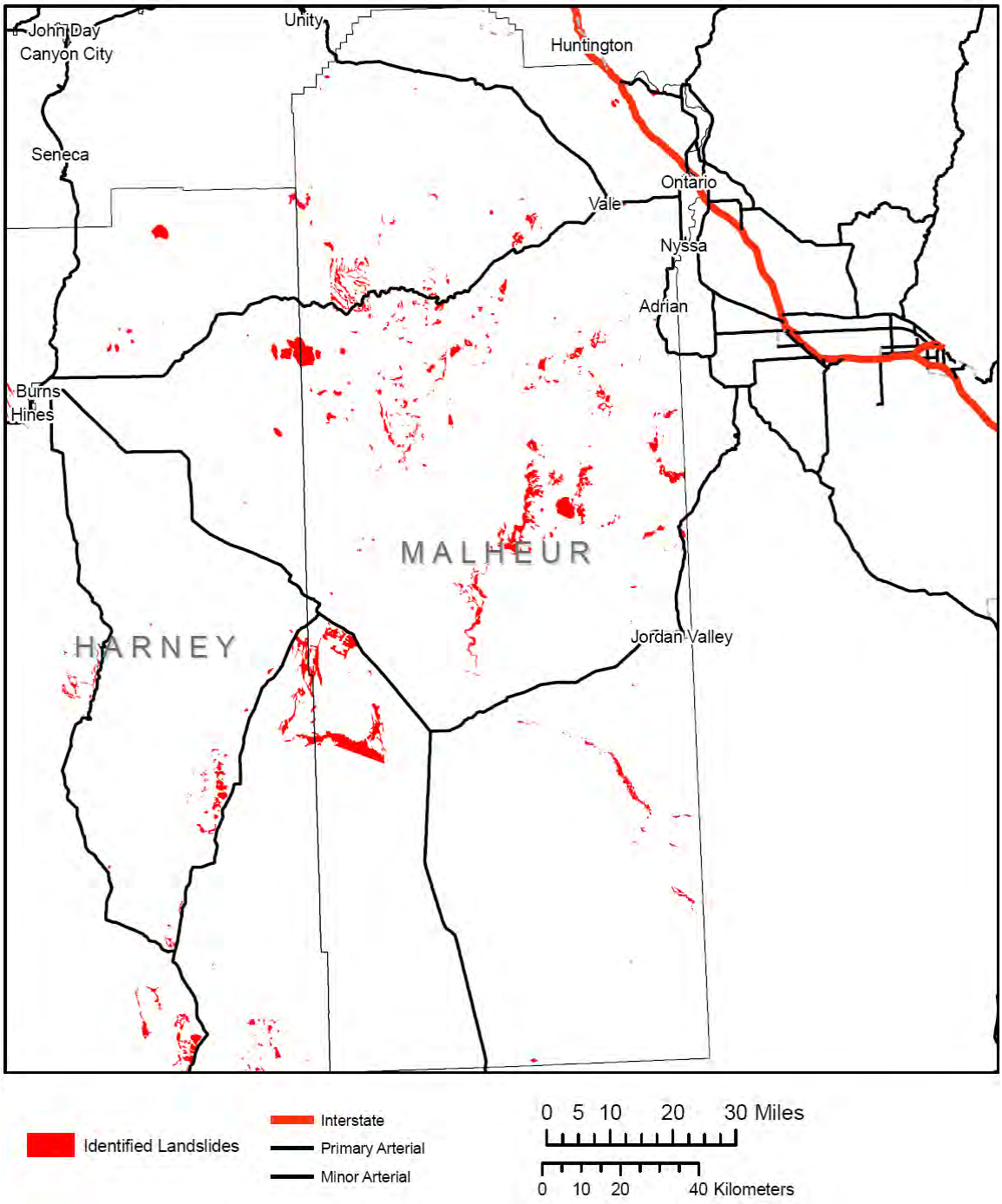


Figure ?-8. Identified landslide map for Malheur County, Oregon.

HAZUS Global Reports for
Crustal and Probabilistic Scenarios

HAZUS-MH: Earthquake Event Report

Region Name: ***Malheur County***

Earthquake Scenario: ***Malheur Arbitrary Crustal M6.9***

Print Date: ***May 30, 2007***

Disclaimer:

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Oregon

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 9,909.33 square miles and contains 9 census tracts. There are over 10 thousand households in the region and has a total population of 31,615 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 9 thousand buildings in the region with a total building replacement value (excluding contents) of 1,441 (millions of dollars). Approximately 99.00 % of the buildings (and 86.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 4,396 and 188 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are 9 thousand buildings in the region which have an aggregate total replacement value of 1,441 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 77% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 74 beds. There are 25 schools, 4 fire stations, 4 police stations and 0 emergency operation facilities. With respect to HPL facilities, there are 49 dams identified within the region. Of these, 7 of the dams are classified as 'high hazard'. The inventory also includes 3 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 2 and 3.

The total value of the lifeline inventory is over 4,584.00 (millions of dollars). This inventory includes over 611 kilometers of highways, 149 bridges, 31,103 kilometers of pipes.

Table 2: Transportation System Lifeline Inventory

System	Component	# locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	149	1,014.80
	Segments	55	2,812.30
	Tunnels	0	0.00
		Subtotal	**3,827.20**
Railways	Bridges	0	0.00
	Facilities	2	4.90
	Segments	38	68.20
	Tunnels	0	0.00
		Subtotal	**73.10**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	1	1.20
		Subtotal	**1.20**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	12	73.90
	Runways	12	421.40
		Subtotal	**495.30**
		Total	**4,396.90**

Table 3: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	311.00
	Facilities	1	37.60
	Pipelines	0	0.00
		Subtotal	**348.70**
Waste Water	Distribution Lines	NA	186.60
	Facilities	2	150.50
	Pipelines	0	0.00
		Subtotal	**337.10**
Natural Gas	Distribution Lines	NA	124.40
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**124.40**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	1	0.10
		Subtotal	**0.10**
		Total	**810.30**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Malheur Arbitrary Crustal M6.9
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-117.07
Latitude of Epicenter	44.07
Earthquake Magnitude	6.90
Depth (Km)	10.00
Rupture Length (Km)	35.97
Rupture Orientation (degrees)	160.00
Attenuation Function	WUS Shallow Crustal Event - Extensional

Building Damage

Building Damage

HAZUS estimates that about 4,290 buildings will be at least moderately damaged. This is over 45.00 % of the total number of buildings in the region. There are an estimated 1,187 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 4 below summaries the expected damage by general occupancy for the buildings in the region. Table 5 summaries the expected damage by general building type.

Table 4: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	3	0.09	4	0.17	12	0.56	16	1.55	23	1.97
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.01	0	0.03	0	0.04
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Other Residential	490	15.31	223	10.82	448	21.48	501	49.30	533	44.91
Religion	0	0.00	0	0.00	0	0.01	0	0.02	0	0.03
Single Family	2,708	84.60	1,837	89.00	1,627	77.95	499	49.09	630	53.05
Total	**3,201**		**2,064**		**2,087**		**1,016**		**1,187**	

Table 5: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	2,718	84.93	1866	90.43	1,652	79.15	498	49.03	623	52.45
Steel	2	0.06	1	0.04	3	0.16	7	0.70	11	0.96
Concrete	4	0.13	2	0.08	5	0.24	7	0.68	9	0.74
Precast	0	0.01	0	0.01	1	0.05	2	0.21	4	0.33
RM	0	0.01	0	0.01	0	0.02	1	0.07	1	0.08
URM	20	0.61	11	0.52	20	0.97	22	2.14	37	3.12
MH	456	14.25	184	8.92	405	19.40	479	47.16	502	42.32
Total	**3,201**		**2,064**		**2,087**		**1,016**		**1,187**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 74 hospital beds available for use. On the day of the earthquake, the model estimates that only 1 hospital beds (3.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 12.00% of the beds will be back in service. By 30 days, 48.00% will be operational.

Table 6: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	1	1	0	0
Schools	25	11	0	12
EOCs	0	0	0	0
PoliceStations	4	2	0	2
FireStations	4	3	0	1

Transportation and Utility Lifeline Damage

Table 7 provides damage estimates for the transportation system.

Table 7: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	55	0	0	55	55
	Bridges	149	12	0	138	142
	Tunnels	0	0	0	0	0
Railways	Segments	38	0	0	38	38
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	2	1	0	2	2
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	1	0	0	1	1
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	12	1	0	12	12
	Runways	12	0	0	12	12

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 8-10 provide information on the damage to the utility lifeline systems. Table 8 provides damage to the utility system facilities. Table 9 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 10 provides a summary of the system performance information.

Table 8 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	1	1	0	0	1
Waste Water	2	1	0	1	2
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	1	1	0	1	1

Table 9 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	15,552	336	234
Waste Water	9,331	266	185
Natural Gas	6,221	284	198
Oil	0	0	0

Table 10: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	10,221	94	38	2	0	0
Electric Power		2,923	1,682	649	139	4

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 2 ignitions that will burn about 0.05 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 38 people and burn about 1 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.00 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 42.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates (1,224 households to be displaced due to the earthquake. Of these, 347 people (out of a total population of 31,615 will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 11 provides a summary of the casualties estimated for this earthquake

Table 11: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	4	1	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	3	1	0	0
	Industrial	2	1	0	0
	Other-Residential	135	35	3	6
	Single Family	142	33	2	4
	Total	**286**	**71**	**6**	**11**
2 PM	Commercial	246	78	13	26
	Commuting	0	0	1	0
	Educational	68	22	4	7
	Hotels	1	0	0	0
	Industrial	14	4	1	1
	Other-Residential	32	8	1	2
	Single Family	36	8	1	1
	Total	**398**	**121**	**20**	**37**
5 PM	Commercial	192	61	10	20
	Commuting	5	7	12	2
	Educational	6	2	0	1
	Hotels	1	0	0	0
	Industrial	9	3	0	1
	Other-Residential	50	13	1	2
	Single Family	57	13	1	2
	Total	**320**	**99**	**25**	**28**

Economic Loss

The total economic loss estimated for the earthquake is 604.42 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 453.47 (millions of dollars); 12 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 64 % of the total loss. Table 12 below provides a summary of the losses associated with the building damage.

Table 12: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	1.07	15.50	0.15	0.42	17.13
	Capital-Related	0.00	0.46	12.95	0.09	0.18	13.68
	Rental	6.67	6.75	6.39	0.04	0.20	20.05
	Relocation	0.75	0.20	0.36	0.00	0.08	1.39
	Subtotal	**7.42**	**8.48**	**35.19**	**0.28**	**0.88**	**52.25**
Capital Stock Loses							
	Structural	33.67	14.31	20.54	0.91	2.38	71.80
	Non_Structural	124.39	60.83	56.45	3.56	7.10	252.33
	Content	30.58	12.70	26.10	2.21	3.45	75.04
	Inventory	0.00	0.00	1.43	0.52	0.10	2.04
	Subtotal	**188.64**	**87.83**	**104.52**	**7.19**	**13.03**	**401.21**
	Total	**196.06**	**96.31**	**139.71**	**7.47**	**13.91**	**453.47**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 13 & 14 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 15 presents the results of the region for the given earthquake.

Table 13: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2,812.32	$15.22	0.54
	Bridges	1,014.85	$91.90	9.06
	Tunnels	0.00	$0.00	0.00
	Subtotal	**3827.20**	**107.10**	
Railways	Segments	68.21	$0.52	0.76
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	4.93	$1.31	26.58
	Subtotal	**73.10**	**1.80**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	1.23	$0.42	33.92
	Subtotal	**1.20**	**0.40**	
Ferry	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	73.90	$4.07	5.51
	Runways	421.44	$0.70	0.17
	Subtotal	**495.30**	**4.80**	
	Total	**4396.90**	**114.10**	

Table 14: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	37.60	$8.33	22.14
	Distribution Line	311.00	$3.01	0.97
	Subtotal	**348.67**	**$11.34**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	150.50	$20.52	13.63
	Distribution Line	186.60	$2.38	1.28
	Subtotal	**337.14**	**$22.90**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Line	124.40	$2.55	2.05
	Subtotal	**124.41**	**$2.55**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Communication	Facilities	0.10	$0.03	25.66
	Subtotal	**0.11**	**$0.03**	
	Total	**810.33**	**$36.82**	

Table 15. Indirect Economic Impact with outside aid
(Employment as # of people and Income in millions of $)

	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	(4)	-1.99
Second Year			
	Employment Impact	0	0.00
	Income Impact	(12)	-6.06
Third Year			
	Employment Impact	0	0.00
	Income Impact	(15)	-7.80
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	(15)	-7.80
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	(15)	-7.80
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	(15)	-7.80

Appendix A: County Listing for the Region

Malheur,OR

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Oregon					
	Malheur	31,615	1,234	206	1,441
Total State		**31,615**	**1,234**	**206**	**1,441**
Total Region		**31,615**	**1,234**	**206**	**1,441**

HAZUS-MH: Earthquake Event Report

Region Name: ***Malheur County***

Earthquake Scenario: ***2500yr Probable Scenario M6.5 Driving***

Print Date: ***May 30, 2007***

Disclaimer:
The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Oregon

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 9,909.33 square miles and contains 9 census tracts. There are over 10 thousand households in the region and has a total population of 31,615 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 9 thousand buildings in the region with a total building replacement value (excluding contents) of 1,441 (millions of dollars). Approximately 99.00 % of the buildings (and 86.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 4,396 and 188 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are 9 thousand buildings in the region which have an aggregate total replacement value of 1,441 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 77% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 74 beds. There are 25 schools, 4 fire stations, 4 police stations and 0 emergency operation facilities. With respect to HPL facilities, there are 49 dams identified within the region. Of these, 7 of the dams are classified as 'high hazard'. The inventory also includes 3 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 2 and 3.

The total value of the lifeline inventory is over 4,584.00 (millions of dollars). This inventory includes over 611 kilometers of highways, 149 bridges, 31,103 kilometers of pipes.

Table 2: Transportation System Lifeline Inventory

System	Component	# locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	149	1,014.80
	Segments	55	2,812.30
	Tunnels	0	0.00
		Subtotal	**3,827.20**
Railways	Bridges	0	0.00
	Facilities	2	4.90
	Segments	38	68.20
	Tunnels	0	0.00
		Subtotal	**73.10**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	1	1.20
		Subtotal	**1.20**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	12	73.90
	Runways	12	421.40
		Subtotal	**495.30**
		Total	**4,396.90**

Table 3: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	311.00
	Facilities	1	37.60
	Pipelines	0	0.00
		Subtotal	**348.70**
Waste Water	Distribution Lines	NA	186.60
	Facilities	2	150.50
	Pipelines	0	0.00
		Subtotal	**337.10**
Natural Gas	Distribution Lines	NA	124.40
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**124.40**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	1	0.10
		Subtotal	**0.10**
		Total	**810.30**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	2500yr Probable Scenario M6.5 Driving
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	2,500.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	6.50
Depth (Km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Building Damage

Building Damage

HAZUS estimates that about 2,151 buildings will be at least moderately damaged. This is over 23.00 % of the total number of buildings in the region. There are an estimated 297 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 4 below summaries the expected damage by general occupancy for the buildings in the region. Table 5 summaries the expected damage by general building type.

Table 4: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	16	0.32	12	0.54	17	1.18	8	1.78	4	1.27
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.01	0	0.01	0	0.02	0	0.03	0	0.02
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Other Residential	535	10.54	480	20.61	734	52.43	341	75.28	106	35.59
Religion	0	0.01	0	0.01	0	0.02	0	0.03	0	0.02
Single Family	4,525	89.13	1,835	78.84	649	46.35	104	22.88	188	63.09
Total	**5,077**		**2,327**		**1,400**		**454**		**298**	

Table 5: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	4,576	90.14	1852	79.58	645	46.07	98	21.50	187	62.79
Steel	7	0.13	4	0.17	8	0.55	4	0.95	2	0.60
Concrete	9	0.17	5	0.23	8	0.54	4	0.81	1	0.42
Precast	2	0.03	1	0.05	2	0.17	2	0.43	1	0.21
RM	1	0.02	0	0.01	1	0.05	1	0.12	0	0.05
URM	37	0.74	26	1.10	26	1.88	13	2.81	7	2.45
MH	445	8.77	439	18.85	710	50.74	333	73.38	100	33.49
Total	**5,077**		**2,327**		**1,400**		**454**		**298**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 74 hospital beds available for use. On the day of the earthquake, the model estimates that only 19 hospital beds (27.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 59.00% of the beds will be back in service. By 30 days, 91.00% will be operational.

Table 6: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	1	0	0	0
Schools	25	0	0	25
EOCs	0	0	0	0
PoliceStations	4	0	0	4
FireStations	4	0	0	4

Transportation and Utility Lifeline Damage

Table 7 provides damage estimates for the transportation system.

Table 7: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	55	0	0	55	55
	Bridges	149	0	0	149	149
	Tunnels	0	0	0	0	0
Railways	Segments	38	0	0	38	38
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	2	0	0	2	2
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	1	0	0	1	1
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	12	0	0	12	12
	Runways	12	0	0	12	12

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 8-10 provide information on the damage to the utility lifeline systems. Table 8 provides damage to the utility system facilities. Table 9 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 10 provides a summary of the system performance information.

Table 8 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	1	0	0	1	1
Waste Water	2	0	0	1	2
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	1	0	0	1	1

Table 9 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	15,552	631	190
Waste Water	9,331	499	150
Natural Gas	6,221	533	160
Oil	0	0	0

Table 10: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	10,221	43	12	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 1 ignitions that will burn about 0.03 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 33 people and burn about 1 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.00 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 46.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates (357 households to be displaced due to the earthquake. Of these, 99 people (out of a total population of 31,615 will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 11 provides a summary of the casualties estimated for this earthquake

Table 11: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	1	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	1	0	0	0
	Industrial	0	0	0	0
	Other-Residential	39	8	1	1
	Single Family	44	10	1	1
	Total	**85**	**18**	**1**	**2**
2 PM	Commercial	55	15	2	4
	Commuting	0	0	0	0
	Educational	17	4	1	1
	Hotels	0	0	0	0
	Industrial	3	1	0	0
	Other-Residential	9	2	0	0
	Single Family	11	2	0	0
	Total	**95**	**25**	**4**	**7**
5 PM	Commercial	45	12	2	4
	Commuting	1	1	2	0
	Educational	1	0	0	0
	Hotels	0	0	0	0
	Industrial	2	1	0	0
	Other-Residential	14	3	0	0
	Single Family	18	4	0	0
	Total	**81**	**21**	**4**	**5**

Economic Loss

The total economic loss estimated for the earthquake is 210.09 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 143.37 (millions of dollars); 12 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 68 % of the total loss. Table 12 below provides a summary of the losses associated with the building damage.

Table 12: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.34	5.29	0.05	0.13	5.82
	Capital-Related	0.00	0.15	4.49	0.03	0.06	4.73
	Rental	2.06	2.18	2.47	0.01	0.06	6.78
	Relocation	0.23	0.08	0.14	0.00	0.03	0.47
	Subtotal	**2.28**	**2.75**	**12.39**	**0.09**	**0.27**	**17.79**
Capital Stock Loses							
	Structural	10.65	5.17	6.54	0.29	0.84	23.49
	Non_Structural	42.25	18.64	14.22	0.83	1.80	77.75
	Content	12.29	3.76	6.41	0.51	0.88	23.84
	Inventory	0.00	0.00	0.35	0.12	0.04	0.51
	Subtotal	**65.19**	**27.57**	**27.52**	**1.74**	**3.56**	**125.58**
	Total	**67.47**	**30.31**	**39.91**	**1.84**	**3.83**	**143.37**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 13 & 14 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 15 presents the results of the region for the given earthquake.

Table 13: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2,812.32	$3.67	0.13
	Bridges	1,014.85	$30.68	3.02
	Tunnels	0.00	$0.00	0.00
	Subtotal	**3827.20**	**34.30**	
Railways	Segments	68.21	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	4.93	$0.75	15.16
	Subtotal	**73.10**	**0.70**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	1.23	$0.19	15.39
	Subtotal	**1.20**	**0.20**	
Ferry	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	73.90	$10.99	14.87
	Runways	421.44	$0.77	0.18
	Subtotal	**495.30**	**11.80**	
	Total	**4396.90**	**47.00**	

Table 14: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	37.60	$3.00	7.98
	Distribution Line	311.00	$3.16	1.02
	Subtotal	**348.67**	**$6.16**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	150.50	$8.34	5.54
	Distribution Line	186.60	$2.50	1.34
	Subtotal	**337.14**	**$10.84**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Line	124.40	$2.67	2.15
	Subtotal	**124.41**	**$2.67**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Communication	Facilities	0.10	$0.01	7.96
	Subtotal	**0.11**	**$0.01**	
	Total	**810.33**	**$19.68**	

Table 15. Indirect Economic Impact with outside aid
(Employment as # of people and Income in millions of $)

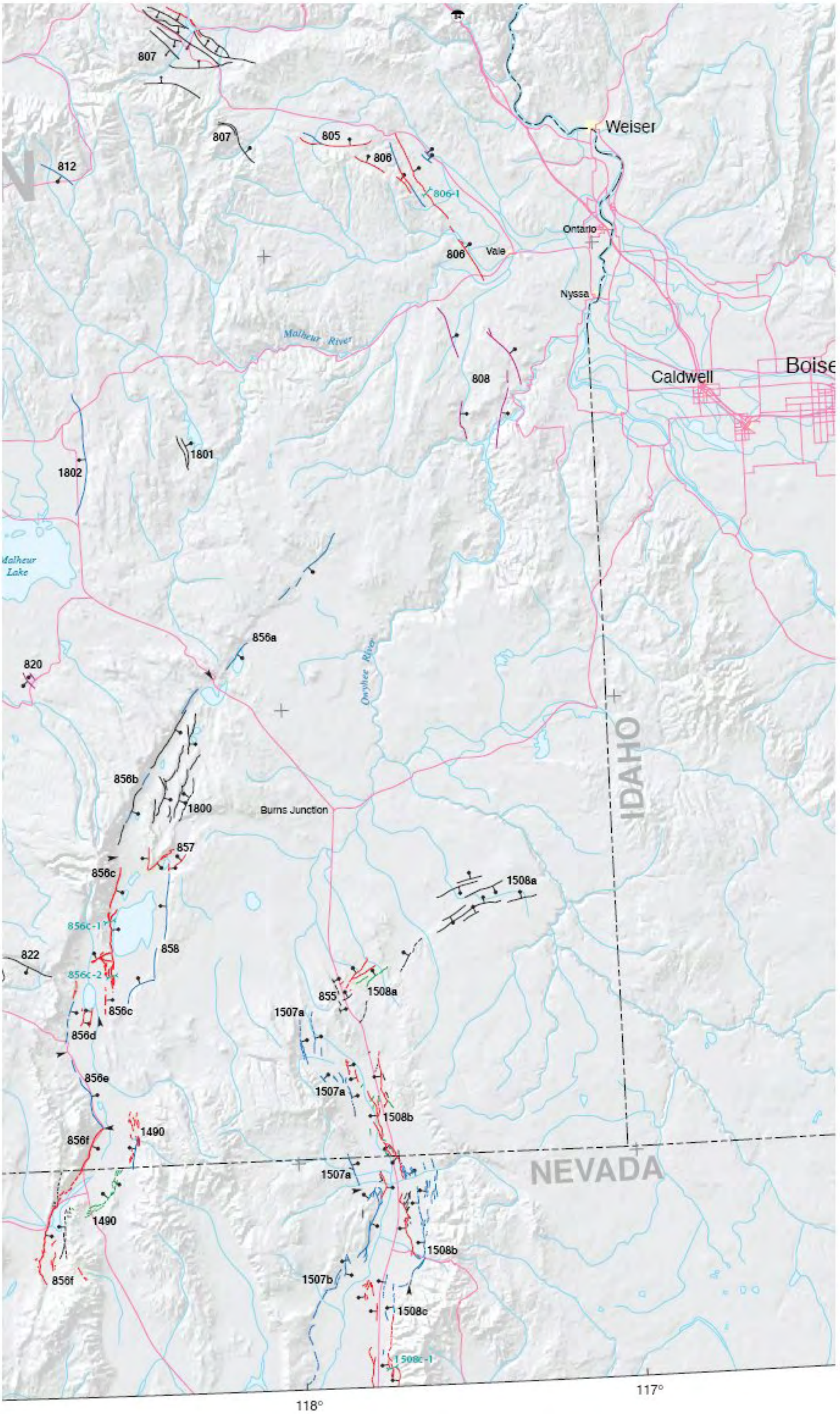
	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	(1)	-0.62
Second Year			
	Employment Impact	0	0.00
	Income Impact	(4)	-1.89
Third Year			
	Employment Impact	0	0.00
	Income Impact	(5)	-2.43
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	(5)	-2.43
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	(5)	-2.43
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	(5)	-2.43

Appendix A: County Listing for the Region

Malheur,OR

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Oregon					
	Malheur	31,615	1,234	206	1,441
Total State		**31,615**	**1,234**	**206**	**1,441**
Total Region		**31,615**	**1,234**	**206**	**1,441**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UNDERSTANDING EARTHQUAKE HAZARDS THROUGHOUT THE UNITED STATES

Quaternary Fault and Fold Database for the Nation

What are the faults in my area and where are they? When did they last have a large earthquake? Now you can find the answers to these questions online at http://Qfaults.cr.usgs.gov/ through a user-friendly interface developed by the U.S. Geological Survey (USGS). This is the first nationwide compilation to provide up-to-date and comprehensive geologically based information on known or suspected active faults.

The Database

The USGS has released a new Quaternary Fault and Fold Database that summarizes geologic, geomorphic, and geographic information for about 2,000 Quaternary faults in the United States. This online database at *http://Qfaults.cr.usgs.gov/* contains information on faults and associated folds that are believed to be sources of earthquakes greater than magnitude 6 (M>6). The database is limited to structures with documented activity during the Quaternary (past 1.6 m.y.) because this period of geologic time is most relevant for studies of active earthquake faults.

Earthquakes occur when faults move beneath the Earth's surface. When the earthquake is large enough, movement will continue up to the surface and produce scarps, folds, or other geologic evidence of ground deformation. Although not all future earthquakes will occur on known faults, virtually all occur on preexisting faults. Thus, the faults included in this database have the most potential for future large earthquakes and provide a fairly accurate picture of earthquake hazards in the United States.

Quaternary Faults

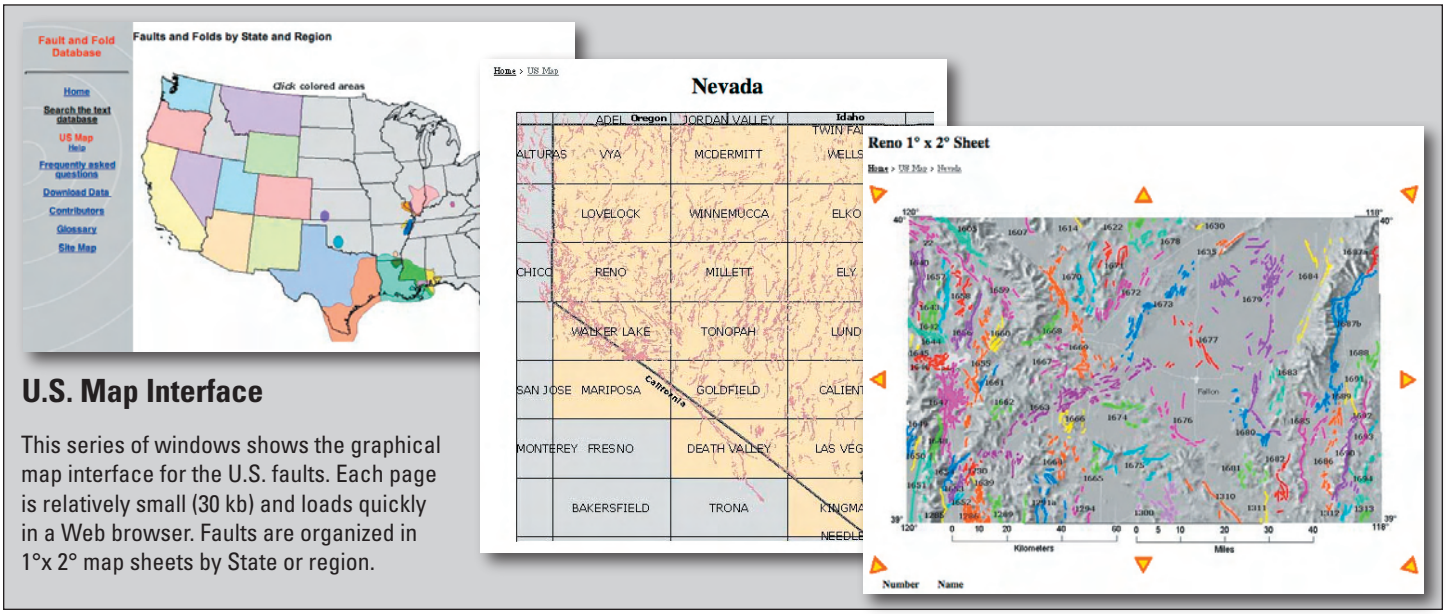
The Quaternary Fault and Fold Database includes information such as geologic setting, fault orientation, fault type, sense of movement, slip rate, recurrence (repeat) interval, and the time of the most recent surface-faulting event. Much of the information in the database is based on paleoseismology, which is the geologic study of prehistoric earthquakes. Paleoseismology combines geologic tools such as trenching with archeological-style analysis to determine the times and sizes of ancient earthquakes in the Quaternary Period. These studies extend the historic record of earthquakes and are extremely useful in assessing the potential hazard posed by the thousands of Quaternary faults in the United States.

Interfaces

Three distinct but highly powerful interfaces can access the Quaternary Fault and Fold Database; each is tailored to different groups of users. There are two map interfaces. The U.S. Map interface (see below) is based on States or regions. Clicking on a State brings up the State map (Nevada is shown here), with all the 1°x 2° sheets for the State. Each sheet covers an area about 120 miles wide (E.-W.) and 60 miles high (N.-S.). Clicking one of the sheets brings up a shaded relief map of the area showing all the Quaternary faults. Each of these faults is numbered and linked to text descriptions in a table that is below the map. The static map images are small (typically 30 kb), so they load quickly using a standard dial-up modem.

The second map interface is a dynamic one, which utilitizes ArcInfo's Interactive Map Service (IMS). This map is linked to digital fault-and-fold files in a GIS (geographic information system). The interface loads a base map of the United States and a series of user-controlled layers, such as streams, roads, and towns, as well as the Quaternary faults and folds. Special tools allow users to zoom, pan, query, and link to the database (see next page). This powerful interface requires high-speed Internet access.

Users can also query the database. Queries can be simple, such as fault name, or as complicated as user-defined combinations of location, fault activity, and geologic characteristics.



U.S. Map Interface

This series of windows shows the graphical map interface for the U.S. faults. Each page is relatively small (30 kb) and loads quickly in a Web browser. Faults are organized in 1°x 2° map sheets by State or region.

Purpose and Uses

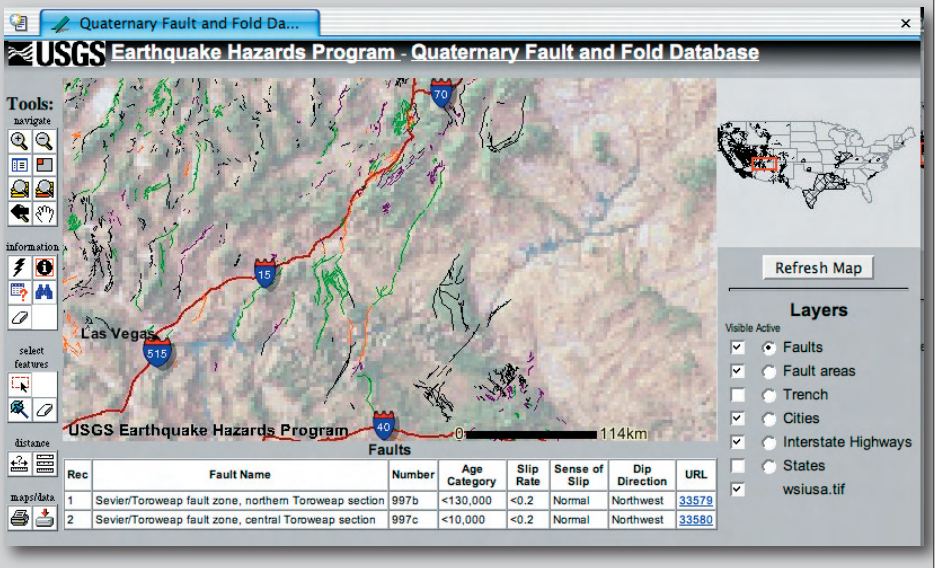
The database is designed to fulfill the needs of a broad group of users, ranging from the science community to the general public. Scientific and technical professionals engaged in seismological and paleoseismological research will find this Web site a powerful tool. The Web site facilitates making comparisons of spatial and temporal patterns of faulting at local, regional, and national scales and provides critical input for modeling plate motion and regional strain distribution. In addition, paleoseismologists and earthquake geologists will be able to identify where trenching studies have been conducted and review summaries of the results of those studies. Other geological specialists, such as hydrologists, can use it to address issues of ground-water availability and hydrothermal potential.

The seismic-hazard-assessment community will benefit from public access to all data available on potential earthquake sources in one location. The database will allow these users to identify faults that have likely produced strong ground motion in the geologically recent past and that may contribute to future seismic hazards. The database will continue to be the primary source for USGS seismic-hazards information on faults and fault-related folds in the United States, providing geologic information on the probable sources of past, current, and future earthquakes.

Other potential users include the earthquake-engineering community, the insurance industry, and companies managing large infrastructures, such as pipelines or power-transmission networks. In addition, local and State planners can use the database to locate potential earthquake sources on maps. Similarly, emergency-response officials can use the database to plan earthquake drills and to identify and fortify critical infrastructure near active faults.

Finally, the general public is becoming increasingly aware of potential hazards in their environment. The USGS as well as State geological surveys frequently are called upon to respond to questions regarding the location of hazardous faults that may impact the lives of the population at large. Now individuals can find the answers to their questions directly in a user-friendly online interface.

GIS Map Interface



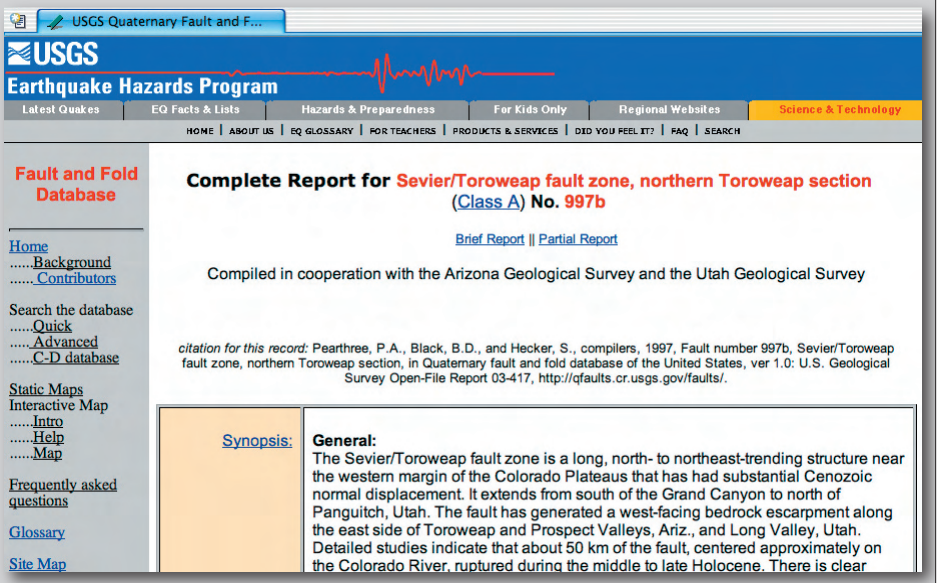
This window shows the GIS interface. Although powerful and having a variety of navigational tools, it is relatively large (>250 kb) and designed for users with high-speed Internet access.

Acknowledgments

Ten years in the making, this massive collection of data, which is estimated to contain about 10,000 pages of content on about 2,000 faults and folds (see below), was accomplished with the cooperation and assistance of State geological surveys as well as individuals in the academic and private sectors (see Web site for a complete list). Future additions to the database will include information for Alaska and Hawaii, as well as updates to information in the lower 48 States.

The work of the USGS and its cooperators in developing this database is only one part of the ongoing USGS efforts to protect lives and property from future earthquakes throughout the United States.

Database Information



Example of a complete report for a Quaternary fault. These descriptions are typically 2–5 pages long with references.

For More Information Contact:

Earthquake Hazards Program
U.S. Geological Survey
DFC PO Box 25046 MS-966
Denver, CO 80225

Quaternary Fault & Fold Database is at:
http://Qfaults.cr.usgs.gov/

Earthquake Hazards Program
http://earthquake.usgs.gov/

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Graphics and layout design by Lisa Wald

This Fact Sheet is available online at
http://pubs.usgs.gov/fs/2004/3033

Project Facility Tracking Data:

Site Unique ID	Building Unique ID	Site_Type
Malh_coc01	Malh_coc01A	Community_College
Malh_coc02	Malh_coc02A	Community_College
Malh_coc03	Malh_coc03A	Community_College
Malh_coc04	Malh_coc04A	Community_College
Malh_coc05	Malh_coc05A	Community_College
Malh_coc06	Malh_coc06A	Community_College
Malh_coc08	Malh_coc08A	Community_College
Malh_fir02	Malh_fir02A	Fire - City
Malh_fir03	Malh_fir03A	EOC-Public Safety Answering Point - City
Malh_fir05	Malh_fir05A	Fire - RFPD
Malh_fir06	Malh_fir06A	Fire - City
Malh_fir07	Malh_fir07A	Fire - City
Malh_hos01	Malh_hos01A	Hospital
Malh_pol02	Malh_pol02A	EOC-Public Safety Answering Point
Malh_pol03	Malh_pol03A	EOC-Public Safety Answering Point - County
Malh_pol04	Malh_pol04A	Police - City
Malh_sch01	Malh_sch01A	School
Malh_sch01	Malh_sch01B	School
Malh_sch02	Malh_sch02A	School
Malh_sch02	Malh_sch02B	School
Malh_sch03	Malh_sch03A	School
Malh_sch03	Malh_sch03B	School
Malh_sch03	Malh_sch03C	School
Malh_sch04	Malh_sch04A	School
Malh_sch04	Malh_sch04B	School
Malh_sch04	Malh_sch04C	School
Malh_sch04	Malh_sch04D	School
Malh_sch04	Malh_sch04E	School
Malh_sch04	Malh_sch04F	School
Malh_sch05	Malh_sch05A	School
Malh_sch05	Malh_sch05B	School
Malh_sch05	Malh_sch05C	School
Malh_sch06	Malh_sch06A	School
Malh_sch06	Malh_sch06B	School
Malh_sch06	Malh_sch06C	School
Malh_sch06	Malh_sch06D	School
Malh_sch06	Malh_sch06E	School
Malh_sch07	Malh_sch07A	School
Malh_sch08	Malh_sch08A	School
Malh_sch09	Malh_sch09A	School
Malh_sch09	Malh_sch09B	School
Malh_sch09	Malh_sch09C	School
Malh_sch10	Malh_sch10A	School
Malh_sch11	Malh_sch11A	School
Malh_sch11	Malh_sch11B	School
Malh_sch11	Malh_sch11C	School
Malh_sch12	Malh_sch12A	School
Malh_sch12	Malh_sch12B	School
Malh_sch13	Malh_sch13A	School
Malh_sch14	Malh_sch14A	School

Public K12 District_Name	Individual Public K12 Facility Name
Treasure Valley CC	Treasure Valley - Malheur Dormitory
Treasure Valley CC	Treasure Valley - Tech Lab Building
Treasure Valley CC	Treasure Valley - Easley Memorial Gymnasium
Treasure Valley CC	Treasure Valley - Barber Hall. Administration Bldg.
Treasure Valley CC	Treasure Valley - Oregon Trail Building
Treasure Valley CC	Treasure Valley - Weese Building
Treasure Valley CC	Treasure Valley - Four Rivers Cultural Center and Muse
City of Nyssa	Nyssa Fire Department
City of Ontario	Ontario Fire Department
Adrian RFPD	Adrian RFPD
City of Jordan Valley	Jordan Valley VFD
City of Vale	Vale Fire Department
Catholic Health Initiatives NFP	Holy Rosary Medical Center - Ontario
City of Ontario	Ontario Police Dept
Malheur County	Malheur County Sheriff
City of Nyssa	Nyssa City Police Dept
Ontario SD 8C	Aiken Elementary School
Ontario SD 8C	Aiken Elementary School
Ontario SD 8C	May Roberts Elementary School
Ontario SD 8C	May Roberts Elementary School
Ontario SD 8C	Pioneer Elementary School
Ontario SD 8C	Pioneer Elementary School
Ontario SD 8C	Pioneer Elementary School
Ontario SD 8C	Ontario Middle School
Ontario SD 8C	Ontario Middle School
Ontario SD 8C	Ontario Middle School
Ontario SD 8C	Ontario Middle School
Ontario SD 8C	Ontario Middle School
Ontario SD 8C	Ontario Middle School
Ontario SD 8C	Ontario High School
Ontario SD 8C	Ontario High School
Ontario SD 8C	Ontario High School
Vale SD 84	Vale Elementary School
Vale SD 84	Vale Elementary School
Vale SD 84	Vale Elementary School
Vale SD 84	Vale Elementary School
Vale SD 84	Vale Elementary School
Nyssa SD 26	Nyssa Elementary School
Nyssa SD 26	Nyssa Middle School
Nyssa SD 26	Nyssa High School
Nyssa SD 26	Nyssa High School
Nyssa SD 26	Nyssa High School
Adrian SD 61	Adrian Elementary School
Vale SD 84	Vale High School
Vale SD 84	Vale High School
Vale SD 84	Vale High School
Vale SD 84	Vale Middle School
Vale SD 84	Vale Middle School
Ontario SD 8C	Alameda Elementary School
Ontario SD 8C	Cairo Elementary School

Address	City	ZIP	County	**USGS Seismic Zone**	Field Plaque	Estimate Decade	**ODE Yr Built**
650 College Blvd	Ontario	97914	Malheur	Moderate	1968	1960	1968
650 College Blvd	Ontario	97914	Malheur	Moderate	1970	1970	1970
650 College Blvd	Ontario	97914	Malheur	Moderate	1968	1960	1968
650 College Blvd	Ontario	97914	Malheur	Moderate	1965	1960	1965
650 College Blvd	Ontario	97914	Malheur	Moderate	1965	1960	1965
650 College Blvd	Ontario	97914	Malheur	Moderate	1966	1960	1966
676 S.W. 5th Ave	Ontario	97914	Malheur	Moderate	1996		1996
21 Good Avenue	Nyssa	97913	Malheur	Moderate		1960	1938
444 SW 4th St	Ontario	97914	Malheur	Moderate	1977	1970	1977
608 First Street	Adrian	97901	Malheur	Moderate		1960	1964
306 Blackaby St	Jordan Val	97910	Malheur	Moderate		1970	1900
950 Hope St	Vale	97918	Malheur	Moderate	1995	1990	1995
351 SW 9th St	Ontario	97914	Malheur	Moderate	2003	2000	2002
444 Southwest 4th St	Ontario	97914	Malheur	Moderate	1977	1970	1977
151 B Street West	Vale	97918	Malheur	Moderate	1996	1990	1996
14 South 3rd St	Nyssa	97913	Malheur	Moderate	1938	1930	1938
1297 West Idaho St	Ontario	97914	Malheur	Moderate		1960	1957
1297 West Idaho St	Ontario	97914	Malheur	Moderate		1960	1957
590 NW 8th St	Ontario	97914	Malheur	Moderate		1960	1970
590 NW 8th St	Ontario	97914	Malheur	Moderate		1950	1970
4744 Pioneer Rd	Ontario	97914	Malheur	Moderate		1930	1964
4744 Pioneer Rd	Ontario	97914	Malheur	Moderate		1960	1964
4744 Pioneer Rd	Ontario	97914	Malheur	Moderate		1960	1964
573 SW 2nd	Ontario	97914	Malheur	Moderate		1950	1939
573 SW 2nd	Ontario	97914	Malheur	Moderate		1950	1939
573 SW 2nd	Ontario	97914	Malheur	Moderate	1939	1930	1939
573 SW 2nd	Ontario	97914	Malheur	Moderate		1970	1939
573 SW 2nd	Ontario	97914	Malheur	Moderate	1939	1930	1939
573 SW 1st	Ontario	97914	Malheur	Moderate	1939	1930	1939
1115 West Idaho Ave	Ontario	97914	Malheur	Moderate		1950	1980
1115 West Idaho Ave	Ontario	97914	Malheur	Moderate		1970	1980
1115 West Idaho Ave	Ontario	97914	Malheur	Moderate		1970	1980
403 E St W	Vale	97918	Malheur	Moderate		2000	1954
403 E St W	Vale	97918	Malheur	Moderate		1950	1954
403 E St W	Vale	97918	Malheur	Moderate		2000	1954
403 E St W	Vale	97918	Malheur	Moderate		1950	1954
403 E St W	Vale	97918	Malheur	Moderate		1970	1954
809 Bower Ave	Nyssa	97913	Malheur	Moderate	1998	1990	1998
101 S 11th St	Nyssa	97913	Malheur	Moderate	1958	1950	1958
824 Adrian Blvd	Nyssa	97913	Malheur	Moderate	1974	1970	1974
824 Adrian Blvd	Nyssa	97913	Malheur	Moderate	1974	1970	1974
824 Adrian Blvd	Nyssa	97913	Malheur	Moderate	1974	1970	1974
300 High St	Adrian	97901	Malheur	Moderate		1950	1949
505 Viking Dr	Vale	97918	Malheur	Moderate	1958	1950	1958
505 Viking Dr	Vale	97918	Malheur	Moderate		1960	1958
505 Viking Dr	Vale	97918	Malheur	Moderate		1990	1958
403 E St W	Vale	97918	Malheur	Moderate		1950	1950
403 E St W	Vale	97918	Malheur	Moderate		1980	1950
1252 Alameda Dr	Ontario	97914	Malheur	Moderate		1960	1962
531 Highway 20/26	Ontario	97914	Malheur	Moderate	1957	1950	1957

Facility Sq Ft	Students Enrolled	DOGAMI Tracking Code	NEHRP **Soil**	Primary 1 Type	1 RVS	Secondary 2 Type	2 RVS	Tertiary 3 Type
18,842		FEMA154	D	**S3**	**2.3**			
9,856		FEMA154	D	**RM1**	**(0.1)**			
45,585		FEMA154	D	**C1**	**(0.5)**	PC1	1.7	RM1
24,021		FEMA154	D	**PC2**	**0.0**			
8,549		FEMA154	D	**PC2**	**0.0**			
23,788		FEMA154	D	**PC2**	**0.0**			
8,472		NEW	D					
17,400		RVS2006	D	**C2**	**(0.1)**			
30,000		RVS2006	**E**	**RM1**	**-**			
3,432		RVS2006	D	**RM1**	**0.4**			
8,404		RVS2006	**E**	**W1**	**4.0**			
		NEW	D	**S3**	**2.3**			
224,160		NEW	D	**S1**	**1.5**			
		RVS2006	**E**	**RM1**	**-**			
		NEW	D	**RM1**	**2.4**			
17,400		RVS2006	D	**C2**	**0.0**	URM	0.7	
22,045	276	RVS2006	D	W2	3.6	**RM1**	**2.4**	
22,045	276	RVS2006	D	W2	3.6	**RM1**	**2.4**	C2
33,653	365	RVS2006	D	**RM1**	**(0.1)**	W2	0.1	
33,653	365	RVS2006	D	W1	4.6	**S1**	**2.6**	
12,860	139	RVS2006	D	**URM**	**0.2**			
12,860	139	RVS2006	D	**RM1**	**(0.1)**			
12,860	139	RVS2006	D	**RM1**	**2.4**			
148,000	698	RVS2006	D	**RM1**	**2.4**			
	698	RVS2006	D	**C2**	**0.4**	RM1	0.4	
	698	RVS2006	D	URM	1.7	**C2**	**1.5**	
	698	RVS2006	D	**RM1**	**0.4**			
	698	RVS2006	D	URM	1.7	**C2**	**1.5**	
	698	RVS2006	D	URM	2.2	**C2**	**2.0**	
87,681	784	RVS2006	D	**C2**	**(0.1)**			
87,681	784	RVS2006	D	**C2**	**(0.1)**			
87,681	784	RVS2006	D	**C2**	**(0.1)**			
52,900	420	RVS2006	D	**W2**	**5.2**			
	420	RVS2006	D	W2	0.1	**C2**	**(0.1)**	URM
	420	RVS2006	D	**RM1**	**3.9**	W2	4.7	
	420	RVS2006	D	**C2**	**1.9**	W2	3.1	
	420	RVS2006	D	**C2**	**(0.1)**	W2	0.1	
66,044	566	NEW	D		-			
20,411	262	RVS2006	D	**C2**	**(0.1)**			
38,058	318	RVS2006	D	**RM1**	**1.9**	C2	1.9	
38,058	318	RVS2006	D	**RM1**	**(0.1)**	C2	(0.1)	
38,058	318	RVS2006	D	**RM1**	**2.4**	C2	2.4	
31,672	152	RVS2006	D	**RM1**	**(0.1)**			
71,503	335	RVS2006	D	W2	0.6	**RM1**	**0.4**	
71,503	335	RVS2006	D	**RM1**	**(0.1)**			
71,503	335	RVS2006	D	C2	4.0	**RM1**	**2.4**	
13,035	121	RVS2006	D	**C2**	**(0.1)**			
13,035	121	RVS2006	D	**C2**	**(0.1)**	RM1	(0.1)	
28,723	318	RVS2006	D	**RM1**	**(0.1)**			
16,888	151	RVS2006	E	W2	2.5	**C2**	**1.5**	

3 RVS	Type Final	FEMA 154-Based F RVS	llapse Poten	mmary Report link
	S3	2.3	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	(0.1)	Very High	http://www.oregongeology.com/sub/projects/rvs/reports/M
(0.1)	C1	(0.5)	Very High	http://www.oregongeology.com/sub/projects/rvs/reports/M
	PC2	0.0	Very High	http://www.oregongeology.com/sub/projects/rvs/reports/M
	PC2	0.0	Very High	http://www.oregongeology.com/sub/projects/rvs/reports/M
	PC2	0.0	Very High	http://www.oregongeology.com/sub/projects/rvs/reports/M
			Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	-	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	0.4	High (>10%	http://www.oregongeology.com/sub/projects/rvs/reports/M
	W1	4.0	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	S3	2.3	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	S1	1.5	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	-	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	2.4	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	0.0	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	2.4	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
2.4	RM1	2.4	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	S1	2.6	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	URM	0.2	High (>10%	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	2.4	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	2.4	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	0.4	High (>10%	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	1.5	Moderate (>	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	0.4	High (>10%	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	1.5	Moderate (>	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	2.0	Moderate (>	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	W2	5.2	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
0.6	C2	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	3.9	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	1.9	Moderate (>	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
			Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	1.9	Moderate (>	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	2.4	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	0.4	High (>10%	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	2.4	Low (<1%)	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	RM1	(0.1)	Very High (	http://www.oregongeology.com/sub/projects/rvs/reports/M
	C2	1.5	Moderate (>	http://www.oregongeology.com/sub/projects/rvs/reports/M

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U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

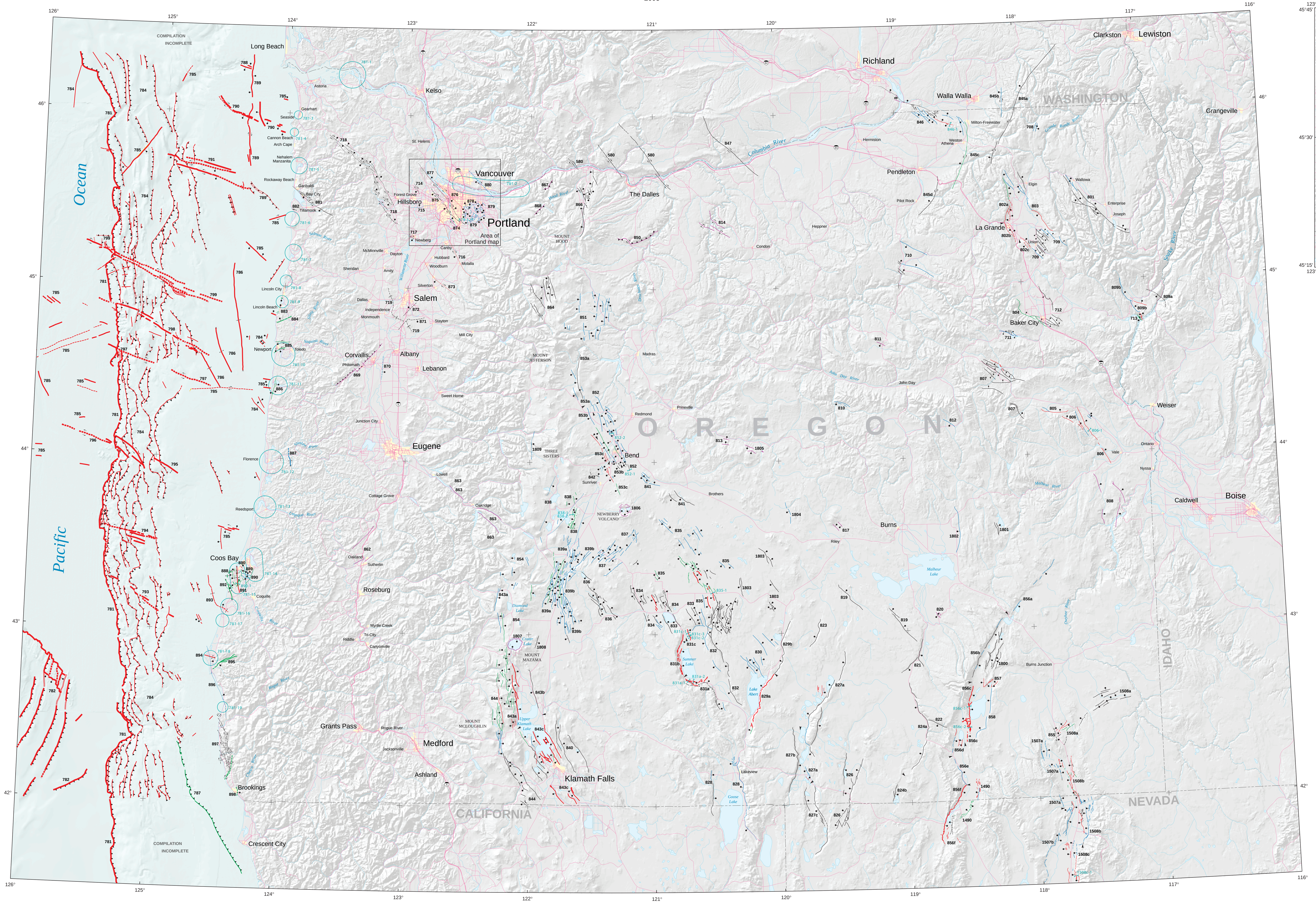
OPEN FILE REPORT
OFR 03-095
Version 1.1
Pamphlet accompanies map

Map of Quaternary Faults and Folds in Oregon

by

Stephen F. Personius, Richard L. Dart, Lee-Ann Bradley and Kathleen M. Haller

2003

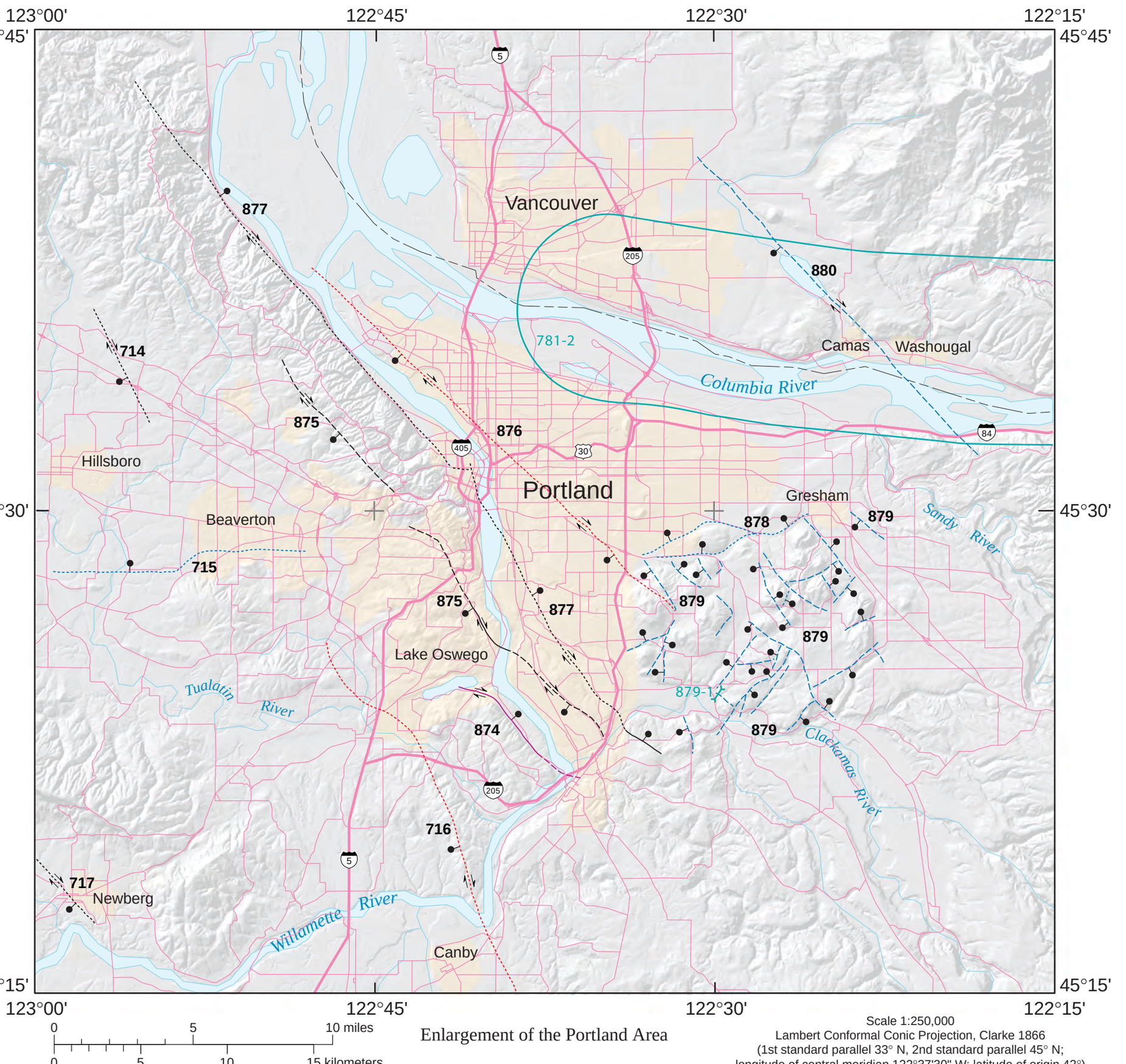


Scale 1:750,000
Lambert Conformal Conic Projection, Clarke 1866
(1st standard parallel 33° N, 2nd standard parallel 45° N;
longitude of central meridian 121°30' W; latitude of origin 42°)

0 50 100 miles
0 50 100 150 kilometers

A Project of International Lithosphere Program Task Group II-2, Major Active Faults of the World
Project coordination by Michael N. Machette (Co-chairman, ILP Task Group II-2)

A PDF file for this map is available at http://pubs.usgs.gov/of/2003/ofr-03-095/



Enlargement of the Portland Area

Scale 1:250,000
Lambert Conformal Conic Projection, Clarke 1866
(1st standard parallel 33° N, 2nd standard parallel 45° N;
longitude of central meridian 122°37'30" W; latitude of origin 42°)

MAP EXPLANATION

TIME OF MOST RECENT SURFACE RUPTURE

- Holocene (<10,000 years) or post last glaciation (<15,000 years; 15 ka); no historic ruptures in Oregon to date
- Late Quaternary (<130,000; post penultimate glaciation)
- Late and middle Quaternary (<750,000 years; 750 ka)
- Quaternary, undifferentiated (<1,600,000 years; <1.6 Ma)
- Class B structure (age or origin uncertain)

SLIP RATE

- >5 mm/year
- 1.0-5.0 mm/year
- 0.2-1.0 mm/year
- <0.2 mm/year

TRACE

- Mostly continuous at map scale
- Mostly discontinuous at map scale
- Inferred or concealed

STRUCTURE TYPE AND RELATED FEATURES

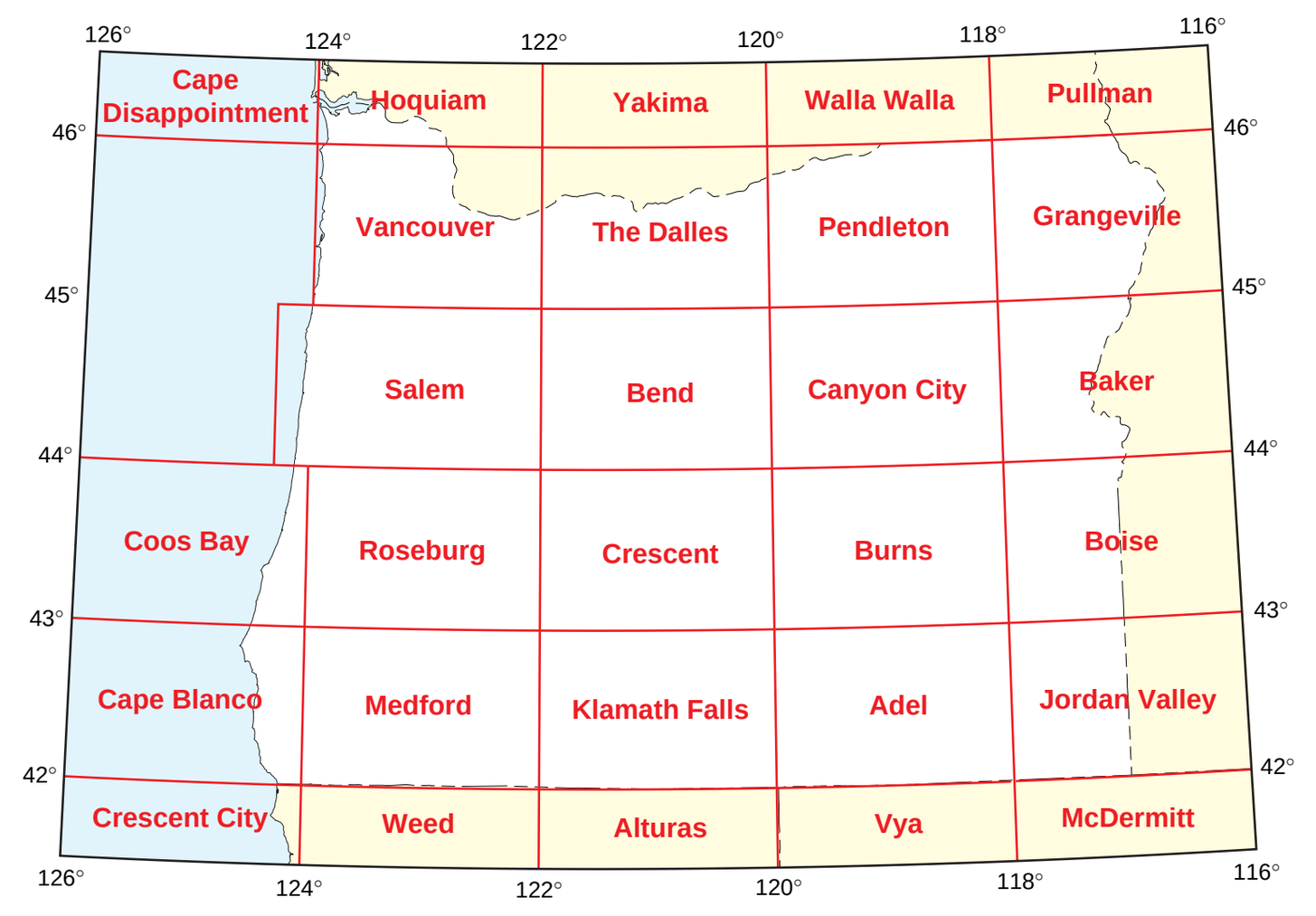
- Normal or high-angle reverse fault
- Strike-slip fault
- Thrust fault
- Anticlinal fold
- Synclinal fold
- Monoclinal fold
- Plunge direction of fold
- Fault section marker

DETAILED STUDY SITES

- 731-2 Trench site
- 781-2 Subduction zone study site

CULTURAL AND GEOGRAPHIC FEATURES

- Divided highway
- Primary or secondary road
- Permanent river or stream
- Intermittent river or stream
- Permanent or intermittent lake



Index of 1° x 2° topographic map sheets for Oregon

DATA ON SUSPECT (CLASS C) FAULTS AND FOLDS IN OREGON

Name of structure	Reason for exclusion
Unnamed feature near Applegate	No evidence of Quaternary offset
Unnamed features in Camas Valley	No evidence of Quaternary offset
Unnamed faults on Cedar Mountain	No evidence of Quaternary offset
Unnamed fault southeast of Condon	No evidence of Quaternary offset
Unnamed features near Drews Reservoir	No evidence of Quaternary offset
Firn Hill fault zone	No evidence of Quaternary offset; reported scarps probably caused by differential erosion
Fulmar fault	No evidence of Quaternary offset on seafloor
Unnamed feature near Grants Pass	No evidence of Quaternary offset
Harrisburg anticline	No geomorphic expression; no unequivocal evidence of Quaternary deformation
Unnamed faults near Ireland Flat	No evidence of Quaternary offset
Limekiln fault	No evidence of Quaternary offset
Mount Hood fault	No evidence of Quaternary offset
Pony Slough faults	No geomorphic expression; no unequivocal evidence of Quaternary deformation
Salmon River fault zone	No evidence of Quaternary offset
Sandy River fault zone	No evidence of Quaternary offset
Sherwood/Lake Oswego fault	No evidence of Quaternary offset
Swan Island fault	No geomorphic expression; no unequivocal evidence of Quaternary deformation
Unnamed faults near Wagontire Mountain	No evidence of Quaternary offset

DATA ON QUATERNARY FAULTS AND FOLDS IN OREGON

Abbreviations: ka, thousands of years ago; Ma, millions of years ago; —, not reported or not applicable. Fault numbers not used on map or in database are 783, 792, 800, 815, 816, 818, 825, 848, 849, 859, 860, 861 and 865.

Fault Number	Name of structure	Most recent event	Slip rate (mm/yr)	Length, end to end (km)	Length, cumulative (km)	Azimuth (average)	Fault type
580	**Faults near The Dalles**	<1.6 Ma	<0.2	54.3	96.7	N 38° W	Dextral, Normal, Thrust
708	**Unnamed faults near Jaussaud Creek**	<750 ka	<0.2	5.8	11.1	N 18° E	Normal
709	**South Grande Ronde Valley faults**	<750 ka	<0.2	20.1	98.3	N 39° W	Normal
710	**Ukiah Valley faults**	<750 ka	<0.2	32.0	56.7	N 61° W	Normal
711	**Sumpter Valley faults**	<750 ka	<0.2	12.3	22.3	N 44° W	Normal
712	**Unnamed East Baker Valley faults**	<1.6 Ma	<0.2	27.3	30.2	N 40° W	Normal
713	**Powder River Peninsula fault zone**	<15 ka	<0.2	5.4	16.9	N 28° W	Normal-Sinistral
714	**Helvetia fault**	<1.6 Ma	<0.2	7.4	7.4	N 26° W	Normal?, Reverse?, Dextral?
715	**Beaverton fault zone**	<750 ka	<0.2	14.7	15.1	N 86° E	Normal?, Reverse?
716	**Canby-Molalla fault**	<15 ka	<0.2	50.0	52.5	N 34° W	Dextral-Reverse?
717	**Newberg fault**	<1.6 Ma	<0.2	5.0	5.0	N 42° W	Dextral-Reverse
718	**Gales Creek fault zone**	<1.6 Ma	<0.2	72.7	152.1	N 41° W	Dextral-Reverse
719	**Salem-Eola Hills homocline**	<1.6 Ma	<0.2	31.2	34.3	N 26° W	Monocline
781	**Cascadia subduction zone**	<15 ka	>5	>535.6	>547.1	N 28° W	Thrust
782	**Blanco transform fault zone**	<15 ka	>5	>106.5	>362.6	N 11° E	Dextral-Normal, Normal, Thrust
784	**Cascadia fold and thrust belt**	<15 ka	1-5	>483.4	>3188.0	N 30° W	Anticline, Syncline, Thrust
785	**Unnamed offshore faults**	<15 ka	1-5	>196.3	>334.6	N 11° W	Sinistral, Dextral, Reverse, Normal
786	**Stonewall anticline**	<15 ka	1-5	80.2	124.9	N 13° W	Anticline, Reverse?
787	**Bald Mountain-Big Lagoon fault zone**	<130 ka	0.2-1	95.0	96.7	N 27° W	Thrust or Reverse
788	**Fault "J"**	<15 ka	1-5	7.6	10.5	N 69° W	Normal, Sinistral?
789	**Nehalem Bank fault**	<15 ka	1-5	101.0	113.2	N 15° W	Dextral, Reverse
790	**Fault "H"**	<15 ka	>5	48.7	81.3	N 49° W	Normal, Sinistral?
791	**Fault "G"**	<15 ka	>5	56.7	138.3	N 74° W	Sinistral
793	**Thompson Ridge fault**	<15 ka	>5	48.6	34.5	N 56° W	Sinistral
794	**Coos Basin fault**	<15 ka	>5	35.4	67.5	N 74° W	Sinistral
795	**Heceta Bank structure**	<15 ka	>5	18.2	18.2	N 58° W	Sinistral?, Monocline?
796	**Heceta South fault**	<15 ka	>5	60.3	84.3	N 54° W	Sinistral
797	**Alvin Canyon fault**	<15 ka	>5	71.2	60.0	N 68° W	Sinistral
798	**Daisy Bank fault**	<15 ka	>5	80.1	91.0	N 63° W	Sinistral
799	**Wecoma fault**	<15 ka	>5	96.0	178.5	N 66° W	Sinistral
801	**Wallowa fault**	<750 ka	<0.2	56.4	118.8	N 51° W	Normal
802	**West Grande Ronde Valley fault zone**	—	—	48.5	86.5	N 19° W	Normal
802a	Mount Emily section	<15 ka	<0.2	29.0	44.9	N 02° W	Normal
802b	La Grande section	<15 ka	<0.2	14.5	25.8	N 30° W	Normal
802c	Craig Mountain section	<15 ka	<0.2	9.6	15.7	N 49° W	Normal
803	**East Grande Ronde Valley fault zone**	<15 ka	<0.2	49.9	79.6	N 35° W	Normal
804	**West Baker Valley fault**	<130 ka	<0.2	32.6	68.5	N 54° W	Normal
805	**Juniper Mountain fault**	<15 ka	<0.2	17.4	23.8	N 81° W	Normal
806	**Cottonwood Mountain fault**	<15 ka	<0.2	41.9	69.4	N 33° W	Normal
807	**Faults near Unity Valley**	<15 ka	<0.2	46.3	151.5	N 61° W	Normal
808	**Faults near Owyhee Dam (Class B)**	<1.6 Ma	<0.2	37.4	59.5	N 13° W	Normal
809	**Pine Valley graben fault system**	—	—	35.2	57.2	N 44° W	Normal
809a	Brownlee section	<1.6 Ma	<0.2	17.1	18.9	N 45° W	Normal
809b	Halfway-Posey Valley section	<15 ka	<0.2	25.4	38.2	N 43° W	Normal
810	**Unnamed faults near Murderers Creek**	<750 ka	<0.2	10.8	15.9	N 71° W	Normal? Reverse?
811	**Unnamed fault in Fox Basin (Class B)**	<1.6 Ma	<0.2	6.1	6.1	N 64° W	Normal
812	**Unnamed fault in Logan Valley**	<750 ka	<0.2	9.4	9.4	N 57° W	Normal
813	**Unnamed fault near Polk Butte (Class B)**	<1.6 Ma	<0.2	5.5	8.6	N 80° W	Normal? Reverse?
814	**Unnamed faults northwest of Condon (Class B)**	<1.6 Ma	<0.2	21.8	43.3	N 52° W	Normal? Dextral?
817	**Unnamed faults on Dry Mountain (Class B)**	<1.6 Ma	<0.2	6.2	9.8	N 44° W	Normal
819	**Brothers fault zone**	<1.6 Ma	<0.2	62.4	56.5	N 43° W	Normal? Dextral?
820	**Unnamed faults near Diamond Craters (Class B)**	<15 ka	<0.2	4.8	7.0	N 37° W	Normal? Dextral?
821	**Donner und Blitzen fault**	<1.6 Ma	<0.2	25.8	34.0	N 18° E	Normal
822	**Unnamed fault near V lake**	<1.6 Ma	<0.2	12.8	13.0	N 69° W	Normal? Dextral?
823	**Unnamed fault near Dry Valley**	<1.6 Ma	<0.2	19.2	20.7	N 21° E	Normal
824	**Unnamed fault near Catlow Valley**	—	—	77.0	76.4	N 00°	Normal
824a	Catlow Valley section	<1.6 Ma	<0.2	55.8	61.1	N 02° W	Normal
824b	Hawksy Walksy Valley section	<1.6 Ma	<0.2	11.3	15.4	N 08° E	Normal
826	**Guano Valley faults**	<1.6 Ma	<0.2	49.2	130.3	N 09° E	Normal, Normal-Dextral
827	**Warner Valley faults**	—	—	132.0	259.8	N 09° E	Normal
827a	East Warner Valley section	<15 ka	<0.2	89.0	135.2	N 09° E	Normal
827b	West Warner Valley section	<1.6 Ma	<0.2	42.1	45.8	N 03° E	Normal
827c	Coleman Valley section	<1.6 Ma	<0.2	43.5	78.8	N 07° W	Normal
828	**Goose Lake graben faults**	<750 ka	<0.2	55.4	107.2	N 09° W	Normal
829	**Abert Rim fault**	—	—	77.1	84.8	N 15° E	Normal
829a	Lake Abert section	<15 ka	0.2-1	41.5	46.8	N 14° E	Normal
829b	Northern section	<1.6 Ma	<0.2	35.4	38.0	N 17° E	Normal
830	**Unnamed faults north of Abert Lake**	<750 ka	<0.2	28.6	86.2	N 36° W	Normal
831	**Winter Rim fault system**	—	—	57.9	122.3	N 38° W	Normal
831a	Slide Mountain section	<15 ka	0.2-1	32.8	75.8	N 57° W	Normal
831b	Winter Ridge section	<15 ka	0.2-1	25.9	38.2	N 04° W	Normal
831c	Ana River section	<15 ka	0.2-1	7.5	8.4	N 15° W	Normal
832	**Faults east of Summer Lake**	<750 ka	<0.2	62.1	96.7	N 16° W	Normal
833	**Faults north of Summer Lake**	<750 ka	<0.2	25.7	270.6	N 10° W	Normal
834	**Paulina Marsh fault**	<15 ka	0.2-1	34.6	131.0	N 25° W	Normal, Sinistral?
835	**Southeast Newberry fault zone**	<15 ka	0.2-1	66.3	204.5	N 34° W	Normal-Sinistral
836	**Unnamed fault near Antelope Mountain**	<1.6 Ma	<0.2	37.6	80.3	N 36° W	Normal
837	**Southwest Newberry fault zone**	<750 ka	<0.2	35.6	121.9	N 41° E	Normal
838	**La Pine graben faults**	<130 ka	<0.2	45.6	149.3	N 20° E	Normal
839	**Chemult graben fault system**	—	—	69.6	514.6	N 07° E	Normal
839a	Western section	<130 ka	<0.2	48.8	226.0	N 14° E	Normal
839b	Walker Rim section	<750 ka	<0.2	60.4	288.5	N 01° E	Normal
840	**Faults on the Modoc Plateau**	<1.6 Ma	<0.2	39.5	83.5	N 20° W	Normal
841	**Unnamed faults near Millican Valley**	<750 ka	<0.2	39.7	50.9	N 54° W	Normal
842	**Unnamed faults near Kiwa Butte**	<1.6 Ma	<0.2	6.9	5.1	N 45° W	Unknown
843	**Klamath graben fault system**	—	—	147.7	446.6	N 17° W	Normal
843a	West Klamath Lake section	<15 ka	0.2-1	90.6	220.5	N 05° W	Normal
843b	East Klamath Lake section	<1.6 Ma	<0.2	25.3	25.7	N 15° W	Normal
843c	South Klamath Lake section	<15 ka	0.2-1	59.3	200.4	N 31° W	Normal
844	**Sky Lakes fault zone**	<15 ka	<0.2	77.3	198.3	N 18° W	Normal
845	**Hite fault system**	—	—	140.7	184.0	N 20° E	Sinistral-Normal
845a	Hite section	<1.6 Ma	<0.2	87.0	90.0	N 27° E	Sinistral-Normal
845b	Kooskooskie section	<750 ka	<0.2	18.9	18.9	N 00°	Sinistral-Normal
845c	Thorn Hollow section	<130 ka	<0.2	44.0	45.5	N 10° E	Sinistral-Normal
845d	Agency section	<1.6 Ma	<0.2	27.9	29.4	N 26° E	Sinistral-Normal
846	**Wallula fault system**	<15 ka	<0.2	62.9	160.2	N 53° W	Dextral? Reverse? Normal?
847	**Arlington-Shutler Butte fault**	<750 ka	<0.2	52.2	53.4	N 43° W	Dextral? Normal?
850	**Unnamed faults near Tygh Ridge (Class B)**	<1.6 Ma	<0.2	26.3	31.7	N 83° E	Reverse or Thrust, Dextral
851	**Warm Springs fault zone**	<750 ka	<0.2	31.7	115.3	N 03° E	Normal
852	**Sisters fault zone**	<130 ka	<0.2	52.9	131.5	N 26° W	Normal, Normal-Dextral?
853	**Metolius fault zone**	—	—	93.6	155.9	N 22° W	Normal-Dexral?
853a	Green Ridge section	<750 ka	<0.2	29.4	50.2	N 11° W	Normal-Dextral?
853b	Rimrock-Tumalo section	<750 ka	<0.2	44.7	56.6	N 29° W	Normal-Dextral?
853c	Northwest Rift zone section	<15 ka	<0.2	42.9	49.1	N 26° W	Normal-Dextral?
854	**Unnamed faults NE of Diamond Lake**	<750 ka	<0.2	44.4	39.6	N 00°	Normal
855	**Unnamed fault zone near Blue Mountain**	<1.6 Ma	<0.2	8.7	6.7	N 23° W	Normal
856	**Steens fault zone**	—	—	192.1	264.7	N 11° E	Normal
856a	Crowley section	<750 ka	<0.2	42.6	27.5	N 39° E	Normal
856b	Mann Lake section	<750 ka	<0.2	42.8	42.6	N 29° E	Normal
856c	Alvord section	<15 ka	0.2-1	36.1	69.3	N 01° W	Normal
856d	Fields section	<15 ka	<0.2	15.6	23.0	N 13° E	Normal
856e	Tum Tum section	<750 ka	<0.2	18.4	17.5	N 24° W	Normal
856f	Denio section	<15 ka	0.2-1	37.3	84.8	N 09° E	Normal
857	**Mickey Basin faults**	<15 ka	<0.2	8.1	18.0	N 33° E	Normal
858	**Tule Springs Rims fault**	<750 ka	<0.2	33.4	33.5	N 11° E	Normal
862	**Unnamed faults near Sutherlin (Class B)**	<750 ka	<0.2	27.7	34.5	N 49° E	Normal?
863	**Upper Willamette River fault zone (Class B)**	<1.6 Ma	<0.2	44.0	50.8	N 52° W	Dextral?
864	**Clackamas River fault zone**	<1.6 Ma	<0.2	28.6	92.9	N 19° W	Dextral, Normal
866	**Hood River fault zone**	<1.6 Ma	<0.2	44.3	80.8	N 11° W	Normal, Dextral?
867	**Eagle Creek thrust fault (Class B)**	<1.6 Ma	<0.2	8.1	9.0	N 44° E	Thrust
868	**Bull Run thrust fault (Class B)**	<1.6 Ma	<0.2	9.4	9.5	N 44° E	Thrust
869	**Corvallis fault zone (Class B)**	<1.6 Ma	<0.2	40.4	44.6	N 33° E	Thrust, Sinistral?
870	**Owl Creek fault**	<750 ka	<0.2	14.9	14.9	N 05° E	Reverse
871	**Mill Creek fault**	<1.6 Ma	<0.2	18.4	20.1	N 66° E	Reverse-Sinistral?
872	**Waldo Hills fault**	<1.6 Ma	<0.2	11.8	11.8	N 45° E	Normal?, Reverse?
873	**Mount Angel fault**	<15 ka	<0.2	29.7	30.4	N 43° W	Reverse-Dextral
874	**Bolton fault (Class B)**	<1.6 Ma	<0.2	8.8	9.2	N 53° W	Reverse-Dextral
875	**Oatfield fault**	<1.6 Ma	<0.2	28.7	27.3	N 41° W	Reverse-Dextral
876	**East Bank fault**	<15 ka	<0.2	28.9	29.0	N 46° W	Reverse-Dextral
877	**Portland Hills fault**	<1.6 Ma	<0.2	49.3	50.4	N 37° W	Reverse-Dextral? Thrust?
878	**Grant Butte fault**	<750 ka	<0.2	9.9	16.6	N 77° E	Normal
879	**Damascus-Tickle Creek fault zone**	<750 ka	<0.2	16.7	83.8	N 00°	Dextral-Reverse
880	**Lacamas Lake fault**	<750 ka	<0.2	23.7	23.8	N 43° W	Dextral-Normal? or Reverse?
881	**Tillamook Bay fault zone**	<1.6 Ma	<0.2	31.8	47.6	N 56° W	Reverse-Sinistral
882	**Happy Camp fault**	<1.6 Ma	<0.2	3.3	3.4	N 73° W	Thrust
883	**Siletz Bay faults**	<130 ka	<0.2	11.6	10.0	N 73° W	Normal? Reverse?
884	**Cape Foulweather fault**	<130 ka	0.2-1	10.4	10.8	N 69° E	Reverse? Sinistral?
885	**Yaquina faults**	<130 ka	0.2-1	12.7	18.5	N 79° E	Reverse? Sinistral?
886	**Waldport faults**	<130 ka	<0.2	14.5	18.9	N 13° E	Normal? Reverse? Sinistral?
887	**Unnamed Siuslaw River anticline**	<750 ka	0.2-1	11.6	21.0	N 10° W	Anticline
888	**Sunset Bay-Cape Arago folds and faults**	<130 ka	0.2-1	4.2	9.5	N 52° W	Dextral Normal? Reverse?
889	**East South Slough faults**	<750 ka	<0.2	7.8	14.1	N 70° W	Reverse? Sinistral?
890	**South Slough thrust and reverse faults**	<130 ka	<0.2	13.3	62.0	N 08° E	Reverse, Thrust
891	**South Slough syncline**	<15 ka	0.2-1	17.2	17.3	N 07° W	Syncline
892	**Pioneer anticline**	<130 ka	0.2-1	13.8	24.8	N 33° W	Anticline
893	**Coquille fault**	<15 ka	0.2-1	27.1	28.3	N 30° W	Reverse?
894	**Cape Blanco anticline**	<15 ka	0.2-1	8.1	8.1	N 74° W	Anticline, Reverse or Thrust?
895	**Beaver Creek fault zone**	<130 ka	0.2-1	17.0	33.2	N 65° E	Normal
896	**Battle Rock fault zone**	<750 ka	<0.2	48.0	48.7	N 16° W	Normal Dextral?
897	**Whaleshead fault zone**	<130 ka	0.2-1	43.0	139.0	N 12° W	Dextral, Sinistral
898	**Chetco River fault**	<130 ka	0.2-1	5.6	7.8	N 05° W	Reverse? Dextral?
1490	**East Pueblo Valley fault zone**	<130 ka	<0.2	28.1	58.3	N 17° E	Normal
1507	**Hoppin Peaks fault zone**	—	—	91.1	140.1	N 01° E	Normal
1507a	Oregon Canyon Mountains section	<750 ka	<0.2	44.0	54.2	N 16° W	Normal
1507b	Hoppin Peaks section	<130 ka	<0.2	54.9	85.9	N 12° E	Normal
1508	**Santa Rosa Range fault system**	—	—	127.6	374.3	N 11° E	Normal
1508a	Owyhee River section	<15 ka	<0.2	46.7	112.4	N 48° E	Normal
1508b	Quinn River section	<15 ka	<0.2	57.5	192.6	N 07° W	Normal
1508c	Santa Rosa Peak section	<15 ka	<0.2	27.8	69.4	N 01° E	Normal
1800	**Unnamed Sheepshead Mountains faults**	<1.6 Ma	<0.2	28.7	77.6	N 12° E	Normal
1801	**Warm Springs fault**	<1.6 Ma	<0.2	8.7	16.3	N 16° W	Normal
1802	**Harney fault**	<750 ka	<0.2	29.5	30.6	N 02° W	Normal
1803	**Unnamed East Christmas Lake Valley faults**	<1.6 Ma	<0.2	41.9	62.2	N 24° W	Normal, Dextral?
1804	**Unnamed fault east of the Dust Bowl**	<750 ka	<0.2	14.1	12.6	N 14° W	Normal
1805	**Unnamed faults near Arrowwood Point (Class B)**	<750 ka	<0.2	13.1	15.4	N 68° W	Normal
1806	**Newberry volcano ring faults (Class B)**	<15 ka	<0.2	7.6	26.5	N 16° W	Normal
1807	**Mount Mazama ring faults (Class B)**	<15 ka	<0.2	8.0	27.1	N 87° W	Normal
1808	**Unnamed fault near Lookout Butte**	<1.6 Ma	<0.2	8.1	8.2	N 19° E	Normal
1809	**White Branch fault zone**	<750 ka	<0.2	18.3	18.6	N 06° E	Normal

Flood
Hazard Annex

This annex covers the flood hazard and includes detailed information on the hazard that is specific to the County. The annex includes some actual documents when digital copies were available; other resources are on file with the Malheur County Planning Department in its Multi-Jurisdictional Natural Hazards Mitigation Plan File and can be accessed upon request, as the county does not have the ability to scan these documents. Annex materials may include existing ordinances; supplemental information for Section 3 hazard vulnerabilities, and potential losses when local data is available.

Hazard Resources

This section documents the existing resources that were used to develop the risk assessment for this hazard. They include:

- *Floodplain Ordinances (Planning)*
    - The Malheur County and City of Ontario floodplain ordinances are attached. Other cities do not have their ordinances available in digital form; these ordinances are on file with the Malheur County Planning Department and with individual cities.
- *After Incident Reports (Emergency Services)*
    - The County Emergency Services department maintains files on significant floods that include County Court declarations of emergency and any other relevant information, including photographs. At the time of this report, files were only available for selected flood years and are on hard copy file in the Malheur County Emergency Services Department.
- *State Natural Hazard Risk Assessment: Flood*
    - The state risk assessment for flood provides a useful overview of drought in Oregon and documents statewide historic events. This assessment also outlines several state-scale action items that are relevant to flood mitigation in Malheur County. Available online; see Appendix D.
- *Technical Resource Guide*
    - This guide lists basic mitigation strategies for floods, including examples from other communities in Oregon. See Appendix D for information on how to access this document.
- *Emergency Operations Plans*
    - The Malheur County Emergency Services Dept (Sheriff's Office) keeps emergency plans on file for every major dam in the county, in addition to those in Idaho which could affect this region.
- *Maps*
    - FEMA floodplain FIRM maps are available in hard copy form only at the Malheur County Planning Department.

Hazard Vulnerability

Most hazard vulnerability information is located in Section 3: Flood Hazard Summary. The information here is intended as a supplement to that section.

Major Dams and Reservoirs in the County

Dams owned by the Bureau of Reclamation serve a dual purpose as both irrigation water providers and as flood control tools. Listed below is information from the Bureau on its dams' flood control benefits. For details on each reservoir's total storage capacity, see the Drought Hazard Annex.

Vale Project

(Warm Springs, Agency Valley, and Bully Creek Dams)

Bully Creek Reservoir provides specific storage space for flood control purposes and is instrumental in reducing floods on the Malheur River that could cause considerable damage and losses, and in controlling flood damages along Bully Creek and on the Malheur River below the mouth of Bully Creek. The three reservoirs are operated on a coordinated forecast basis for flood control under an agreement of November 9, 1970, between the Corps of Engineers and the Bureau of Reclamation.

Dam & Reservoir	**Accumulated Benefits (1950-1998, $1,000)**	**Capacity Assigned to Flood Control**
Vale Project Overall	*$10,403*	*170,000*
Warm Springs	-	90,000
Agency Valley	-	60,000
Bully Creek	-	20,000

Owyhee Project

(Owyhee Dam)

Flood control criteria have been developed, but are informal and advisory only. Under these criteria, a minimum of 70,000 acre-feet of space is maintained in Owyhee Reservoir through February and more space is maintained beginning in January if the inflow forecast is large.

Dam & Reservoir	**Accumulated Benefits (1950-1998, $1,000)**	**Capacity Assigned to Flood Control**
Owyhee	$33,010	100,000

Flood Stage Categories

Flood Categories and Historical Crests from USGS/National Weather Service river gauges in Malheur County are listed below.

Gauge: Snake River at Weiser, ID

Historical Crests
(2) 15.55 ft on 12/20/1972
(3) 15.54 ft on 01/14/1979
(4) 15.00 ft on 02/17/1933
(5) 14.67 ft on 04/29/1952
(6) 14.47 ft on 01/03/1997
(7) 14.46 ft on 01/13/1974
(8) 13.66 ft on 04/20/1984
(9) 13.60 ft on 05/23/1921
(10) 13.50 ft on 02/25/1986

Flood Categories (in feet)

Major Flood Stage:	14
Moderate Flood Stage:	13
Flood Stage:	12
Action Stage:	12

Description of flood categories (taken directly from NWS online gauge websites)

15.0 MAJOR FLOODING NEAR THE RIVER WILL OCCUR WITH EXTENSIVE AGRICULTURAL FLOODING ALONG THE RIVER IN MALHEUR COUNTY OREGON WITH SEVERAL COUNTY ROADS UNDERWATER. SIGNIFICANT FLOODING WILL ALSO OCCUR IN WEISER IDAHO WITH FLOOD WATERS COVERING THE WATER TREATMENT PLANT ON MORTIMER ROAD. FLOOD WATERS MAY ALSO REACH THE AIRPORT SOUTH OF WEISER.

13.5 MODERATE FLOODING IS LIKELY NEAR WEISER WITH WATER OVERTOPPING MORTIMER ROAD TO A DEPTH OF TWO FEET. FLOODING OF THE WEISER CITY WATER TREATMENT PLANT IS POSSIBLE. SOME COUNTY ROADS IN MALHEUR COUNTY NEAR THE RIVER WILL HAVE WATER FLOWING OVER THEM. MODERATE AGRICULTURAL FLOODING WILL OCCUR NEAR THE RIVER IN MALHEUR COUNTY.

12.0 AGRICULTURAL FLOODING IS LIKELY NEAR THE RIVER IN MALHEUR COUNTY OREGON AND IN WASHINGTON COUNTY IDAHO. MORTIMER ROAD IN WEISER WILL BE FLOODED.

Gauge: Malheur River at Vale, OR

Historical Crests
(1) 14.58 ft on 02/24/1957
(2) 13.80 ft on 02/22/1982
(3) 13.30 ft on 03/21/1993
(4) 11.09 ft on 03/05/1983

Flood Categories (in feet)

Major Flood Stage:	13
Moderate Flood Stage:	11
Flood Stage:	9.5
Action Stage:	9.5

Description of flood categories (taken directly from NWS online gauge websites)

13.0 WATER MAY BEGIN FLOWING OVER HIGHWAY 20 NEAR HARPER. NUMEROUS ROADS CROSSING THE RIVER BETWEEN HARPER AND ONTARIO WILL BE FLOODED WITH WATER ENTERING HOUSES NEAR THE 36TH STREET BRIDGE IN ONTARIO. FOOTHILL AND LAGOON DRIVE NEAR VALE MAY FLOOD IF WILLOW CREEK IS RUNNING HIGH. EXTENSIVE INNUDATION OF FARM LAND WILL OCCUR BETWEEN HAPER AND ONTARIO.

12.0 EXTENSIVE FLOODING OF FARM LAND BETWEEN HARPER AND ONTARIO WILL OCCUR. NUMEROUS ROADS NEAR THE RIVER WILL BE FLOODED INCLUDING HARPER BRIDGE ROAD NEAR HARPER...AIRPORT ROAD AND RUSSEL ROAD NEAR VALE...BUTTE DRIVE BETWEEN VALE AND ONTARIO...AND THE 36TH STREET BRIDGE AREA JUST UPSTREAM FROM ONTARIO INCLUDING MALHEUR DRIVE. SOME HOUSES MAY BE SURROUNDED BY WATER. THE RIVER CREST WILL TAKE ABOUT 12 HOURS TO MOVE DOWNSTREAM FROM HARPER TO VALE...AND ANOTHER 8 HOURS TO MOVE FROM VALE TO ONTARIO.

11.0 FLOOD WATERS WILL RISE ABOVE LOW SPOTS ON COPELAND ROAD NEAR HARPER. BUTTE DRIVE WILL BE FLOODED WITH WATER GREATER THAN 1 FOOT DEEP. FLOOD WATERS WILL COVER PORTIONS OF AIRPORT ROAD AND RUSSEL ROAD SOUTHWEST OF VALE. THE AREA NEAR THE 36TH STEET BRIDGE UPSTREAM FROM ONTARIO WILL FLOOD WITH WATER FLOWING OVER LOW SPOTS ON MALHEUR DRIVE. DEBRIS DAMMING ON THE 36TH STREET BRIDGE MAY BE A PROBLEM.

10.5 FLOODING OF SOME COUNTY ROADS NEAR THE RIVER INCLUDING WESTFALL ROAD NEAR HARPER WILL OCCUR.

9.5 THE RIVER WILL BEGIN SPILLING OVER ITS BANK FLOODING FARM LAND BETWEEN VALE AND ONTARIO. WATER WILL BEGIN APPROACHING LOW SPOTS ON BUTTE DRIVE. WATER WILL APPOACH THE 36TH STEET BRIDGE UPSTREAM FROM ONTARIO ABOUT 8 HOURS AFTER FLOOD STAGE IS EXCEEDED NEAR VALE.

Gauge: Owyhee River at Owyhee Dam

Historical Crests
(1) 15.70 ft on 04/15/1952
(2) 15.10 ft on 02/25/1986
(3) 14.60 ft on 04/17/1984
(4) 12.70 ft on 04/03/1972
(5) 11.80 ft on 09/30/1986
(5) 11.80 ft on 04/16/1983

Flood Categories (in KCFS)

Major Flood Flow:	19000
Moderate Flood Flow:	12000

Flood Flow:	10000
Action Flow:	10000

Description of flood categories (taken directly from NWS online gauge websites)

14.5 OR 19000 CFS... LARGE AMOUNTS OF FARM LAND WILL BE INUNDATED DOWNSTREAM FROM THE DAM TO CONFLUENCE WITH THE SNAKE RIVER. HOUSES NEAR OWYHEE JUNCTION WILL BE FLOODED. WATER WILL COVER PORTIONS OF OREGON HIGHWAY 201.

14.0 OR 17500 CFS... SIGNIFICANT FLOODING IS LIKELY DOWNSTREAM FROM THE DAM ESPECIALLY IN VICINITY OF OWYHEE JUNCTION. WATER WILL COVER PORTIONS OF HIGHWAY 201.

13.0 OR 14700 CFS... FLOOD WATERS WILL COVER ROADS NEAR OWYHEE JUNCTION. SOME HOUSES NEAR OWYHEE JUNCTION WILL BE FLOODED.

11.9 OR 12000 CFS... FLOOD WATER WILL APPROACH HOUSES NEAR OWYHEE JUNCTION. FARM LAND BETWEEN THE DAM AND OWYHEE JUNCTION WILL BE FLOODED. FLOODING WILL BE ABOUT 1 FOOT DEEP NEAR THE OVERSTREET BRIDGE.

11.0 OR 10000 CFS... MINOR FLOODING WILL OCCUR DOWN STREAM FROM THE DAM WITH FARM LAND ADJACENT TO THE RIVER UNDERWATER. WATER MAY SPILL OVER PORTIONS OF OVERSTREET ROAD BELOW OWYHEE DAM.

Gauge: **Owyhee River at Owyhee Dam**

Historical Crests

(1) 20.11 ft on 03/18/1993

(2) 16.70 ft on 12/24/1964

(3) 16.0 ft on 4/6/2006

(No other data is available for this gauge at this time.)

Potential Losses

Currently the County does not have sufficient data to calculate potential flood losses. This is due both to the unpredictability of flood severity/length and limited local records in terms of quantifying losses. If the county is able to access funding for updating and digitizing its floodplain maps, staff will then be able to estimate the number of and value of structures in floodplains throughout the county. This task is not feasible with current staff resources and technologies until the maps are digitized.

CHAPTER 1
FLOOD HAZARD BUILDING REGULATIONS
5-1-1: UTILITY CONNECTIONS:
A. Short Title: This Section shall be known as the MALHEUR COUNTY UTILITIES ORDINANCE and may be so cited and pleaded.
B. Definitions:
BUILDING: A structure built for the support, shelter, or enclosure of persons, animals, chattels or property of any kind.
SERVICE: Providing or attaching to any newly constructed building or newly placed mobile home or prefabricated building the initial line, hookup or metering device to provide electricity.
UTILITY: Any public or private corporation or company which supplies the public or a group of individuals with electrical power.
ZONING PERMIT: A zoning permit issued subject to the regulations as described in the Malheur County Zoning Ordinance12.
C. Zoning Permit Required:
1. Providing Services Without A Zoning Permit Prohibited: No utility shall provide any service to any newly constructed building or newly placed mobile home or prefabricated building outside the limits of any incorporated city in Malheur County until such utility has been furnished with a copy of the zoning permit which has been issued for such newly constructed building or newly placed mobile home or prefabricated building.
2. Issuance Of Copies: When a zoning permit is issued pursuant to the Malheur County Zoning Ordinance, the issuer shall furnish to the successful applicant copies in an amount sufficient for said applicant to provide the utility with a copy.
D. Violation of this Section is a Class A County infraction. (Res., 3-13-1974; 1989 Code)
5-1-2: BUILDING PERMIT SYSTEM FOR FLOOD-PRONE AREAS:
A. The Planning Director shall review all building permit applications for new construction or substantial improvements to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is in a location that has a flood hazard, any proposed new construction or substantial improvement (including prefabricated and mobile homes) must 1) be designed (or modified) and anchored to prevent flotation, collapse, or lateral movement of the structure; 2) use construction materials and utility equipment that are resistant to flood damage; and 3) use construction methods and practices that will minimize flood damage.
B. The Planning Commission shall review subdivision proposals and other proposed new developments to assure that 1) all such proposals are consistent with the need to minimize flood damage; 2) all public utilities and facilities, such as sewer, gas, electrical and water systems are located, elevated and constructed to minimize or eliminate flood damage; and 3) adequate drainage is provided so as to reduce exposure to flood hazards.
C. The Environmental Health Director shall require new or replacement water supply systems and/or sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters, and require on-site waste disposal systems to be located so as to avoid impairment of them or contamination from them during flooding. (Res., 3-13-1974; 1989 Code)
CHAPTER 2
FLOOD CONTROL
5-2-1: FINDINGS:

A. Findings Of Fact:
1. The flood hazard areas of Malheur County are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base; all of which adversely affect the public health, safety and general welfare.
2. These flood losses are caused by the cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities, and when inadequately anchored, damage uses in other areas. Uses that are inadequately floodproofed, elevated or otherwise protected from flood damage also contribute to the flood loss.
B. Statement Of Purpose: It is the purpose of this Chapter to promote the public health, safety and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed:
1. To protect human life and health;
2. To minimize expenditure of public money for costly flood control projects;
3. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
4. To minimize prolonged business interruptions;
5. To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;
6. To help maintain a stable tax base by providing for the second use and development of areas of special flood hazard so as to minimize future flood blight areas;
7. To insure that potential buyers are notified that property is in an area of special flood hazard; and
8. To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.
C. Methods Of Reducing Flood Losses: In order to accomplish its purposes, this Chapter includes methods and provisions for:
1. Restricting or prohibiting uses which are dangerous to health, safety and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
2. Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
3. Controlling the alteration of natural flood plains, stream channels and natural protective barriers, which help accommodate or channel flood waters;
4. Controlling filling, grading, dredging and other development which may increase flood damage; and
5. Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas. (Ord. 54, 3-24-1987)
5-2-2: DEFINITIONS:
Unless specifically defined below, words or phrases used in this Chapter shall be interpreted so as to give them the meanings they have in common usage and to give this Chapter its most reasonable application.
APPEAL: A request for a review of the Planning Director's interpretation of any provision of this Chapter or a request for a variance.
APPEAL BOARD: The Malheur County Court, until such time as they appoint a Board consisting of five (5) persons. Four (4) of the appointed Board members shall have experience in

engineering, architecture, land surveying, residential insurance claims or home financing.
AREA OF SHALLOW FLOODING: A designated AO Zone on the flood insurance rate map (FIRM). The base flood depths range from one to three feet (1' - 3'); a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and, velocity flow may be evident. AO is characterized as sheet flow.
AREA OF SPECIAL FLOOD HAZARD: The land in the flood plain within a community subject to a one percent (1%) or greater chance of flooding in any given year. Designation on maps always includes the letters A or V.
BASE FLOOD: The flood having a one percent (1%) chance of being equalled or exceeded in any given year. Also referred to as the "100 year flood". Designation on maps always includes the letters A or V.
DEVELOPMENT: Any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations located within the area of special flood hazard.
FLOOD INSURANCE RATE MAP (FIRM): The official map on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.
FLOOD INSURANCE STUDY: The official report in which the Federal Insurance Administration has provided flood profiles, as well as the flood boundary-floodway map and the water surface elevation of the base flood.
FLOOD OR FLOODING: A general and temporary condition of partial or complete inundation of normally dry land areas from: a) the overflow of inland waters, and/or b) the unusual and rapid accumulation or runoff of surface waters from any source.
FLOODWAY: The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot (1').
LOWEST FLOOR: The lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage, in an area other than a basement area, is not considered a building's lowest floor; provided that such enclosure is not built so as to render the structure in violation of the applicable nonelevation design requirements of subsection 5-2-5-2A of this Chapter.
MANUFACTURED HOME: A structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. For flood plain management purposes, the term "manufactured home" also includes park trailers, travel trailers and other similar vehicles placed on a site for greater than one hundred eighty (180) consecutive days. For insurance purposes, the term "manufactured home" does not include park trailers, travel trailers and other similar vehicles.
MANUFACTURED HOME PARK OR SUBDIVISION: A parcel (or contiguous parcels) of land divided into two (2) or more manufactured home lots for rent or sale.
NEW CONSTRUCTION: Structures for which the "start of construction" commenced on or after the effective date of this Chapter.
PLANNING DIRECTOR: The Malheur County Planning Director.
START OF CONSTRUCTION: Includes substantial improvement and means the date the building permit was issued; provided the actual start of construction, repair, reconstruction, placement or other improvement was within one hundred eighty (180) days of the permit date.

The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundation or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure.

STRUCTURE: A walled and roofed building including a gas or liquid storage tank, that is principally above ground.

SUBSTANTIAL IMPROVEMENT: A. Any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds fifty percent (50%) of the market value of the structure either: a) before the improvement or repair is started, or b) if the structure has been damaged and is being restored, before the damage occurred.

B. For the purposes of this definition, "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.

C. The term does not, however, include either:

1. Any project for improvement of a structure to comply with existing State or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions; or

2. Any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

VARIANCE: A grant of relief from the requirements of this Chapter which permits construction in a manner that would otherwise be prohibited by this Chapter. (Ord. 54, 3-24-1987)

5-2-3: GENERAL PROVISIONS:

A. Lands To Which Provisions Applicable: This Chapter shall apply to all areas of special flood hazards within the jurisdiction of Malheur County excluding areas within incorporated city limits.

B. Basis For Establishing Areas Of Special Flood Hazard: The areas of special flood hazard identified by the Federal Insurance Administration in a scientific and engineering report entitled "The Flood Insurance Study of Malheur County", dated June, 1985, with accompanying flood insurance rate maps and flood boundary-floodway maps is hereby adopted by reference and declared to be a part of this Chapter. That flood insurance study described above is on file in the Malheur County Planning Office.

C. Penalties For Noncompliance: No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this Chapter and other applicable regulations. Violation of the provisions of this Chapter by failure to comply with any of its requirements (including violations of conditions and safeguards established in connection with conditions) shall constitute a misdemeanor. Any person who violates this Chapter or fails to comply with any of its requirements shall be subject to the fines, penalties and remedies provided for in the Malheur County Zoning Ordinance13. Nothing herein contained shall prevent the Malheur County Court from taking such other lawful action as is necessary to prevent or remedy any violation14.

D. Abrogation And Greater Restrictions: This Chapter is not intended to repeal, abrogate, or impair any existing easements, covenants or deed restrictions. However, where this Chapter and

other ordinances, easements, covenants or deed restrictions conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

E. Interpretation: In the interpretation and application of this Chapter, all provisions shall be:

1. Considered as minimum requirements;

2. Liberally construed in favor of the governing body; and

3. Deemed neither to limit nor repeal any other powers granted under State statutes.

F. Warning And Disclaimer Of Liability: The degree of flood protection required by this Chapter is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This Chapter does not imply that land outside the area of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This Chapter shall not create liability on the part of Malheur County, any officer or employee thereof or the Federal Insurance Administration, for any flood damages that result from reliance on this Chapter or any administrative decision lawfully made thereunder. (Ord. 54, 3-24-1987)

5-2-4: ADMINISTRATION:

5-2-4-1: ESTABLISHMENT OF DEVELOPMENT PERMIT:

Development permit shall be obtained before construction or development begins within any area of special flood hazard established in subsection 5-2-3B of this Chapter. The permit shall be for all structures including manufactured homes as set forth in the definitions and all development including fill and other activities; also as set forth in the definitions. Application for a development permit shall be made on forms furnished by the Malheur County Planning Director and may include, but not be limited to: plans in duplicate drawn to scale showing the nature, location, dimensions and elevations of the area in question; existing or proposed structures, fill, location of the foregoing.

Specifically, the following information is required:

A. Elevation in relation to mean sea level, of the lowest floor (including basement) of all structures.

B. Elevation in relation to mean sea level to which any structure has been floodproofed.

C. Certification by a registered professional engineer or architect that the floodproofing methods for any nonresidential structure meet the floodproofing criteria in subsection 5-2-5-2B of this Chapter.

D. Description of the extent to which any watercourse will be altered or relocated as a result of proposed development. (Ord. 54, 3-24-1987)

5-2-4-2: LOCAL ADMINISTRATOR:

A. Designation: The Malheur County Planning Director is hereby appointed to administer and implement this Chapter by granting or denying development permit applications in accordance with its provisions.

B. Duties And Responsibilities: Duties of the Planning Director shall include, but not be limited to:

1. Permit Review:

a. Review all development permits to determine that the permit requirements of this Chapter have been satisfied.

b. Review all development permits to determine that all necessary permits have been obtained from those Federal, State or local governmental agencies from which prior approval is required.

c. Review all development permits to determine if the proposed development is located in the floodway. If located in the floodway, assure that the encroachment provisions of subsection 5-2-5-3A of this Chapter are met.
2. Use Of Other Base Flood Data: When base flood elevation data has not been provided in accordance with subsection 5-2-3B of this Chapter, the Planning Director shall obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State or other source, in order to administer Sections 5-2-5-2A, 5-2-5-2B and 5-2-5-3 of this Chapter.
3. Information To Be Obtained And Maintained:
a. Where base flood elevation data is provided through the flood insurance study or required as in subsection 5-2-4-2B2, obtain and record the actual elevation (in relation to mean sea level) of the lowest habitable floor (including basement) of all new or substantially improved structures, and whether or not the structure contains a basement.
b. For all new substantially improved floodproofed structures:
(1) Verify and record the actual elevation (in relation to mean sea level); and
(2) Maintain the floodproofing certifications required in subsection 5-2-4-1C of this Chapter.
c. Maintain for public inspection all records pertaining to the provisions of this Chapter.
4. Alteration Of Watercourses:
a. Notify adjacent communities and the Division of State Lands prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Insurance Administration.
b. Require that maintenance is provided within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished.
5. Interpretation Of FIRM Boundaries: Make interpretations where needed, as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions). The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in Section 5-2-4-3 of this Chapter. (Ord. 54, 3-24-1987)
5-2-4-3: VARIANCE REQUESTS AND APPEALS:
A. Variance Procedure:
1. The Appeal Board, as established by Malheur County, shall hear and decide appeals and requests for variances from the requirements of this Chapter. This Board shall be the Malheur County Court until such time as the Court forms or appoints a body to review and decide flood hazard variance applications.
2. The Appeal Board shall hear and decide appeals when it is alleged there is an error in any requirement, decision or determination made by the Planning Director in the enforcement or administration of this Chapter.
3. Unless the Appeal Board makes a land use decision, as defined in ORS 197.015, those aggrieved by the decision of the Appeal Board, or any party to the proceeding, may request review of that decision pursuant to ORS 34.020.
4. In passing upon such applications, the Appeal Board shall consider all technical evaluations, all relevant factors, standards specified in other sections of this Chapter and:
a. The danger that materials may be swept onto other lands to the injury of others;
b. The danger of life and property due to flooding or erosion damage;
c. The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;
d. The importance of the services provided by the proposed facility to the community;

e. The necessity to the facility of a waterfront location, where applicable;
f. The availability of alternative locations for the proposed use which are not subject to flooding or erosion damage;
g. The compatibility of the proposed use with existing and anticipated development;
h. The relationship of the proposed use to the Comprehensive Plan, and flood plain management program of that area;
i. The safety of access to the property in times of flood for ordinary and emergency vehicles;
j. The expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site; and
k. The costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, and streets and bridges.
5. Upon consideration of the factors of subsection 5-2-4-3A4 and the purposes of this Chapter, the Appeal Board may attach such conditions to the granting of further variances as it deems necessary to the purposes of this Chapter.
6. The Planning Director shall maintain the records of all appeal actions, including technical information, and report any variance to the Federal Insurance Administration upon request.
B. Conditions For Variances:
1. Generally, variances may be issued for new construction and substantial improvements to be erected on a lot of one-half (1/2) acre or less in size contiguous to and surrounded by lots with existing structures constructed below the one foot (1') above base flood level, providing items (a - k) in subsection 5-2-4-3A4 have been fully considered. As the lot size increases beyond the one-half (1/2) acre, the technical justification required for issuing the variance increases.
2. Variances may be issued for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places, without regard to the procedures set forth in the remainder of this Section.
3. Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.
4. Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
5. Variances shall only be issued upon:
a. A showing of good and sufficient cause;
b. A determination that failure to grant the variance would result in exceptional hardship to the applicant; and
c. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public as identified in subsection 5-2-4-3A4, or conflict with existing local laws or ordinances.
6. Variances as interpreted in the national flood insurance program are based on the general zoning law principle that they pertain to a physical piece of property; they are not personal in nature and do not pertain to the structure, its inhabitants, economic or financial circumstances. They primarily address small lots in densely populated residential neighborhoods. As such, variances from the flood elevations should be quite rare.
7. Variances may be issued for nonresidential buildings in very limited circumstances to allow a lesser degree of floodproofing than watertight or dry-floodproofing, where it can be determined that such action will have low damage potential, complies with all other variance criteria except

subsection 5-2-4-3B1, and otherwise complies with subsections 5-2-5-1A and B of the general standards.
8. Any applicant to whom a variance is granted shall be given written notice that the structure will be permitted to be built with a lowest floor elevation below one foot (1') above the base flood elevation and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation. (Ord. 54, 3-24-1987)

5-2-5: PROVISIONS FOR FLOOD HAZARD REDUCTION:

5-2-5-1: GENERAL STANDARDS:

In all areas of special flood hazards, the following standards are required:

A. Anchoring:

1. All new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure.
2. All manufactured homes must likewise be anchored to prevent flotation, collapse or lateral movement, and shall be installed using methods and practices that minimize flood damage. Anchoring methods may include, but are not limited to, use of over-the-top or frame ties to ground anchors (reference FEMA's "Manufactured Home Installation in Flood Hazard Areas" guidebook for additional techniques).

B. Construction Materials And Methods:

1. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.
2. All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.
3. Electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

C. Utilities:

1. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.
2. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.
3. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

D. Residential, Commercial And Industrial Development Proposals:

1. All development proposals shall be consistent with the need to minimize flood damage.
2. All development proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage.
3. All development proposals shall have adequate drainage provided to reduce exposure to flood damage.
4. Where base flood elevation data has not been provided or is not available from another authoritative source, it shall be determined by the developer and be monumented within development proposals and other proposed property improvements which contain five (5) acres or more of improved land area within the flood plain.

E. Review Of Building Permits: Where elevation data is not available either through the flood insurance study or from another authoritative source (subsection 5-2-4-2B2 of this Chapter), applications for building permits shall be reviewed to assure that proposed construction will be reasonably safe from flooding. The test of reasonableness is a local judgment and

includes use of historical data, high water marks, photographs of past flooding, etc., where available. Failure to elevate at least two feet (2') above grade in these zones may result in higher insurance rates. (Ord. 54, 3-24-1987)

5-2-5-2: SPECIFIC STANDARDS:

In all areas of special flood hazards where base flood elevation data have been provided as set forth in subsection 5-2-3B or in subsection 5-2-4-2B2 of this Chapter, the following standards are required:

A. Residential Construction:

1. New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated to or above one foot (1') above base flood elevation.

2. Fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or must meet or exceed the following minimum criteria:

a. A minimum of two (2) openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.

b. The bottom of all openings shall be no higher than one foot (1') above grade.

c. Openings may be equipped with screens, louvers or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

B. Nonresidential Construction: New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor, including basement, elevated to the level of one foot (1') above the base flood elevation; or, together with attendant utility and sanitary facilities, shall:

1. Be floodproofed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water.

2. Have structural components capable of resisting hydrostatic and hydro-dynamic loads and effects of buoyancy.

3. Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based on their development and/or review of the structural design, specifications and plans. Such certifications shall be provided to the official as set forth in subsection 5-2-4-2B2 of this Chapter.

4. Nonresidential structures that are elevated, not floodproofed, must meet the same standards for space below the lowest floor as described in subsection A2 of this Section.

5. Applicants floodproofing nonresidential buildings shall be notified that flood insurance premiums will be based on rates that are one foot (1') below the floodproofed level (e.g. a building constructed to the base flood level will be rated as 1 foot below that level).

C. Manufactured Homes: All manufactured homes to be placed or substantially improved within Zones A1-30, AH and AE shall be elevated on a permanent foundation such that the lowest floor of the manufactured home is at or above the base flood elevation and be securely anchored to an adequately anchored foundation system in accordance with the provisions of subsection 5-2-5-1A2 of this Chapter. (Ord. 54, 3-24-1987)

5-2-5-3: FLOODWAYS:

Located within areas of special flood hazard established in subsection 5-2-3B of this Chapter are areas designed as floodways. Since the floodway is an extremely hazardous area due to the

velocity of flood waters which carry debris, potential projectiles and erosion potential, the following provisions apply:

A. Prohibit encroachments, including fill, new construction, substantial improvements and other development unless a technical evaluation demonstrates that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

B. If subsection A is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of Section 5-2-5 of this Chapter.

C. Prohibit the placement of any mobile homes, except in an existing mobile home park or existing mobile home subdivision. (Ord. 54, 3-24-1987)

5-2-5-4: ENCROACHMENTS:

In those portions of the County where base flood elevations have been provided but floodways have not, the cumulative effect of any proposed development, when combined with all other existing and anticipated development, shall not increase the water surface elevation of the base flood more than one foot (1') at any point. (Ord. 54, 3-24-1987)

CHAPTER 10A-47, FHO, FLOOD HAZARD OVERLAY ZONE

10A-47-01 PURPOSE. Provide and overly zone as a device for applying flood hazard protection measures to lands subject to flood hazard.

10A-47-05 APPLICABILITY. The areas mapped on the Official Zoning Map as FHO, Flood Hazard Overlay Zone are the areas of special flood hazard and floodways identified by the Federal Insurance Administration in a scientific and engineering report entitled "The Flood Insurance Study for the City of Ontario, Malheur County" dated March 16, 1983 with accompanying Flood Insurance Rate Maps and Flood Boundary/Floodway Maps are hereby adopted by reference and declared to be part of this Title. The Flood Insurance Study is on file at the Ontario City Hall, 444 SW 4th Street, Ontario, Oregon.

10A-47-10 DEVELOPMENT PERMIT. A development permit shall be obtained before construction begins within the FHO Zone. This permit shall be in addition to any other permits required for development in the base zone and may be included as a part of a building permit or other required permit, including those for the sitting of manufactured homes and the placing of fill. Fill requirements shall be in addition to other grading provisions of this Title.

10A-47-15 ADMINISTRATIVE RESPONSIBILITY. The City Manager shall designate an official or officials to administer and implement the special provisions of the FHO Zone by granting or denying development permit applications in accordance with the provisions of this chapter. The duties and responsibilities of the administrators shall include, but not be limited to:

1. Review all development permits to determine that the permit requirements of this provision have been satisfied.
2. Review all development permits to determine that all necessary permits have been obtained from those Federal, State, or local governmental agencies from which prior approval is required.
3. Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State or other authoritative source, in order to administer this chapter.
4. Notify adjacent communities and the Oregon Waste Resources Department prior to any alteration or relocation of a water course, and submit evidence of such notification to the Federal Insurance Administration.
5. Require that maintenance is provided within the altered or relocated portion of said water course so that the flood carrying capacity is not diminished.
6. Make interpretations where needed, as to exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions). The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided for this Title.

10A-47-20 ADMINISTRATIVE RESPONSIBILITY, SPECIAL INFORMATION. The official charged with administering this chapter shall obtain and maintain a record of the following:

1. The actual elevation in relationship to mean sea level of the lowest floor, including basement, of all new or substantially improved structures, and whether or not the structure contains a basement. This information shall be recorded on a permanent record which may be the face of the building permit.
2. For all new or substantially improved flood proofed structures:
    a. verify and record the actual elevation (in relation to mean sea level), and
    b. maintain the flood proofing certifications required in Section 10A-47-40-2, "Non-residential Construction."

10A-47-30 SPECIAL STANDARDS, FLOODABLE LAND. The following special standards shall apply to all developments including the placing of manufactured homes and fill in the FHO Zone in addition to any applicable standards of the primary zone:

1. Anchoring:
    a. All new construction or substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure.
    b. All manufactured homes likewise be anchored to prevent flotation, collapse or lateral movement, and shall be installed using methods and practices that minimize flood damage.
2. Construction Materials and Methods:
    a. All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage
    b. All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.
    c. Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.
3. Utilities:
    a. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.
    b. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.
    c. On-site waste disposal systems shall be located to avoid impairment of them or contamination from them during flooding.
4. Subdivision proposals:
    a. All subdivision proposals shall be consistent with the need to minimize flood damage.
    b. All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage.
    c. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage.

10A-47-40 FLOODPROOFING STANDARDS. The following floodproofing standards shall apply to all new or substantially improved building or manufactured homes located in the FHO Zone.

1. Residential Construction:
    a. New construction and substantial improvements of any residential structure shall have the lowest floor, including basement, elevated to or above one foot above the base flood elevation.
    b. Fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for entry and exit of flood waters. Designs for meeting this requirement must either be certified by registered professional engineers or architect or must meet or exceed the following minimum criteria:
        i. A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
        ii. The bottom of all openings shall be no higher than one foot above grade.
        iii. Openings may be equipped with screens, louvers, or other coverings or devices provided that they permit the automatic entry and exit of flood waters.
2. Nonresidential Construction. New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor, including basement, elevated to the level of the base flood elevation; or, together with attendant utility and sanitary facilities, shall:
    a. Be flood-proofed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water.
    b. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.
    c. Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based on their development and/overview of the structural design, specifications and plans. Such certifications shall be provided to the official as set forth in Section 10A-47-20.
    d. Nonresidential structures are elevated, not flood-proofed, must meet the same standards for space below the lowest floor as described in Subsection 10A-47-30-1a.
    e. Applicants floodproofing nonresidential buildings shall be notified that flood insurance premiums will be based on rates that are one foot below the flood-proofed level (e.g. a building constructed to the base flood level will be rated as one foot below that level).
3. Manufactured Homes. All manufactured homes to be placed or substantially improved within Zones A1-A30, AH, and AE shall be elevated on a permanent foundation such that the lowest floor of the manufactured home is at or above one foot above the base flood elevation and be securely anchored to an adequately anchored foundation system in accordance with the provisions of Subsection 10A-47-30-1b.

10A-47-50 FLOODWAYS ESTABLISHED, SPECIAL STANDARDS. Located within areas of special flood hazard established in section 10A-47-05, applicability are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

1. Prohibit encroachments, including fill, new construction, substantial improvements, and other development unless certification by a registered professional engineer or architect is provided demonstrating that encroachments shall not result in any increase in flood levels during occurrence of the base flood discharge.
2. If the above paragraph is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of Section 10A-47-30, Special Standards, Floodable Lands.
3. Prohibit the placement of any mobile home, except in an existing mobile home park or existing mobile home subdivision.

10A-47-60 VARIANCES, SPECIAL STANDARDS. Variances to the special standards of the FHO Zone shall be processed using the Variance procedures and standards of this Title, except that such variances shall be consistent with the standards of Sections 60.3(d) and 60.6(a) of the rules and regulations of the National Flood Insurance Program as found in 44CFR50, etc.

10A-47-70 WARNING AND DISCLAIMER OF LIABILITY. The degree of flood protection required by this chapter is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man made or natural causes. This chapter does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This chapter shall not create liability on the part of the City of Ontario, any officer or employee thereof, or the Federal Insurance Administration, for any flood damages that result from reliance on this chapter or any administrative decision lawfully made hereunder.

Landslide
Hazard Annex

This annex covers the landslide hazard and includes detailed information on the hazard that is specific to the County. The annex includes some actual documents when digital copies were available; other resources are on file with the Malheur County Planning Department in its Natural Hazards Mitigation Plan File and can be accessed upon request, as the county does not have the ability to scan these documents. Annex materials may include existing ordinances; supplemental information for Section 3 hazard vulnerabilities, and potential losses when local data is available.

Hazard Resources

- *State Natural Hazard Risk Assessment*
  - The state risk assessment chapter on landslide events provides a useful overview of landslide risks in Oregon and documents historic landslide activity.
- *Technical Resource Guide*
  - This guide lists basic mitigation strategies for landslides, including examples from other communities in Oregon. See Appendix D for information on how to access this document.
- *Maps*
  - A map of the county's landslide susceptibility is included in the 2007 DOGAMI HAZUS report, which is available in the Earthquake Hazard Annex.

Hazard Vulnerability

Most hazard vulnerability information is located in Section 3: Landslide Hazard Summary. No additional vulnerability information is available in this annex.

Potential Losses

Currently the County does not have sufficient data to calculate potential landslide losses. This is due both to the unpredictability of landslide severity/location and limited local records in terms of quantifying losses.

Severe Weather
Hazard Annex

This annex covers the severe weather hazard and includes detailed information on the hazard that is specific to the County. The annex includes hazard resources, such as existing ordinances; hazard vulnerability summary, including a summary of potential impacts; and potential losses when local data is available.

Hazard Resources

- *Newspaper Articles*
  - The Argus Observer has reported on several damaging windstorms in Malheur County. Summary information, including damages and costs, is available below.
- *State Natural Hazard Risk Assessment*
  - The state risk assessment chapters on windstorms and winter storms provide a useful overview of weather risks in Oregon and documents historic storm activity. They also recommend a multi-hazard approach.

Hazard Vulnerability

Most hazard vulnerability information is located in Section 3: Severe Weather Hazard Summary. The information here is intended as a supplement to that section.

The Oregon State Natural Hazard Mitigation Plan contains a table with probability information for the Southeastern Oregon (Region 8, Harney and Malheur Counties) as follows:

Location	**25-yr event (4% annual prob.)**	**60-yr event (2% annual prob.)**	**100-yr event (1% annual prob.)**
Region 8	55 mph	65 mph	75 mph

Source: The Oregon State Natural Hazard Mitigation Plan, Windstorms Chapter.

Potential Losses

Currently the County does not have sufficient data to calculate potential severe weather losses. This is due both to the unpredictability of weather events' severity/location and limited local records on quantified costs. What records are available for the cost of severe weather events are available in Section 3: Severe Weather Hazard Risk Summary.

Volcanic Eruption
Hazard Annex

This annex covers the volcanic hazard and includes detailed information on the hazard that is specific to the County. The annex includes some actual documents when digital copies were available; other resources are on file with the Malheur County Planning Department in its Multi-Jurisdictional Natural Hazards Mitigation Plan File and can be accessed upon request, as the county does not have the ability to scan these documents. Annex materials may include existing ordinances; supplemental information for Section 3 hazard vulnerabilities, and potential losses when local data is available.

Hazard Resources

- *USGS Open File Reports: Newberry Crater, Mt. St. Helens, and Three Sisters Region*
  - These USGS Open File Reports describe the geographic extent of impacts from volcanic activity originating in those three volcanic sites. According to these reports, Malheur County is only at risk for tephra (ash) fall from these sites, should they become active.
- *State Natural Hazard Risk Assessment*
  - The state risk assessment chapter on volcanic events provides a useful overview of volcanic risks in Oregon and documents historic volcanic activity. It also recommends a multi-hazard approach, given the uncertainty of most of Oregon being impacted by volcanic hazards in the foreseeable future.
- *Maps*
  - USGS Open File reports on Newberry Crater, Mt. St. Helens, and Three Sisters Region include tephra fall maps. These are attached.

Hazard Vulnerability

Most hazard vulnerability information is located in Section 3: Volcanic Hazard Summary. The information here is intended as a supplement to that section.

All of the Pacific Northwest is vulnerable to impacts from volcanic activity. Like the rest of Eastern Oregon, Malheur County has some risk of being impacted by volcanic activity in the Cascade Range. The principal hazards are linked to Newberry Crater in Deschutes County and Mount St. Helens in Washington State. Because of its geographic distance from these volcanic sites, Malheur County is not at risk for proximal hazards such as lava flows. However, it is at risk for distal hazards, primarily ash fall (tephra). The location, size, and shape of the area affected by tephra fall is determined by both the vigor and duration of the eruption and the wind direction at the time of eruption, making prediction of the area to be affected impossible more than a few hours in advance.

Potential Losses

Currently the County does not have sufficient data to calculate potential losses from volcanic events. This is due both to the unpredictability of future volcanic events and the lack of past events from which to draw projections.

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT
95-497

123°

122°

46° 30'

46°

Riffe Lake

Kid Valley

Toutle River

North Fork Toutle River

Toutle

Coldwater Lake

Spirit Lake

Castle Lake

Silver Lake

Castle Rock

South Fork Toutle River

Cowlitz River

Longview

Kelso

MOUNT ST. HELENS

Swift Reservoir

Kalama River

Columbia River

Yale Lake

Lake Merwin

EXPLANATION

Flowage-Hazard Zone 1: Zone 1 represents the area vulnerable to passage of high-concentration (high-density) flows, including pyroclastic flows, lava flows, and proximal parts of lahars.

Flowage-Hazard Zone 2: Zone 2 represents the area that could be overrun by pyroclastic surges, which are low-concentration (low-density) flows.

Flowage-Hazard Zone 3: Zone 3 includes the intermediate and lower reaches of valleys that could be inundated by lahars.

Town boundaries: Town boundaries shown are not official corporate boundaries but are drawn by the authors around areas of de-facto urban-suburban areas as indicated by the highest concentrations of roads depicted on USGS 1:100,000 quadrangles of late-1980's vintage.

Water body

Stream

SCALE 1: 100 000

5 0 5 MILES

5 0 5 10 KILOMETERS

VOLCANIC-HAZARD ZONATION FOR MOUNT ST. HELENS, WASHINGTON

by
Edward W. Wolfe and Thomas C. Pierson

1995

U. S. Department of the Interior
U. S. Geological Survey

Volcanic-Hazard Zonation for Mount St. Helens, Washington, 1995

by

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U.S. Geological Survey
Cascades Volcano Observatory
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Vancouver, WA 98661

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1995

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This report is also available in digital form through the World Wide Web.
URL: http://vulcan.wr.usgs.gov/Volcanoes/MSH/Hazards/

Cover photo: May 18, 1980 eruption of Mount St. Helens. *Austin Post, U.S. Geological Survey*

Volcanic-Hazard Zonation for Mount St. Helens, Washington, 1995

by

Edward W. Wolfe and Thomas C. Pierson

INTRODUCTION

Mount St. Helens remains a potentially active and dangerous volcano, even though it is now (1995) quiescent. In the last 515 years, it is known to have produced 4 major explosive eruptions (each with at least 1 km^3 of eruption deposits, fig. 1) and dozens of lesser eruptions. Two of the major eruptions were separated by only 2 years. One of those, in 1480 A.D., was about 5 times larger than the May 18, 1980 eruption, and even larger eruptions are known to have occurred during Mount St. Helens' brief but very active 50,000-yr lifetime. Following the most recent major eruption, on May 18, 1980, there were 5 smaller explosive eruptions over a period of 5 months. Thereafter, a series of 16 dome-building eruptions through October 1986 constructed the new, 270-m- (880-ft-) high, lava dome in the crater formed by the May 18, 1980 eruption.

Volcanoes commonly repeat their past behavior. Thus, it is likely that the types, frequencies, and magnitudes of past activity will be repeated in the future. Among the possibilities for renewed eruptive activity at Mount St. Helens are resumption of dome growth, eruption of basaltic or andesitic tephra and lava flows, or explosive eruptions of dacitic tephra and pyroclastic flows in volumes that could be as large as or even larger than the volume erupted in 1980. Lahars (sediment-rich floods in volcanic terrain) generated by snowmelt are likely to accompany any eruptive activity. Lahars may also be generated without an eruption by intense storm runoff over erodible sediment, landslides, or by failure of the Castle Lake impoundment as a consequence of an earthquake or heavy rains. Neither a large debris avalanche nor a major lateral blast like those of May 18, 1980 is likely now that a deep, open crater has formed.

Sufficient time has elapsed since the last dome-building eruption in October 1986 for magma in the conduit beneath the dome to crystallize and form a plug. The pressure needed to overcome this blockage may exceed that of any eruption since May 18, 1980; therefore, the next eruption may be initially explosive owing simply to blockage of the conduit. Several scenarios for renewed eruptive activity notwithstanding, a conservative approach to hazards assessment requires us to assume, until there is specific evidence to the contrary, that the next eruption will be explosive and as large as or larger than the eruption of May 18, 1980.

Basalt—Dark, low-silica (less than 53 percent SiO_2) volcanic rock that is relatively fluid when molten; eruptions of basalt are generally nonexplosive and tend to produce relatively long thin lava flows like those common in Hawaii.

Dacite—Light-colored, fairly silica-rich (63 to 68 percent SiO_2) volcanic rock that is viscous when molten; eruptions are commonly explosive (e.g., Mount St. Helens' eruption of May 18, 1980) and may produce voluminous tephra, pyroclastic flows, and lava domes.

Andesite—Volcanic rock intermediate in color, composition, and eruptive character between basalt and dacite.

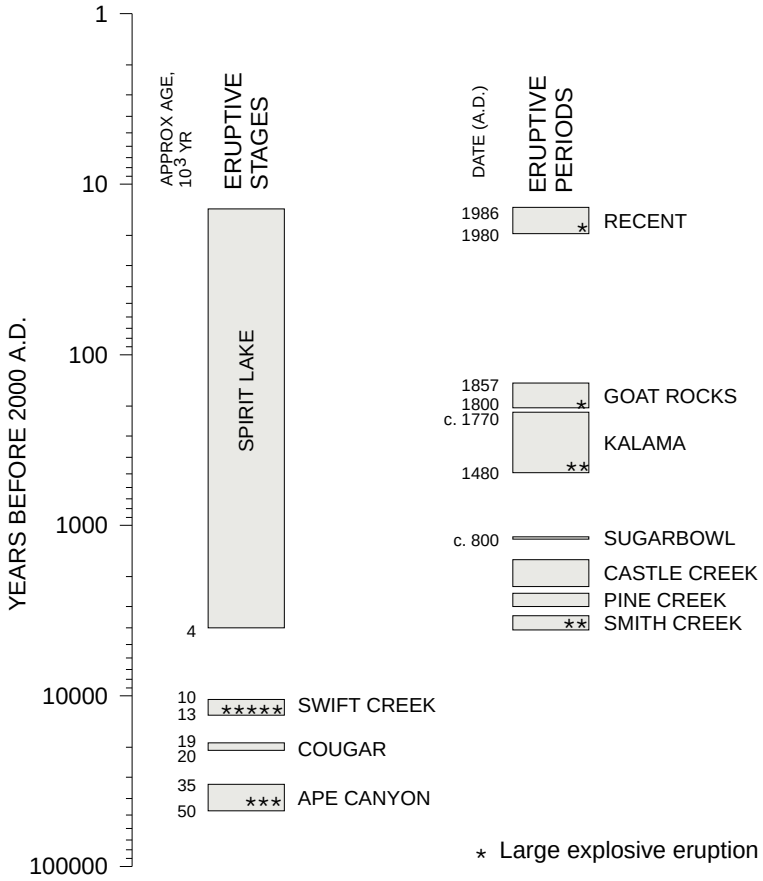

Figure 1. Eruptive history of Mount St. Helens shown on a logarithmic time scale (expands with decreasing age). Eruptive periods (at right) are subdivisions of the Spirit Lake eruptive stage. Large explosive eruptions are those that deposited at least 25 cm of tephra at distances of 8 to 10 km downwind of Mount St. Helens. Modified from Pallister and others (1992). Additional data from Mullineaux (in press) and Yamaguchi and Hoblitt (in press).

Future eruptions are certain. Although we do not know when the next one will occur, it should be planned for. This report delineates areas that are likely to be at risk (hazard zones) during another major eruption. It updates previous assessments, taking into account both recent experience at erupting volcanoes and topographic, hydrologic, and geologic changes initiated at Mount St. Helens by the 1980 eruptions. These changes include (1) beheading of the summit, forming a truncated cone with a deep crater open to the north, (2) a large and growing volume of snow and ice in the crater, (3) the existence of a large, potentially unstable, debris-dammed lake (Castle Lake) in a tributary to the North Fork Toutle River, and (4) large volumes of erodible sediment in most of the river valleys draining the volcano.

HAZARDOUS GEOLOGIC PROCESSES

This section describes the major hazardous geologic processes that are likely to occur in the future at Mount St. Helens. Any or all may occur as consequences of future eruptions. However, one potentially lethal process (lahars) can also be triggered by noneruptive mechanisms and thus may occur with little warning. We do not address other noneruptive processes such as rockfalls, avalanches, and small debris flows that commonly produce local hazards in areas of steep terrain, both volcanic and nonvolcanic.

Tephra Fall

During explosive eruptions, a mixture of hot volcanic gas and tephra, which includes volcanic ash (sand-sized or finer particles of volcanic rock) and larger fragments, is ejected rapidly into the air from volcanic vents . This plume of rock fragments and expanding gas not only jets upward but is commonly less dense than the air and thus rises into the atmosphere until no longer buoyant. (The May 18, 1980 tephra plume rose about 25 km [15 mi] in less than 30 min). As the energy required to keep them in suspension diminishes, the particles begin to fall out of the plume under the influence of gravity. Large fragments fall back to earth close to the vent. Finer (ash-size) particles drift downwind as a large

cloud, eventually falling to the ground to form a blanket-like ash deposit that is generally thinner and finer-grained with increasing distance away from the vent. Large eruptions can produce tephra thicknesses of many meters (yards) near the vent, with tephra fragments ranging up to tens of centimeters (10–20 inches) in diameter, whereas tephra deposits several hundred kilometers (several hundred miles) downwind typically consist of a trace to a few centimeters (few inches) of fine powder.

The major hazards of tephra fall are derived from (1) impact of falling fragments, (2) suspension of abrasive fine particles in the air and water, and (3) burial of structures, transportation routes, and vegetation. As learned in the 1980 eruptions of Mount St. Helens, tephra fall can cause severe social disruption over a vast area.

Fragments larger than a few centimeters (1–2 in), that have sufficient mass to cause severe injury or damage through impact, generally fall within about 10 km (6 mi) of the vent. Thus, damaging or lethal impact from falling tephra is likely only in the immediate vicinity of Mount St. Helens.

Ash suspended in the air from a large eruption can be a major source of aggravation and hazard even hundreds of kilometers (a few hundred miles) downwind from its source, both during its initial accumulation and later as fine dry ash is remobilized by wind or passing vehicles. Airborne ash (a) causes eye and respiratory irritation for some people and can cause severe air-quality problems at critical facilities such as hospitals; (b) can cause severe visibility reduction, even complete darkness during daylight hours, which can make driving particularly hazardous; (c) can damage unprotected machinery, especially internal-combustion engines; (d) can cause short circuits in electric-power transmission lines; and (e) can endanger aircraft flying through ash clouds, especially jet aircraft, which can completely lose engine power. Suspension of ash in water can lead to damage at hydroelectric facilities, irrigation pumping stations, sewage-treatment facilities, and stormwater systems.

Burial by tephra can collapse roofs of buildings and other structures, break power and telephone lines, and damage or kill vegetation. Wet tephra is 2 to 3 times heavier than dry uncompacted tephra and adheres better to sloping surfaces. Ten centimeters (4 inches) of wet tephra impose a load in the range of 100 to 125 kg/m2 (approximately 20 to 25 lb/ft2), sufficient to cause some roofs to collapse.

Pyroclastic Flows

Pyroclastic flows are avalanches of hot (300 – 800°C [570 – 1470°F]), dry, volcanic rock fragments and gases that descend a volcano's flanks at speeds ranging from 10 to more than 100 meters per second (20 to more than 200 miles per hour). Owing to their mass, high temperature, high speed, and great mobility, pyroclastic flows are destructive and pose lethal hazard from incineration, asphyxiation, burial, and impact. Because of their high speed, pyroclastic flows are difficult or impossible to escape. Evacuation must take place before such events occur.

Just as mixtures of hot volcanic gas and tephra rise into the atmosphere when the mixture is less dense than the surrounding air, mixtures of hot volcanic rock fragments and gas that are more dense than the surrounding atmosphere flow down the volcano flanks as pyroclastic flows. Such flows can originate from high vertical eruption columns, from low fountains of erupting pyroclastic material that appear to "boil over" from the vent, and from gravitational or explosive disruption of hot lava domes. The first two mechanisms operated during the explosive eruptions of 1980 at Mount St. Helens and are likely again should eruptive activity be resumed. The third mechanism, disruption of a hot lava dome, has operated at numerous times in the past at Mount St. Helens but would be significant there only if new dome growth should become established.

Driven by gravity, pyroclastic flows seek topographically low areas and, beyond the steep flanks of the volcano, tend to be channeled into valleys. Pyroclastic flows from the May 18, 1980 eruption ran out only about 8 km (5 mi) from the vent. As they impinged on Johnston Ridge, they were deflected westward downvalley and eastward to Spirit Lake. During the past 4,000 years, during which time the volcano's modern edifice formed, numerous pyroclastic flows are known to have traveled at least as far as 10–15 km (6–9 mi), and at

least one older flow is known to have traveled as much as 20 km (12 mi). Although the present crater geometry favors distribution of pyroclastic flows into the North Fork Toutle River valley, all flanks of the volcano are subject to pyroclastic-flow hazard during a large eruption.

Pyroclastic Surges

Pyroclastic surges are turbulent, relatively low-density (but still denser than air), mixtures of gas and rock that flow above the ground surface at high velocities similar to those of pyroclastic flows. Hot pyroclastic surges are generated similarly to pyroclastic flows as well as by lateral blasts and as mobile, turbulent ash clouds winnowed from pyroclastic flows. Hazards resulting from pyroclastic surges include incineration, destruction by high-velocity ash-laden winds, impact by rock fragments, burial by surge deposits, exposure to noxious gases, and asphyxiation. Like pyroclastic flows, pyroclastic surges are too fast-moving to escape; evacuation must take place before they occur.

Because they are less dense, pyroclastic surges are less constrained by topography than are pyroclastic flows. Surges may climb or surmount valley walls, affecting areas well beyond the limits of pyroclastic flows. For example, pyroclastic surges surmounted Johnston Ridge and entered the drainage of South Coldwater Creek on May 18, 1980, even though the related pyroclastic flows were deflected by the steep north-facing escarpment of the ridge.

The presence of water-saturated sediment beneath the crater floor raises the potential for steam-driven explosions that could be generated by intrusion of magma into the water-bearing material. Such explosions may produce relatively low-temperature pyroclastic surges that could flow at high speeds through the crater breach and down the volcano's north flank toward Spirit Lake and Johnston Ridge. Steam-driven explosions are likely during early stages of the next eruption.

Explosive Ejection of Ballistic Projectiles

Volcanic explosions can impel rock fragments on ballistic trajectories that may be counter or oblique to the wind direction. Such events may occur either during or independently from an ongoing magmatic eruption and are likely to occur without warning. A blast related to emplacement of the Sugarbowl dome on the north flank of Mount St. Helens about 1,200 years ago propelled ballistic fragments as large as 5 cm (2 in) as far as 10 km (6 mi) from the vent. More recently, a series of relatively small steam-driven explosions in 1989–91 threw hundreds of blocks, some as large as a meter (yard), for distances of as much as 1 km (0.6 mi) from the dome within the Mount St. Helens crater. Similar explosions could occur without warning in the future but become progressively less likely with continued cooling of the dome's hot interior and the subsurface conduit that supplied the magma for dome growth.

Lateral Blasts

A lateral blast is a volcanic explosion that has a significant low-angle component and is principally directed toward a sector of no more than 180°. Lateral blasts may generate complex pyroclastic flows and surges and launch ballistic projectiles. Previous lateral blasts are known in two contexts at Mount St. Helens: (1) blasts generated by abrupt landslide-induced decompression of a shallow magma body and the hydrothermal system surrounding it within a volcano; (2) explosions originating from sudden release of gases at growing lava domes.

A massive landslide abruptly removed the volcano's summit on May 18, 1980, and the resulting decompression of shallow magma and the hydrothermal system that enveloped it initiated the well-known, highly destructive lateral blast. The current shape of the volcano—with its large crater and much lower summit makes a similar landslide and massive laterally directed blast unlikely when eruptive activity next resumes.

However, smaller lateral blasts could ensue if dome growth recurs. Explosions related to emplacement of the Sugarbowl dome about 1,200 years ago generated pyroclastic flows that extended several kilometers (miles) and impelled rock fragments at least 10 km (6 mi) from the vent. Destructive effects of a lateral blast that might occur from a new dome growing within the crater would

be directed northward. Addition of a 50 percent safety factor to the 10-km (6-mi) range identified for ballistic fragments from the Sugarbowl blasts suggests that hazard from rock projectiles might extend 15 km (9 mi) northward from the crater in laterally directed explosions from a growing dome. A comparable laterally directed explosion could result from abrupt failure of the plug blocking the 1980–86 conduit under elevated pressure related to renewed magmatic activity.

Lava Flows

Numerous elongate lava flows have issued from Mount St. Helens. Most have affected only areas within 10 km (6 mi) of the summit, but two basalt flows that issued about 1,700 years ago extended 16–17 km (c. 10 mi) from the volcano's summit; one of them, which flowed south to the Lewis River valley east of Cougar, contains the Ape Cave lava tube. Andesite lava flows, which were erupted repeatedly during the 16th century and once again at the beginning of the 19th century, were less fluid than the basalt and extended only as far as 6 km (4 mi) from the volcano's summit.

Lava flows are controlled by the topography; they flow downhill, becoming channeled into river valleys if they extend far enough. Thus, a lava flow affects only terrain that is downslope from its vent, which could be either in the crater or anywhere on the volcano's flanks. A lava flow from a vent in the present crater would be directed down the north flank of Mount St. Helens and possibly into the upper part of the North Fork Toutle River valley. Lava flows are destructive but generally not life-threatening because they normally advance so slowly that people can walk or run away from them.

Extremely viscous dacitic lava does not flow easily; it tends to form steep-sided lava domes over vents or very thick, stubby lava flows extending away from vents. On steep slopes like those of a volcano's upper flanks, the steep margins of such domes or stubby lava flows may collapse, spawning avalanches of hot volcanic debris that generate pyroclastic flows and surges. Such events have occurred repeatedly in the past at Mount St. Helens and would be expected again if a dome grows on the upper flanks or fills the crater.

Lahars

Lahars are rapidly flowing mixtures of water and rock debris (at sediment concentrations higher than for normal floods or stream flow) that originate from volcanoes. They can range from dense, viscous slurries resembling wet concrete and termed "debris flows" or "mudflows" (containing about two thirds sediment and one third water by volume) to turbulent muddy floods that carry relatively little sediment. Lahars can begin as sudden releases of large volumes of water or as large landslides of saturated soil and rock debris. Potential sources of large volumes of water include runoff from extremely heavy rainfall, rapid melting of snow and ice, and outbreaks of water from lakes. All of these mechanisms have produced lahars at Mount St. Helens in the past.

Lahars are gravity-controlled flows that are channeled into valleys as they move downhill, and they can flow about twice as fast as water in channels of similar depth and slope. Lahars triggered at Mount St. Helens in 1980 were 3 to 15 m (10 to 50 ft) deep and traveled at speeds of 20 to 40 m/s (45 to 90 mph) on the volcano's steep flanks; in valleys more than about 10 km (6 miles) from the volcano, they flowed typically at 10 to 20 m/s (22 to 45 mph). In addition, lahars can get bigger as they move downstream by incorporating additional sediment and water en route (called bulking), commonly increasing in volume by a factor of 3 to 5. As lahars get farther from a volcano, they slow down and spread out in the wider, flatter river valleys, often burying roads, bridges, and buildings with their deposits. Past lahars at Mount St. Helens have traveled from 50 to 100 km (30 to 60 miles), often reaching the Columbia River via the Toutle, Kalama or Lewis Rivers.

Lahars threaten lives and property, both on the flanks of volcanoes and far downstream in the valleys that drain volcanoes. Lahars are a greater threat to life and property in communities of the Cowlitz and lower Toutle River drainages than any other volcanic phenomenon. Damage is done by impact from large boulders or logs carried in the flows, by high drag and buoyancy forces imposed by the dense fluid, by abrasion, and by burial. Lahars commonly destroy mature forests and any human-made structures in their paths, including bridges, dams, roads, pipelines, and buildings. They

can also bury extensive areas of agricultural land, fill stream channels (decreasing a channel's capacity to safely carry normal high runoff), and block shipping lanes in navigable river channels. In contrast to pyroclastic flows and surges, lahars have sharply defined upper limits in well-defined valleys, and in many cases people can quickly climb or drive to safety by evacuating the valley floor. Future lahars at Mount St. Helens can be expected to have travel times approximately as shown in Table 1.

HAZARD ZONATION

Tephra-fall Hazard

A large eruption of Mount St. Helens can be expected to inject tephra to altitudes of 20–30 km (12–20 mi) and to deposit tephra over an area of 100,000 km^2 (40,000 mi^2) or more. Wind direction and velocity, along with the vigor and duration of the eruption, control the location, size, and shape of the area affected by tephra fall. Wind direction and velocity vary with both time and altitude, making it impossible to predict the velocity and direction of tephra transport more than a few hours in advance. Westerly winds prevail; thus, significant tephra accumulation from a single eruption is more likely east than west of Mount St. Helens (fig. 2). The calculated probability that ten or more centimeters (four or more inches) of tephra from a large eruption will fall as far as 60 km (40 mi) directly east of Mount St. Helens is 20 percent; the probability that such an eruption would deposit ten or more centimeters (four or more inches) 60 km (40 mi) directly west of Mount St. Helens is less, between 1 and 2 percent.

Mount St. Helens has repeatedly produced voluminous tephra and has erupted much more frequently in recent geologic time than any other

Table 1. Expected travel times for lahars triggered by a large eruption of Mount St. Helens.
[Slower travel along the North Fork Toutle River reflects the greater width and lower gradient than in the steep, narrow channels on the west and south sides of the volcano. NFT = North Fork Toutle River, estimate based on computer simulation (Laenen and Orzol, 1987 [unadjusted flood peak]); SFT, P, M, K = South Fork Toutle River, Pine Creek, Muddy River, and Kalama River, estimate based on behavior of Mount St. Helens lahars on May 18, 1980. Lahars will not necessarily travel the full distance indicated by the table; Pine Creek and Muddy River lahars will terminate in Swift Reservoir.]

Distance (via river channels) from Mount St. Helens, km (mi)		Estimated travel time, hr:min	
		NFT	SFT, P, M, K
10	(6.2)	**0:37**	**0:11**
20	(12.4)	**1:08**	**0:30**
30	(18.6)	**1:37**	**0:54**
40	(24.9)	**2:16**	**1:21**
50	(31.1)	**2:53**	**1:49**
60	(37.3)	**3:27**	**2:20**
70	(43.5)	**3:48**	**2:53**
80	(49.7)	**4:43**	**3:31**
90	(55.9)	**6:36**	**4:18**
100	(62.1)	**8:50**	**5:12**

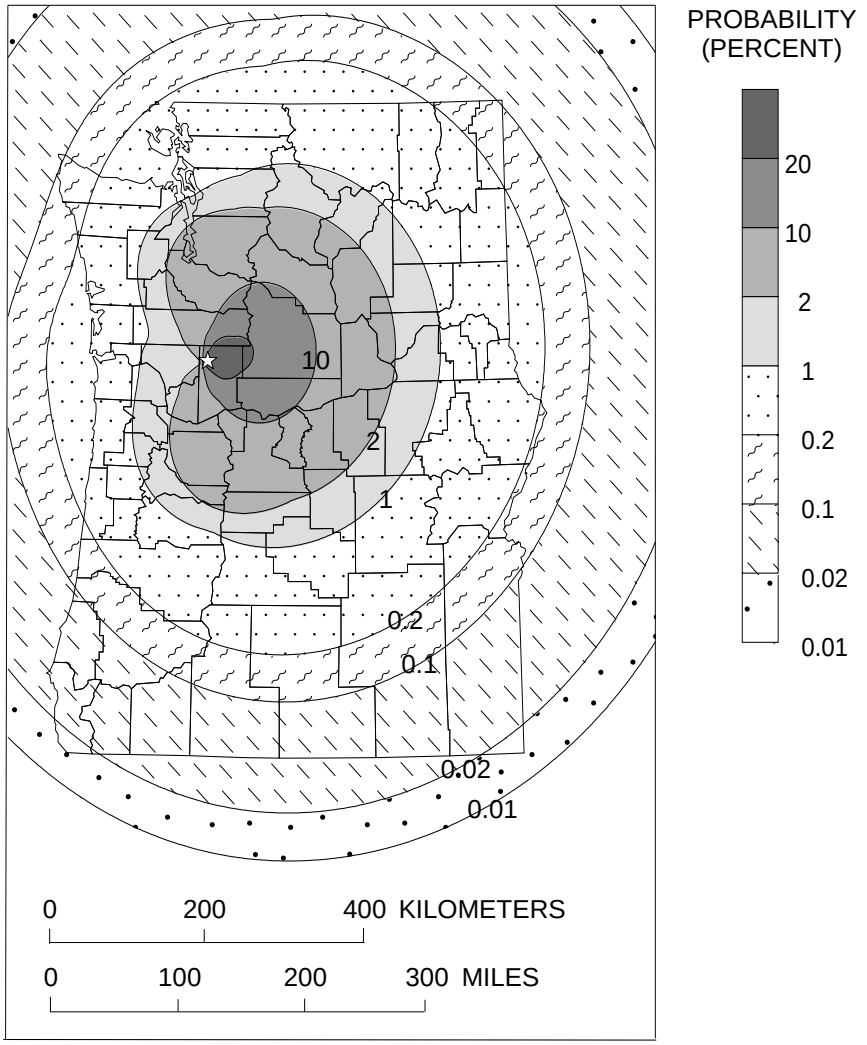

Figure 2. Map of Washington and Oregon showing the percentage probability of accumulation of ten or more centimeters (four or more inches) of tephra from a large eruption of Mount St. Helens (star). Probability distribution reflects interplay of two variables: wind direction and likelihood that a large eruption will deposit ten or more centimeters of tephra at a give distance.

volcano in the Cascade Range. Thus, its influence dominates the annual-probability distribution in Washington and Oregon of ten or more centimeters (four or more inches) of tephra accumulation from eruptions throughout the Cascade Range (fig. 3).

Flowage Hazard

The accompanying flowage-hazard zonation map shows areas potentially threatened by flowage hazards from an eruption as large as any since 1480 A.D., from intense posteruption rainfall, or from an outbreak of Castle Lake. The map draws extensively on previously published hazard zonations (Crandell and Mullineaux, 1978; Miller, Mullineaux, and Crandell, 1981), which were strongly based on the geologic record of past eruptive events at Mount St. Helens. In addition, the current zonation reflects both changes in the landscape as a consequence of the 1980–86 eruptions and experience with recent volcanic eruptions at Mount St. Helens and elsewhere.

The flowage-hazard zonation map portrays three zones: (1) a proximal zone of high-concentration (high-density) flows, which are strongly channeled into topographically low areas; (2) a proximal zone of low-concentration (low-density) flows (pyroclastic surges), which are appreciably less constrained by topography; and (3) a distal zone, where well-channelized lahars represent the only significant flowage hazard. The proximal zones (1 and 2) are subject to the full gamut of

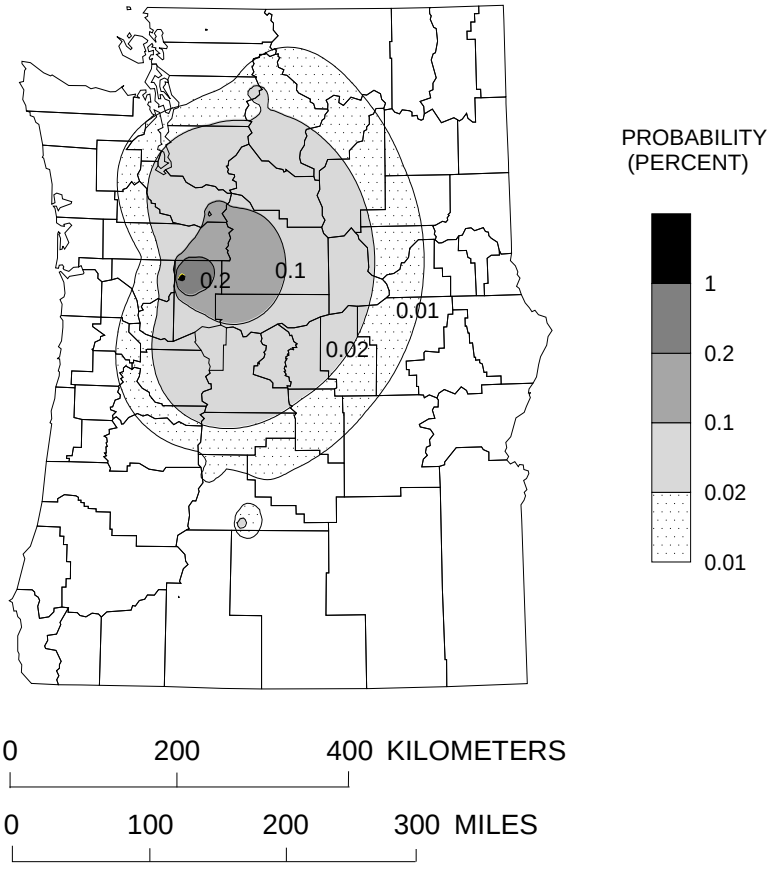

Figure 3. Annual probability of accumulation of ten or more centimeters (four or more inches) of tephra in Washington and Oregon from eruptions throughout the Cascade Range. Probability distribution reflects the frequency of explosive eruptions at each major Cascade volcano, the variability in the thickness of tephra that could be deposited at various downwind distances, and the variability in wind direction.

hazards—pyroclastic flows and surges, explosive ejection of rock fragments, laterally directed blasts, lava flows, and lahars. Most of the eruptive processes within the zones 1 and 2 occur so rapidly that it is too late to evacuate after an eruption has begun; in these areas, evacuation must occur before the eruption begins.

As shown in 1980, a single eruption is unlikely to affect the entire zoned area, but evidence before an eruption will probably be insufficient to identify which parts will be spared. Further, it is important to understand that hazard-zone boundaries are approximate. They indicate the most likely maximum extents of flows, based on past eruptive behavior or on results of numerical models, and they assume the next eruption will be explosive and as large or larger than the May 18, 1980 eruption. The actual extents of future flows will depend upon factors such as volume, mobility, velocity, and exact mixture composition, all of which are difficult to forecast. Therefore, one must not assume that hazard-zone boundaries mark well-defined limits beyond which there is little or no risk of harm.

Flowage-Hazard Zone 1

Zone 1 represents the area vulnerable to passage of high-concentration (high-density) flows, including pyroclastic flows, lava flows, and the proximal parts of lahars. Such flows can spread across broad sectors of the volcano's upper slopes, but they become well channelized in the major drainages at lower elevations. The boundaries are similar to those shown by Miller and others (1981) after the 1980 eruptions, and they are based on field evidence for the distribution of past flows at Mount St. Helens and other volcanoes.

Flowage-Hazard Zone 2

Zone 2 represents the area that could be overrun by pyroclastic surges, which are low-concentration (low-density) flows that are much less constrained by topography than are the high-concentration flows. Crandell and Mullineaux (1978) showed a similar but slightly less extensive zone for ash clouds (surges) associated with pyroclastic flows, based on their knowledge of the distribution of ash-cloud deposits in Mount St. Helens' geologic record. We expand the zone slightly on the basis of experience with highly mobile pyroclastic surges that leave thin deposits unlikely to be preserved in the geologic record. For example, a dilute surge at Redoubt Volcano, Alaska, in February 1990 deposited only a few millimeters of ash and small pebbles, fragments of transported, charred wood, and a scorched and battered bird carcass on a ridge crest 10 km (6 mi) distant and 700 m (2,300 ft) above the intervening valley bottom. The drop in elevation from the vent to the ridge crest was only 1,300 m (4,300 ft); a similarly mobile surge, if generated from an eruption column onto the south flank of Mount St. Helens, would probably have reached Swift Reservoir.

Flowage-Hazard Zone 3

Zone 3 includes the intermediate and lower reaches of valleys that could be inundated by lahars. The maximum size of a potential lahar is limited principally by the amount of available water, which can be estimated for the North Fork Toutle River (see below). However, several major uncertainties are involved in estimating potential lahar size. The zone-3 hazard boundaries in the North Fork Toutle, main stem Toutle, and Cowlitz Rivers are based on previous numerical modeling studies for a hypothetical outbreak of Castle Lake (Laenen and Orzol, 1987; MacArthur and others, 1990), taking into account the effects of the U.S. Army Corps of Engineers' Sediment Retention Structure (SRS) on a lahar coming down the valley. If an outbreak of Castle Lake were to occur during a large storm or during an eruption that released water from the crater, a flood larger than that indicated by the zone-3 boundaries could be anticipated. Hazard boundaries for the other river valleys are based on mapped limits of past flows and the expected mitigative effect of the hydroelectric reservoirs in the Lewis River valley.

Potential Water Sources for Lahars at Mount St. Helens

If a large lahar were to occur at Mount St. Helens within the next few decades, the mechanism most likely to be responsible would be rapid melting of snow and ice in the crater or a sudden outbreak of Castle Lake. Either mechanism would produce a lahar only in the North Fork Toutle River (and downstream). Rainfall is seldom intense enough to directly produce lahars in the Cascades, and the flows produced by this mechanism tend to be fairly small. Likewise, any landslides occurring on the flanks of Mount St. Helens are likely to be relatively small, especially now that the volcano's height has been lowered by the 1980 eruption.

Snow and Ice at Mount St. Helens

A large volume of snow and ice is presently accumulating in the Mount St. Helens crater, protected by the shade of the high, steep crater walls. This accumulation provides a growing potential water source for lahars in the North Fork Toutle River valley (Fig. 4). It is already mixed with rock debris eroded from the crater walls, and this debris would augment the formation of a lahar. It is

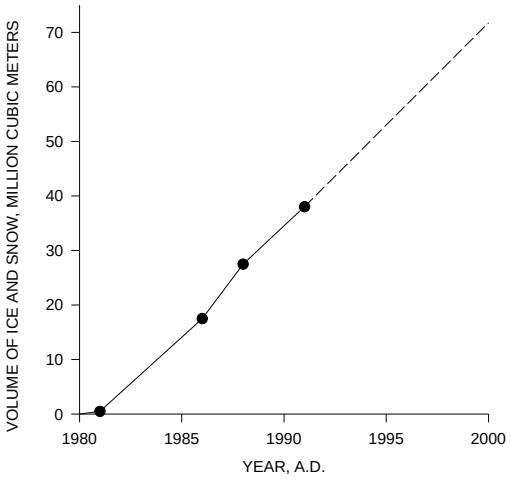

Figure 4. Volume of ice and snow in the Mount St. Helens crater. Measured data (dots) from H.H. Mills (written comm., 1994); dashed line, extrapolated.

possible that a large eruption could melt most or all of this snow and ice in a matter of tens of minutes. A very small eruption in 1982 rapidly melted enough snow and ice in the crater to trigger a 4 million m^3 (5.2 million yd^3) flood that transformed into a lahar and flowed all the way to the Cowlitz River. At the present time (1995), about 53 million m^3 (70 million yd^3) of snow and ice has accumulated. If completely melted, this would produce about 38 million m^3 (50 million yd^3) of water. At the present rate of accumulation, the volume of snow and ice will double in about 15 years.

Permanent and seasonal snow and ice also blanket the outer flanks of Mount St. Helens. A sufficient volume exists there in winter or spring to produce flank lahars similar in magnitude to those of May 18, 1980, if another large eruption were to occur. Lahars formed on the outer flanks can be expected to be substantially smaller than flows generated in the crater.

Lakes in Valleys Draining Mount St. Helens

A number of natural and human-made lakes exist close to the volcano in the North Fork Toutle and Lewis River valleys. The uppermost lake in the Lewis River valley, Swift Reservoir, receives drainage from the volcano via Swift Creek, Pine Creek, and Muddy River. In 1980, lahars descending these streams dumped about 14 million m^3 (18 million yd^3) of sediment and water into the lake, abruptly raising the lake level 0.85 m (2.8 ft). Because the operators of the reservoir, Pacific Power and Light, lowered the lake level about 18 m (23 ft) below normal in anticipation of possible lahars, the small lake-level rise and the 0.4 m (1.3 ft) accompanying wave posed no threat to the dam. It is assumed that (1) future lahars reaching Swift Reservoir would not be appreciably larger than those of May 18, 1980, and (2) dam operators would again take precautionary steps to lower lake level if Mount St. Helens were to show signs of imminent eruption. Therefore, Swift Reservoir and the downstream lakes (Yale Lake and Lake Merwin) are not considered to be at risk from lahars.

Three natural lakes in the North Fork Toutle River, formed by natural debris dams during the 1980 eruption, have required modifications to their outlets in order to prevent catastrophic outbreaks. The U.S. Army Corps of Engineers provided (1) a tunnel outlet to Spirit Lake, (2) a bedrock spillway channel at Coldwater Lake, and (3) a reinforced spillway channel at Castle Lake to hold the levels of these lakes constant and to prevent them from overtopping their erodible natural dams. A recent study (Roeloffs, 1994), however, has verified earlier conclusions that the natural dam at Castle Lake is potentially susceptible to modes of failure other than overtopping and, under certain conditions, is only marginally stable. Castle Lake contains about 23 million m^3 (30 million yd^3) of water and would produce a large lahar if the blockage were to fail. We assume that an outbreak of Castle Lake is a potential hazard, and the inundation levels of a numerically modeled lahar with an initial magnitude of 37,400 m^3/s (1.32 million cfs) were used to produce the Zone-3 hazard boundaries in the North Fork Toutle, main Toutle, and Cowlitz Rivers. This model lahar (for which we conservatively assumed the SRS "full" condition and a bulking factor of 3.3) has an intermediate magnitude within the range of possible lahars modeled by MacArthur and others (1990b) for a potential outbreak of Castle Lake. Channel cross sections from a previous modeling study (Laenen and Orzol, 1987) were used to translate flow magnitude at different points into approximate lahar-inundation levels.

Effect of the SRS Sediment Dam on Downvalley Lahar Hazard

The U.S. Army Corps of Engineers constructed a sediment dam, called the Sediment Retention Structure or SRS, in the North Fork Toutle River to trap the large volumes of sediment washing down the river from the fresh volcanic deposits near Mount St. Helens. The SRS is located just upstream of the Green River confluence and was completed in 1989. The 56-m-(184-ft-) high dam has already lost more than half of its original freeboard due to infilling by sediment and is expected to be completely full (to the spillway crest) by about 2005. The remaining capacity and the dam's ability to trap a lahar decrease every year. The reinforced spillway was designed to safely pass a flood discharge of 6,460 m^3/s (228,000 cfs).

The numerical modeling by MacArthur and others, (1990b) indicates that a range of lahar

magnitudes is possible, depending on assumptions made about the level of Castle Lake, the mode of breaching of the debris dam, the amount of sediment picked up by the flood to form a lahar (bulking factor), and the level of sediment fill behind the SRS. Given that Castle Lake is now fixed at its "full" level, flow through the SRS spillway could vary from 1,350 m^3/s (47,600 cfs) to 6,710 m^3/s (237,000 cfs), depending on whether the reservoir was partly full of sediment (1990 existing condition) or completely full and depending on whether lahar volume increased 2.5, 3.3, or 4.5 times due to incorporation of eroded sediment. At the SRS-outflow discharge considered most likely by the Corps of Engineers (2,980 m^3/s [105,200 cfs]), the lahar reaching the Cowlitz River would be approximately equivalent to a 100-year flood. Such a lahar would be fully contained within the channel at both Kelso-Longview and at Castle Rock. At the high end of the range, flooding would occur all along the Cowlitz River both downstream and slightly upstream of the Toutle River confluence. The modeled lahar chosen to define the Zone 3 hazard boundaries (bulking factor 3.3; SRS "full") would be contained within channel at Kelso-Longview but not at Castle Rock nor in parts of the Toutle River valley between the SRS and the Cowlitz River.

The present water-equivalent volume in the Mount St. Helens crater is 65 percent larger than the volume of lake water in Castle Lake, but it is also about 10 km farther upstream. We assume that the additional distance would attenuate lahar peak discharge coming from the crater to roughly the scale of a lahar that would be produced by an outbreak of Castle Lake. Therefore, the potential Castle Lake lahar is used to delineate lahar-hazard zones on the map. However, the volume of snow and ice in the crater is steadily growing and steadily increasing the possibility of creating a flood too large to be contained by the SRS. At the same time, the SRS is steadily being filled in with sediment and decreasing in its ability to trap lahars. For example, in about 15 years the crater could have approximately twice as much snow and ice as now, and an eruption then could potentially produce a lahar roughly 100 percent larger than the zone-3 model lahar. Earlier modeling by MacArthur and others (1990a) showed that a lahar 84 percent larger than the zone-3 model lahar could be expected to overtop the SRS by about 3 m (10 ft) if the reservoir were full of sediment. Overtopping of the N-1 sediment dam by a lahar in 1982 heavily damaged and breached that structure in two places. Because of the many uncertainties involved in trying to quantify these predictions, such as the continued rate of infilling of crater ice and snow, the melt rate of ice and snow during an eruption, the expected bulking factor for a lahar coming from the crater, and the size and type of the next eruption, it is impossible to predict exactly when a potential lahar might be large enough to overtop the SRS. However, a lahar of such a magnitude is possible sometime within the next few decades. Overtopping (and possible breaching) of the SRS could result in significantly greater lahar flooding in the Toutle and Cowlitz Rivers than is postulated on the accompanying hazard map.

MONITORING AND WARNINGS

Volcanic activity at Mount St. Helens is carefully monitored by the U.S. Geological Survey and the University of Washington. Some kinds of events, such as crater-wall avalanches or steam-driven explosions from the dome have occurred without warning in the past and may do so again. However, our experience since early 1980 at Mount St. Helens and elsewhere indicates that the monitoring is sufficient for us to detect the ascent of fresh magma that must take place before another large eruption. As in the past, interpretation of phenomena related to magma ascent will enable us to provide warnings and updated assessments of hazards.

Lahar and flood hazards are monitored by the U.S. Geological Survey and the National Weather Service; the latter agency has responsibility for providing warnings of floods, including lahars. Currently monitoring includes: (1) lake-level gages on Castle, Coldwater, and Spirit Lakes, (3) sensors to measure movement on the Castle Lake debris dam, (3) flow-vibration sensors in the North Fork Toutle River valley to detect passage of lahars or floods, and (4) streamflow gages in the North Fork, South Fork, and main channel of the Toutle River and in the Muddy River.

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U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT 97-513
PLATE 1
Pamphlet accompanies map

121° 30′ 121° 00′ 44° 00′ 43° 30′

Bend
Pilot Butte
Tumalo Mtn.
Badlands
Bessie Butte
Lava Butte
Horse Ridge
Wanoga Butte
Sunriver
Klawhop Butte
Fuzztail Butte
Millican
Valley
GEO N-3
Pine Mountain
Draw
Pistol Butte
Pilpil Butte
Tepee
Kawak Butte
Paulina Prairie
McKay Butte
Pringle Butte
Paulina Lake
East Lake
Central Pumice Cone
Newberry Crater
The Dome
Big Obsidian Flow vent
Paulina Peak
China Hat
La Pine
Devils Horn
GEO N-1
Finley Butte
DESCHUTES CO
LAKE CO
KLAMATH CO
Indian Butte
Amota Butte
Little River
Moffitt Butte
Hoodigan Hill
Flat Top
Big Hole
Hole in the Ground
Fort Rock Valley
Walker
Rim
CROOK CO
DESCHUTES CO

DESCRIPTION OF VOLCANO-HAZARD ZONES

This map shows areas that could be affected in the future by various kinds of eruptions and related events. Although we show sharp boundaries between hazard zones, the degree of hazard does not change abruptly at these boundaries but decreases gradually as distance from the volcano increases. Areas immediately beyond hazard zones should not be regarded as hazard free, because the boundaries can only be approximately located. See accompanying pamphlet for methodology used to define hazard zones and to locate boundaries.

Hazard zone for explosive pyroclastic eruptions of small to moderate volume in or near caldera —Subject to tephra falls, pyroclastic flows and surges, and ballistic projectiles from eruptions of caldera or near −caldera vents. Can also be affected by lava flows and domes. Probability of tephra-fall hazard resulting from explosive eruptions at Newberry and other volcanoes in region is depicted in pamphlet (fig. 4)

Hazard zone for lahars or floods on Paulina Creek —Subject to lahars and flooding in event of volcanically induced surges of water from Paulina Lake. Shown only as far north as confluence of Little Deschutes and Deschutes Rivers; farther north, zone is thought to coincide with 100 − year floodplain of Deschutes River

Area of upper west flank where Paulina Creek canyon might not contain peak flows during an exceptionally large flood event (see pamphlet)

Hazard zone for volcanic gases —During volcanic unrest and periods of increased gas emission, hazard lies chiefly in small topographic depressions, caves, and artificially created enclosures such as manholes, excavations, tents, or snowcaves where atmospheric circulation is inadequate to disperse gas

Hazard zones for lava flows from flank eruptions —Also includes areas subject to near −vent deposits of cinder cones and fissure vents. Divided on basis of likelihood of future eruption into:

Lava −flow hazard zone LA —Area of Newberry volcano more likely to have future eruptions or to be covered by lava flows. Includes area of hazard zone for pyroclastic eruptions

Lava −flow hazard zone LB —Area on lower flanks of Newberry volcano and surrounding region less likely to have future eruptions or be covered by lava from vents in zone LA or elsewhere in Cascade Range or Basin and Range

GEO N-1 Drill hole —Showing location and name of two holes on north and south flank used to estimate probability of coverage by future lava flows

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SCALE 1:100,000

0 5 10 MILES

0 5 10 KILOMETERS

CONTOUR INTERVAL 50 METERS; 40 METERS ALONG NORTH MARGIN;
20 METERS ALONG EAST AND SOUTH MARGIN

OREGON

AREA OF MAP

N

Base composited in digital form by Steven P. Schilling from U.S. Geological Survey, Bend (1980), La Pine (1986), Brothers (unpub.), Crescent (1979), Christmas Valley (1986), and Prineville (1981) 1:100,000 scale maps. Data for hydrography, culture, transportation, and boundaries from U.S. Geological Survey (EROS Data Center) Digital Line Graph files. Digital Line Graph hypsography (topographic contours) created from U.S. Geological Survey blackline clear-films by Pacer Infotec, Inc., Portland, Oregon.

Universal Transverse Mercator projection, zone 10

1927 North American Datum

Hazard zones interpreted from geologic maps by Walker and others (1967), MacLeod and Sherrod (1992), and MacLeod and others (1995). See accompanying pamplet for rationale

Volcano hazards at Newberry volcano, Oregon

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For sale by U.S. Geological Survey, Information Services, Box 25286, Federal Center, Denver, CO 80225

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Volcano Hazards at Newberry Volcano, Oregon

By

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1997

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ILLUSTRATIONS

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Cover photo: Big Obsidian Flow (center), a 1,300-year-old lava flow, is the youngest product of Newberry volcano. Paulina Peak (back center) forms the highest point on the rim of Newberry Crater, a large caldera or volcanic depression at the summit of the volcano.

INTRODUCTION

Newberry volcano is a broad shield volcano located in central Oregon (fig. 1). It has been built by thousands of eruptions, beginning about 600,000 years ago. At least 25 vents on the flanks and summit have been active during several eruptive episodes of the past 10,000 years. The most recent eruption 1,300 years ago produced the Big Obsidian Flow. Thus, the volcano's long history and recent activity indicate that Newberry will erupt in the future.

The most-visited part of the volcano is Newberry Crater, a volcanic depression or caldera at the summit of the volcano. Seven campgrounds, two resorts, six summer homes, and two major lakes (East and Paulina Lakes) are nestled in the caldera. The caldera has been the focus of Newberry's volcanic activity for at least the past 10,000 years. Other eruptions during this time have occurred along a rift zone on the volcano's northwest flank and, to a lesser extent, the south flank.

Many striking volcanic features lie in Newberry National Volcanic Monument, which is managed by the U.S. Forest Service. The monument includes the caldera and extends along the northwest rift zone to the Deschutes

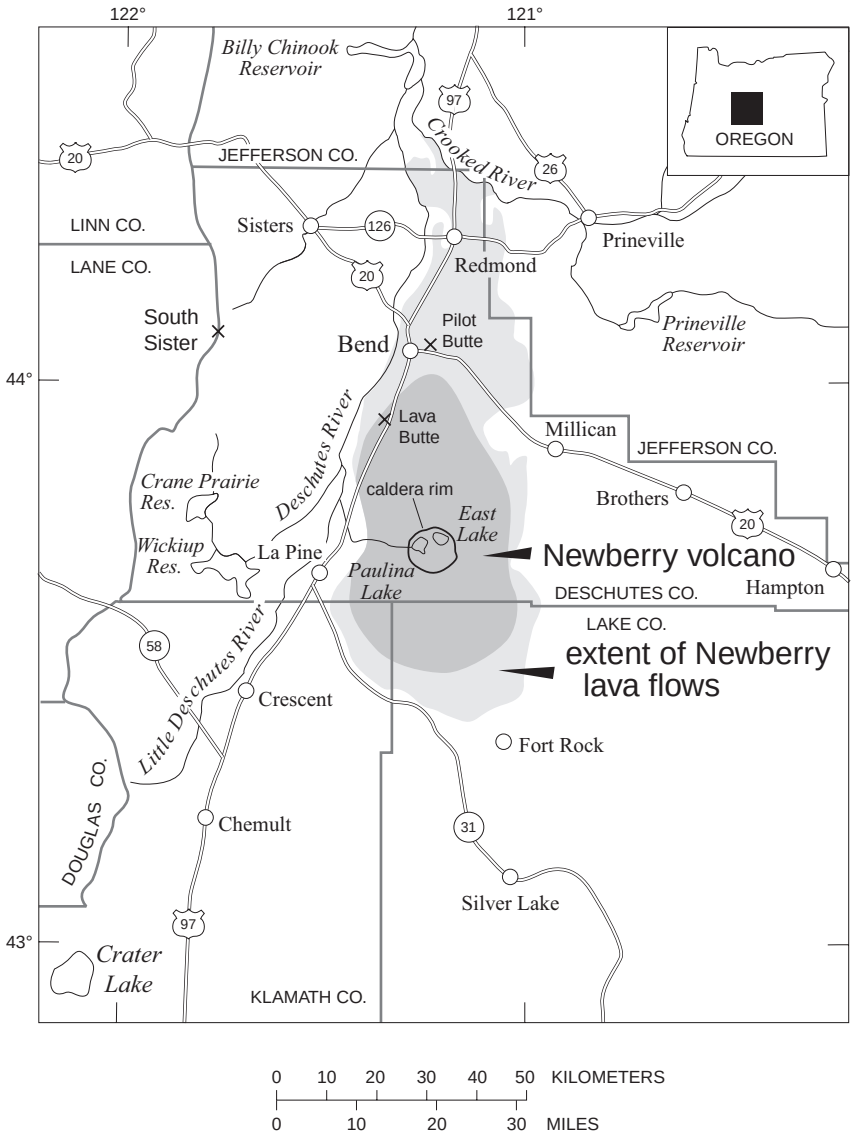


Figure 1. Index map showing Newberry volcano and vicinity.

River. About 30 percent of the area within the monument is covered by volcanic products erupted during the past 10,000 years from Newberry volcano.

Newberry volcano is presently quiet. Local earthquake activity (seismicity) has been trifling throughout historic time. Subterranean heat is still present, as indicated by hot springs in the caldera and high temperatures encountered during exploratory drilling for geothermal energy.

This report describes the kinds of hazardous geologic events that might occur in the future at Newberry volcano. A hazard-zonation map is included to show the areas that will most likely be affected by renewed eruptions. In terms of our own lifetimes, volcanic events at Newberry are not of day-to-day concern because they occur so infrequently; however, the consequences of some types of eruptions can be severe. When Newberry volcano becomes restless, be it tomorrow or many years from now, the eruptive scenarios described herein can inform planners, emergency response personnel, and citizens about the kinds and sizes of events to expect.

HAZARDOUS VOLCANIC PHENOMENA

Newberry's volcanic history is a guide to future eruptions

Future eruptions at Newberry volcano will probably resemble those that occurred in the past 15,000 years (fig. 2). These volcanic eruptions varied widely from relatively quiet

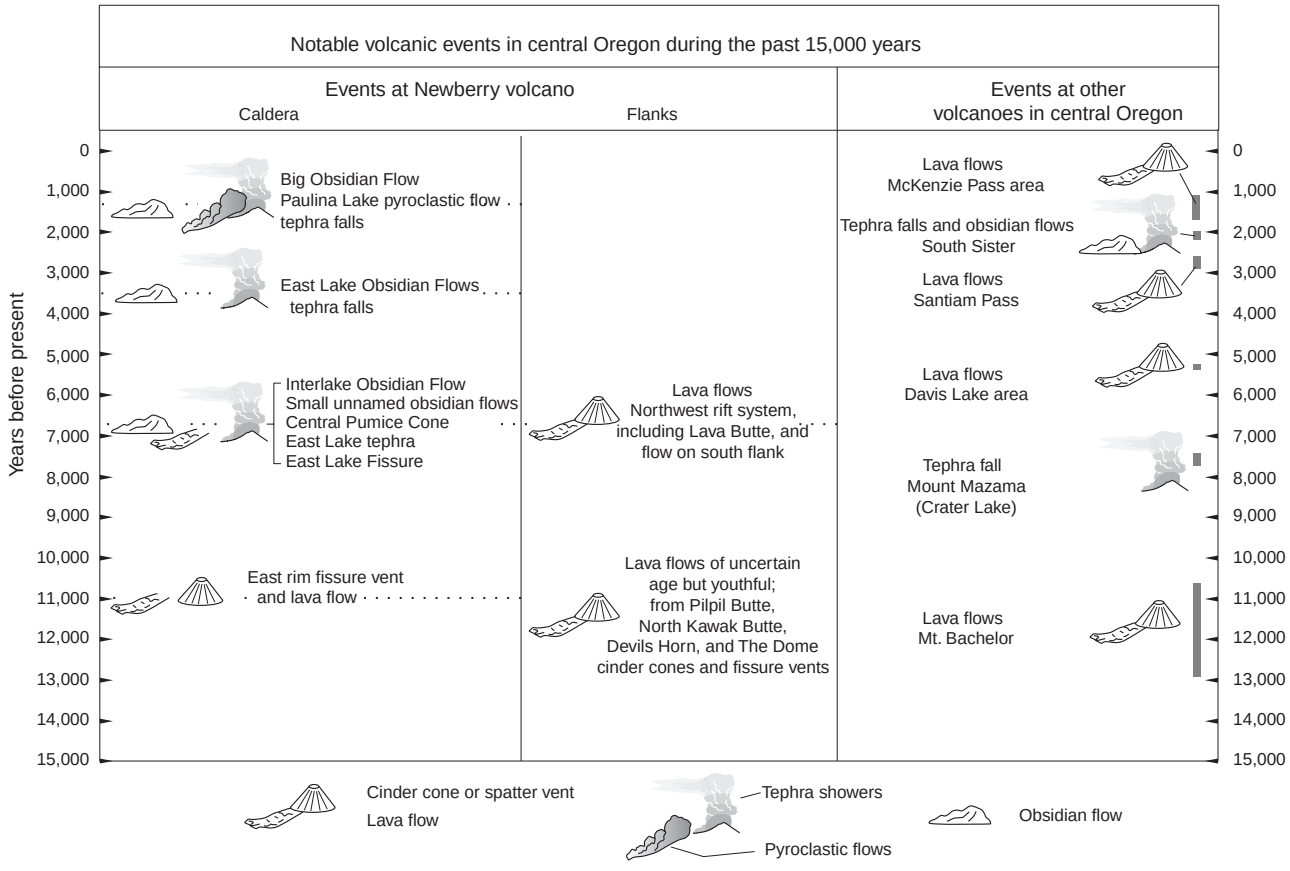


Figure 2. Notable volcanic events at Newberry volcano and in central Oregon during the past 15,000 years. Dotted lines show approximate age of events at Newberry volcano; shaded boxes show age of events at other volcanoes. No eruptions have occurred in the past 1,000 years in this region.

effusion of lava flows to highly explosive discharge of pumice and ash. The difference in eruptive style stems from the composition of the magma, or molten rock, and the amount of dissolved gas it contains. At Newberry volcano, the most common magma types are basalt and rhyolite, and each has characteristic eruptive phenomena associated with it.

Flank eruptions would most likely be basaltic

Basaltic eruptions are well known from observations elsewhere, such as at Hawaii, where spectacular fountains of spatter and cinders are associated with lava flows. At Newberry, basaltic eruptions have occurred repeatedly on the volcano's flanks and in the caldera. Typical products of a basaltic eruption are the 7,000-yr-old cinder cone of Lava Butte and its surrounding lava flows, located 10 km (6 mi) south of Bend (fig. 1). Basaltic eruptions commonly begin with lava fountains that hurl cinders or spatter as far as 1 km (0.6 mi) from the vent. Ejecta are thrown aloft for hundreds to a few thousand meters. Large fragments are expelled from the vent along ballistic trajectories, like artillery shells. Smaller particles are carried by wind and convective updrafts. The resulting deposits may be many meters thick near the vent and build a steep-sided cinder cone, but they generally thin to a few millimeters within 10 km (6 mi) distance downwind. The chief hazard from ballistic ejection is direct impact. Some spatter will be hot upon impact and likely will start forest fires.

Lava flows may also issue from cinder cones or drain away from spatter ramparts that are built by lava fountains. Lava flows are streams of molten rock that move downslope until they cool and solidify. People and animals can walk or run from lava flows, which on average move less than about 500 m per hour (30 ft per minute). But any structures in the flow path are burned or crushed.

Basaltic magma may erupt from long linear fissures or from pipe-like vents. Excellent examples of both are found along Newberry's northwest rift system, which formed about 7,000 years ago. The northwest rift system traverses the volcano's northern flank for 22 km (14 mi) from Lava Butte to the caldera. East Lake Fissure, on the caldera wall north of East Lake, marks the southern extent of the northwest rift system. The rift system includes 12 lava flows that range from 1 to 9 km in length (0.6 to 5.6 mi) and cover areas as great as 24 km^2 (6,000 acres or 9 square miles). In total, lava flows of this eruptive episode covered more than 60 km^2 (23 square miles).

The caldera would be the site of most rhyolitic eruptions–and other types of dangerously explosive eruptions

Rhyolitic eruptions have been restricted to the caldera during the past 10,000 years. Rhyolitic magma tends to erupt more explosively than basaltic magma, owing to the increased amount of gas commonly trapped in it. Gas bubbles in rhyolite cannot easily rise and escape as they can from basalt, and gas pressures may build to much higher levels. This is because rhyolite is more viscous (resistant to flowage) than basalt. Gas-rich eruptions are generally more explosive and therefore more dangerous than gas-poor eruptions. Some events expected in a rhyolitic eruption are shown in figure 3.

Explosive volcanic eruptions discharge debris that is highly fragmented, mainly as a consequence of gases that froth and disrupt the magma as they expand. Geologists use the term “pyroclastic” (literally, fire-broken) to describe these explosive eruptions and the resulting deposits. Pyroclastic eruptions present the greatest threat to lives because of their violence and the great speed with which the material can sweep out from vents.

During rhyolitic eruptions, gas-charged magma and rock along the sides of vents are broken into fragments, called tephra, that range in size from large blocks to fine dust. The tephra is jetted into the atmosphere to form clouds that rise and drift downwind. Larger particles fall close to the vent, but finer-grained tephra can be carried for tens to hundreds of kilometers. Tephra clouds can create darkness lasting tens

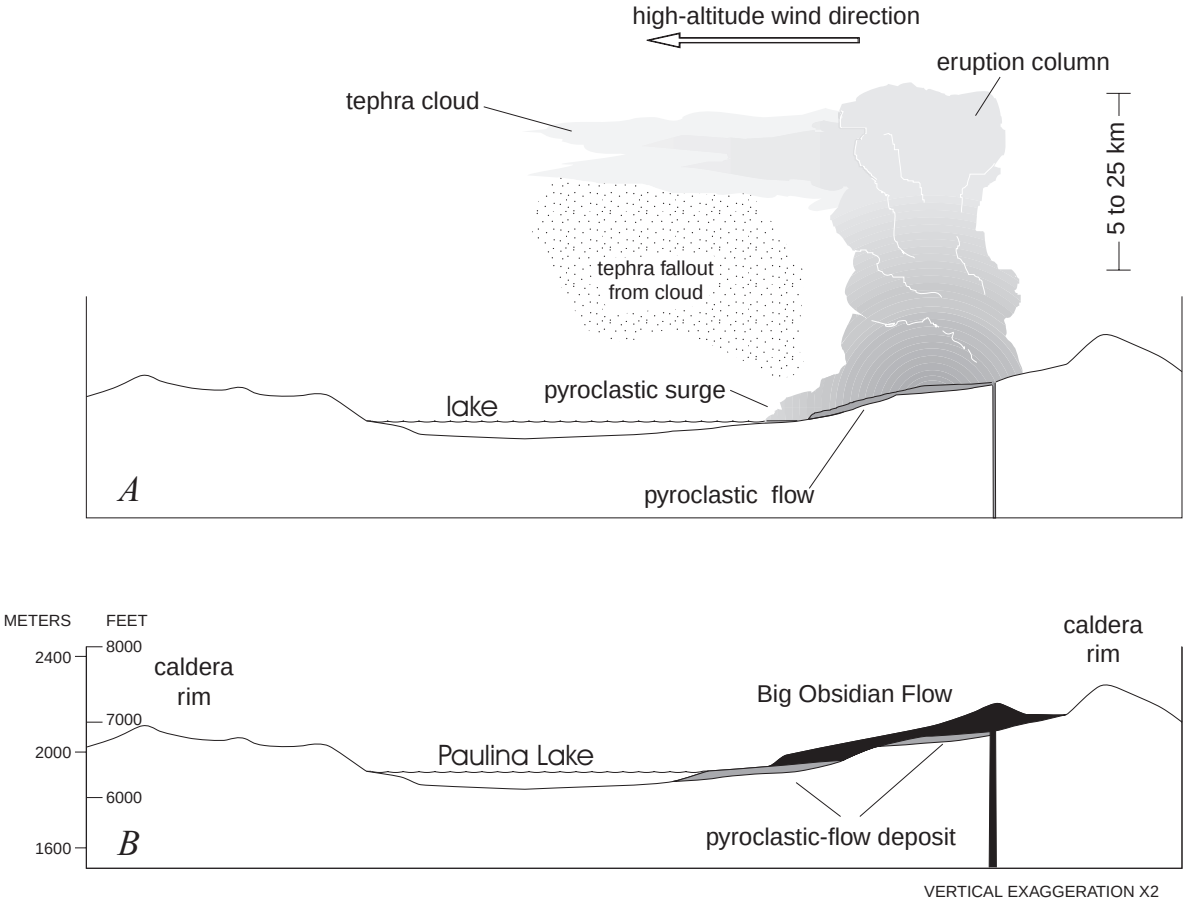


Figure 3. Characteristic volcanic phenomena expected for eruption of small to moderate volumes of rhyolite at Newberry caldera. *A*, eruptive process. Not shown is a final oozing of degassed magma to form obsidian flow. *B*, setting today after such a sequence of events 1,300 years ago. During that particular eruption, prevailing winds forced the tephra cloud eastward to blanket the east flank of volcano with thick fall deposit.

of minutes to hours, even on sunny days. Deposits of tephra can short-circuit electric transformers and power lines, especially if the tephra is wet, which makes it highly conductive, cohesive, and heavy. Tephra ingested by engines will clog filters and increase wear. Tephra clouds often generate lightning that may interfere with electrical and communications systems and start fires. Perhaps most importantly, even dilute tephra clouds pose a substantial hazard to aircraft that fly into them.

In contrast to tephra clouds that ascend into the atmosphere, other mixtures are denser than air and flow along the ground surface, driven by gravity. These mixtures, known as pyroclastic flows, are hot—from 300 to more than 800° C (570 to >1,470° F). They descend a volcano's flanks at speeds ranging from 10 to more than 100 m per second (20 to >200 mi per hour). Described figuratively as "glowing avalanches," these mixtures are sufficiently dense to be funneled into canyons or other topographically low areas.

If the hot mixture is composed mostly of gas with a small proportion of rock and ash, its lower density makes its path less governed by topography. Flows of this type are called pyroclastic surges. Pyroclastic flows and

surges often occur together. They can incinerate, asphyxiate, bury, and crush objects and living things in their path. Because of their high speed, pyroclastic flows and surges are difficult or impossible to escape. Evacuation must take place before such events occur.

Lava flows may also form during rhyolitic eruptions. Rhyolitic lava is so viscous that it typically solidifies without much crystallization, forming volcanic glass called obsidian. Rhyolitic lava may squeeze from the vent to form a steep-sided lava dome. Lava domes and thick lava flows move only meters per day and are not especially hazardous. But the steepened faces may collapse without warning, spawning avalanches of hot volcanic debris that can generate destructive pyroclastic flows and localized clouds of airborne tephra.

The eruptive sequence that culminated in the Big Obsidian Flow 1,300 years ago exemplifies several aspects of a typical rhyolitic eruptive sequence at Newberry volcano. The eruptions began with tephra showers that deposited pumice lumps and dense lava blocks as large as 1 m (3 ft) within the caldera. These tephra deposits, which are thicker than 13 m (43 ft) near the vent, diminish in thickness and grain size downwind. For example, 50 km (30 mi) downwind from the caldera near Brothers, Oregon, these tephra deposits are 25 cm (1 ft) thick and have average grain size of 3 mm (0.1 in.). Newberry tephra can be traced as a fine-grained ash deposit as far east as Idaho.

As the eruption progressed, pyroclastic flows swept downslope from the Big Obsidian vent to Paulina Lake (fig. 3*A*). The boat ramp at Little Crater Campground is excavated in these pyroclastic-flow deposits, as is the caldera road upslope from Paulina Lake. The flows entered Paulina Lake, perhaps causing secondary steam explosions and displacing water from the lake into Paulina Creek.

The final stage of eruption produced the Big Obsidian Flow itself, a lava flow that moved slowly, probably advancing only a few meters or tens of meters per day as it oozed down an inner caldera wall and ponded on the caldera floor (fig. 3*B*). The Big Obsidian Flow is about 1.8 km (6,000 ft) long and locally thicker than 20 m (65 ft).

The presence of lakes may add to the danger of eruptions in the caldera

The mixing of magma, either basaltic or rhyolitic, with water tends to change the character of the eruption from one of continuous expulsion of lava or tephra to one involving discrete explosions. The major hazard produced during such explosions is pyroclastic surges of tephra, gas, and steam that radiate out from the vent at speeds as great as hundreds of kilometers per hour and temperatures that range from 100° C (212° F) to several hundred degrees Celsius. Such surges typically extend less than 1 km from an eruptive vent, but some may reach as far as 10 km (6 mi).

The most damaging lahars and floods at Newberry volcano would be limited to the Paulina Creek area

Lahars are watery flows of volcanic rocks and mud that surge downstream like rapidly flowing, soupy concrete. Lahars, also known as mudflows or debris flows, can devastate valley floors tens of kilometers from the volcano. Lahars are a major hazard at steep-sided, snow- and ice-clad Cascade volcanoes, but they pose much less of a threat at Newberry volcano. The volcano's slopes are relatively gentle, and although it commonly bears a thick seasonal snowpack, it has no glaciers. Pyroclastic flows and surges that encounter a snowpack on the outer upper flanks may generate lahars and floods in some of the numerous small valleys that crease the volcano's flanks, especially the northeast flank. Such lahars and floods will spread out and attenuate on the lower flanks or in basins beyond the volcano, such as Millican Valley.

The valley of Paulina Creek, which drains from Paulina Lake through the west rim of Newberry Crater, is the most likely drainage to carry damaging lahars and floods. In addition to lahars and floods caused by pyroclastic flows melting snow, a lahar could be generated along Paulina Creek by lake overflow. The natural bedrock barrier that forms the spillway from the lake is stable and unlikely to fail

catastrophically, but pyroclastic flows entering the lake or explosive eruptions in the lake could displace water into Paulina Creek's canyon. A large water flow could incorporate enough debris from the canyon walls to become a lahar or it could remain as sediment-laden floodwater.

Geologic evidence suggests at least one such flood occurred in the recent geologic past, but its exact origin is uncertain. It may have been triggered by failure of a 1.5-m-high (5-ft-high) rock ledge at the outlet rather than by an eruption [A]. The flood inundated the entire valley floor in the reach above Paulina Prairie and probably had a discharge similar to that of the flood of record (in 1909) on the Deschutes River downstream from its confluence with the Little Deschutes River (which receives Paulina Creek flow). On the basis of published reports from other volcanoes around the world, similar or larger floods could accompany future eruptive activity in Paulina Lake. [B]

Lahars travel faster than water in channels of similar depth and slope. And because they carry mostly solid debris, lahars are more destructive. They destroy bridges, break and fill pipelines, and clog ponds and reservoirs. They can also bury roadways, houses, and extensive areas of agricultural, forest, or grazing land. Lahars or floods from Paulina Lake could reach the La Pine valley within 30 minutes, so areas likely to be impacted should be evacuated before an eruption occurs. High ground near these areas, such as tops of ridges or buttes, is likely to be safe and may provide suitable emergency refuge.

Small to moderate-size earthquakes are commonly associated with volcanic activity

Earthquakes occur when rocks break suddenly in response to various geologic forces. Magma moving in the Earth's crust may create sufficient force to produce volcanic earthquakes. More common, however, are tectonic earthquakes, which periodically strike parts of Oregon. These earthquakes, the result of fault movements driven by regional crustal stresses, typically have no direct connection to magma movement. Regardless of type, earthquake size is reported by magnitude, and many scientists and media describe earthquakes by the well-known Richter magnitude scale.

Volcanic earthquakes are commonly smaller than about magnitude 2.5, roughly the threshold for felt shaking by observers close to the event. Swarms of small earthquakes may persist for weeks to months before eruptions, but little or no damage would occur to buildings in surrounding communities. Some volcanic-related swarms may include earthquakes as large as about magnitude 5. For the communities of Bend, La Pine, and Sunriver, shallow earthquakes in the magnitude 4-5 range that are located beneath Newberry volcano would cause walls to rattle or windows and dishes to vibrate. Some items might topple from shelves, but bookcases and furniture would remain intact. The larger earthquakes would be felt by everyone in the area. At night, the shaking would awaken many people, especially those living closest to the volcano. Damage to buildings and utilities would be nil in most cases. Sustained episodes of magnitude-4 earthquakes could crack plaster and damage walls in older brick or stone buildings near the volcano.

Tectonic earthquakes occur periodically in south-central and southeast Oregon, and they are capable of exceeding the magnitude of volcanic earthquakes. An example is the Klamath Falls earthquakes, a swarm that began in September 1993 with two large earthquakes of magnitude 5.9 and 6.0 that killed two people and and caused $7.5 million in property damage. Aftershocks as large as magnitude 5.1 continued to disturb residents for as much as six months. These earthquakes had no connection with volcanic processes.

Newberry volcano lies at the northwest margin of a broad geographic province known as the Basin and Range, an area whose landforms result from earthquake activity. Tectonic earthquakes as large as magnitude 7 may strike areas south and east of Newberry. Could such tectonic earthquakes trigger eruptions at Newberry? From observations in other earthquake areas, we conclude that

triggering can only occur if the volcanic system is on the verge of eruption anyway. Statistically speaking, central Oregon residents are far more likely to feel earthquake shaking than to witness an eruption in the area.

VOLCANO HAZARD ZONATION

Newberry's long, diverse volcanic history has produced an array of hazardous eruptions. The accompanying hazard-zonation map (plate 1) shows areas that could be affected by various future eruptive phenomena. Not discussed in this report are nonvolcanic hazards found in all mountainous regions, such as rockfalls or avalanches. Although we show sharp boundaries for hazard zones, the degree of hazard does not change abruptly at these boundaries but decreases gradually as distance from the volcano increases. Areas immediately beyond hazard zones should not be regarded as hazard free, because the boundaries can only be approximately located. Too many uncertainties exist about the source, size, and mobility of future events to locate zero-hazard zones with confidence.

Three kinds of eruptions are expected to occur at Newberry volcano in the future. The most likely type involves explosive pyroclastic eruptions of rhyolitic magma in small to moderate volumes (0.01-1.0 km^3; 13 million-1300 million cubic yards) from vents in the caldera or just beyond the caldera rim. The caldera is the most likely site for such eruptions, owing to the abundance of rhyolite that has erupted there in the past. Also, the presence of lakes and shallow ground water in the caldera increases the likelihood that eruptions from caldera vents will be explosive. Even basaltic magma can generate strong explosions if erupted through water such as the caldera lakes. The next most likely type of future eruption, and one of lesser potential hazard, is a basaltic eruption from vents on the flanks. These would likely produce lava flows and cinder deposits, also of small to moderate volume. The third type, and fortunately the least likely to occur, is a large explosive eruption from a vent in the caldera that discharges several cubic kilometers or more of magma. Such eruptions include those that created the caldera. A description follows of the hazard zones for each of these eruption types as well as other events that might accompany eruptive activity.

Hazard zone for small to moderate, explosive pyroclastic eruptions in or near the caldera

Hazards expected in this zone are tephra falls, pyroclastic flows and surges, and ballistic projectiles. The caldera has repeatedly been the site of volcanic activity, with rhyolitic eruptive products issuing from seven discrete vents during three eruptive periods in the past 7,500 years. The great likelihood of explosive pyroclastic events, especially in the initial phases of intracaldera eruptions, warrants assigning the greatest degree of hazard to the caldera. On the basis of the distribution of past vents, pyroclastic eruptions may burst forth from vents even as far as 3 km (2 mi) from the caldera rim, but the probability of rhyolite vents diminishes abruptly beyond the caldera rim. The hazard zone for explosive pyroclastic eruptions includes areas exposed to the threat of pyroclastic flows and surges and thick tephra-fall deposits, such as those erupted 1,300 years ago from the vent for the Big Obsidian Flow.

Eruptions that occur within East or Paulina Lakes or along their shores may produce pyroclastic surges that would spread rapidly outward from the vent. The caldera walls would contain much of the devastation created by these eruptions except along the western caldera rim, which is topographically low. Pyroclastic flows or surges erupted in that area could surmount the caldera rim and descend the west flank.

Any pyroclastic eruptions at Newberry would also produce tephra showers. The caldera and upper flanks are most likely to receive substantial accumulations of tephra (10 cm to several meters, or 4 in. to more than 100 in.), but these sites have few permanent residents. Therefore, risk is minimized by ease of evacuation and sparse development. Downwind sites have more development at risk.

Mid- to high-altitude winds in central Oregon blow 80 percent of the time toward the northeast, east, and southeast. Millican or Brothers (fig. 1) are the nearest settlements most likely to be downwind during eruptions from caldera vents. However, they lie sufficiently far from the caldera (30-50 km, 20-30 mi) that tephra from most eruptions would likely accumulate less than a few centimeters (few inches), but could reach 25 cm (1 ft) thick during eruptions like those of 1,300 years ago. Similar thicknesses could fall in Bend or La Pine, but suitable wind directions occur infrequently.

On the basis of eruption frequency during the recent geologic past (fig. 2), we estimate the annual probability of explosive eruptions affecting the caldera and immediately adjacent areas is about 1 in 3,000 (four eruptive periods, one basaltic and three rhyolitic, in 12,000 years). The probability of such an eruption occurring in a 30-year period, the duration of many home mortgages or a human generation, is roughly 30 times the annual probability or 1 in 100. We caution that these probabilities are based solely on the long-term behavior of the volcano. Any signs of increased restlessness at Newberry volcano will increase these probabilities dramatically.

Regional tephra hazards

As a group, other Cascade Range volcanoes possess an equally likely chance to thinly blanket the area with tephra. South Sister and Crater Lake are capable of discharging tephra that could fall on Bend, La Pine, or other towns in the region. Even Mount St. Helens could impact central Oregon. If wind direction had been to the south-southeast on May 18, 1980, Bend would have received 2-4 cm of tephra (1-2 in.) from the eruption of Mount St. Helens despite its location 250 km distant (160 mi). Such wind conditions occur about five percent of the time.

When all Cascade volcanoes are considered, the annual probability that at least 1 cm (0.4 in.) of tephra might accumulate in central Oregon ranges from about 1 chance in 1,000 to 1 in 5,000 (fig. 4). Although 1 cm of ash may seem a trifling accumulation, the recent experience with Mount St. Helens indicates that as little as 0.5 cm of ash (0.2 in.) is sufficient to bring automobile and truck traffic to a crawl and to close businesses for as much as a week or two.

Hazard zone for lahars or floods on Paulina Creek

Lahars of greatest concern at Newberry volcano would be those produced in the Paulina Creek drainage on the west side of the volcano, where we show a lahar-hazard zone on plate 1. Small valleys on other flanks, especially on the northeast, could be subject to lahars or floods initiated when pyroclastic flows or surges melt part of a snowpack; forest roads, however, are the only developments at risk in these areas. We don't show a specific lahar-hazard zone in these areas, but effects of lahars and flooding in these areas would be greatest along small valleys in the hazard zone for explosive pyroclastic eruptions and extend downstream into lava-flow hazard zone LA.

The lahar-hazard zone along Paulina Creek encompasses areas that could be inundated by lahars or floods generated by volcanically induced melting of snowpack, by eruptions in Paulina Lake, or by water rapidly displaced when pyroclastic flows enter the lake. We estimate that flows would likely have discharge rates as great as 5,000 cubic meters per second [C]. Such a flow would be contained by Paulina Creek canyon, but if the flow were larger, water would spread as a broad sheet flood across the upland surface west of the caldera rim. There it would either infiltrate or be redistributed among many small channels that lead back into Paulina Creek. This upland area of potential flooding is shown stippled on the hazard zonation map (plate 1).

The downstream reach of Paulina Creek is of greater concern, owing to inhabited sites, highway and railroad routes, and major interstate electric transmission lines and natural gas pipelines in the area north of La Pine. Where Paulina Creek leaves the confines of its canyon, it diminishes in gradient and forms a broad alluvial fan. Lahars could spread across Paulina Prairie and extend north along the flood

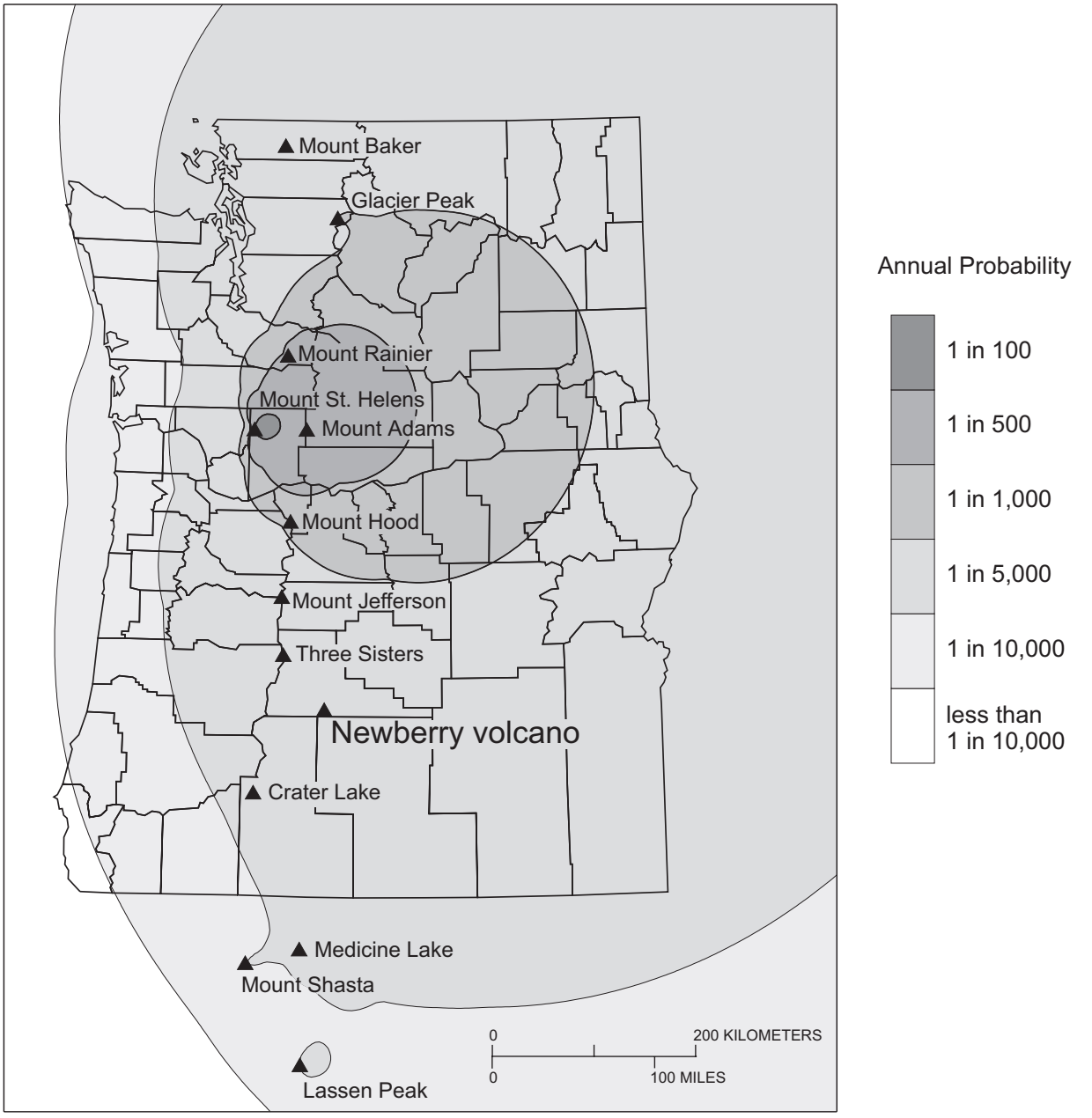


Figure 4. Map showing annual probability of 1 cm or more of tephra accumulation in Washington, Oregon, and northern California from eruptions throughout the Cascade Range. Probability distribution reflects the frequency of explosive eruptions at each major volcano, the variability in the thickness of tephra that could be deposited at various downwind distances, and the variability in wind direction [E].

plain of Paulina Creek to its confluence with the Little Deschutes River. Such lahars or floods could bury or destroy U.S. Highway 97 and tracks of the Burlington Northern-Santa Fe Railway Co.

The 100-year flood plain of the Little Deschutes River downstream from Paulina Creek is also included in the hazard zone for lahars and flooding in the event of volcanically induced surges of water from Paulina Lake. The hazard zone ends at the confluence of the Little Deschutes and Deschutes Rivers [D], but effects of flooding could extend some unknown distance dowstream along the channel and flood plain of the Deschutes River.

Hazard zone for volcanic gases

Gas presently discharges from hot springs in Paulina and East Lakes and from a gas vent (fumarole) at Lost Lake near the Big Obsidian Flow. Water vapor and carbon dioxide (CO_2) are major components in the gas. The gas has an odor of rotten eggs (hydrogen sulfide), but its noxious components are currently in very low concentrations.

Gas in the caldera is of little consequence unless the discharge rate were to increase substantially. The hazard zone for gases is restricted to the caldera, owing to the presence of known gas seeps there and the numerous small topographic depressions found upon the caldera floor. Even with increased gas discharge, atmospheric circulation would probably be adequate to disperse the gas and reduce the hazard in most settings. For example, the broad open basins of Paulina and East Lakes are sufficiently well ventilated that accumulation of gases to dangerous levels is unlikely. However, caves and depressions on the young rugged obsidian flows and elsewhere in the caldera are natural sites where accumulation of carbon dioxide and other gases that are denser than air could become lethal. Artificially created enclosures such as manholes, excavations, tents, or snowcaves present the greatest danger of trapping and concentrating gas sufficient to threaten lives.

Some readers may be familiar with rare events in which volcanic lakes trap carbon dioxide in their lower levels for several years and then release the gas catastrophically. In 1986, 1,700 people living near Lake Nyos, Cameroon, were asphyxiated in this manner. Fortunately, such an event is highly improbable at Newberry caldera. Paulina and East Lakes are not deep enough and their water mixes too well during the year to accumulate sufficient carbon dioxide to produce a deadly gas release.

Hazard zones for lava flows of basaltic flank eruptions

Renewed flank eruptions would produce cinder cones or fissure vents and lava flows. Eruptions would probably include several lava flows, possibly from more than one vent, during a time interval we call an eruptive period. Such periods might range in duration from weeks to a decade. We define two lava-flow hazard zones for Newberry on the basis of likelihood of future lava flows within each zone. Lava-flow hazard zone LA encompasses the area more likely to be the site of flank vents or to be covered by lava, including the caldera. Zone LB includes two main areas: (1) areas on the lower flanks of Newberry that have relatively few flank vents and are chiefly covered by large lava flows from vents farther upslope and (2) lava flows from vents elsewhere in the Cascade Range or Basin and Range. Particular sites that might be affected within each zone cannot be specified in advance. Once precursory activity or a lava-flow eruption begins, scientists can better define areas likely to be affected.

The outer boundary of lava-flow hazard zone LA is determined by encircling the part of the volcano with greatest density of vents as determined by geologic mapping. As shown on the hazard-zonation map, the outline of zone LA broadly defines the elongate shape of Newberry volcano itself, consistent with the idea that the volcano has grown by the repeated eruption of lava from vents preferentially located on the north and south flanks and in the summit region. Indeed, the topographic contour lines may themselves be thought of as probabilistic contours, with likelihood of eruption increasing at higher elevations on the volcano. The caldera, which originated by repeated collapse, is an obvious exception to this concept of linking elevation and eruption probability.

The probability that a flank eruption will affect a given area in zone LA can be estimated only approximately because the frequency of such eruptions prior to the last ones about 7,000 years ago are so poorly known. We infer that the annual probability of a flank eruption occurring in zone LA is roughly 1 in 5,000 to 1 in 10,000. But because lava flows of a flank eruptive period would cover only part of zone LA, the annual probability of a given point in the zone being covered by a lava flow is less than 1 in 10,000, perhaps substantially less. Within zone LA the probability would be somewhat higher near the caldera and along rift zones and

somewhat lower at the outer boundary. Again, we caution that these probabilities are based solely on the long-term behavior of the volcano. Any signs of increased restlessness at Newberry volcano will increase these probabilities dramatically.

Another way to estimate a probability is to consider the results from deep drilling midway along the north and south flanks. These holes, located at roughly the 1,700-m elevation (5,600 ft) on the volcano (see plate 1), indicate that lava flows about 600 m (2,000 ft) in total thickness have been emplaced during the past 600,000 years. From studies at Newberry and other Cascade volcanoes and volcanic fields, we estimate that 10-20 m (33-66 ft) is a representative range for the average thickness of a field of lava flows that would accumulate during an eruptive period. Therefore, the 600 m of material in a drillhole would record 30-60 eruptive periods, or an average frequency of burial of that point of once every 10,000-20,000 years at the middle elevations of the volcano. Such frequencies represent annual probabilities (1 in 10,000 to 1 in 20,000) that are similar to those estimated above.

Lava-flow hazard zone LB encompasses the entire hazard-map area beyond zone LA. Zone LB includes areas on the lower flanks and downslope from Newberry volcano and elsewhere in the region that have been affected by lava flows less frequently than areas in zone LA. Sources for flows include Newberry volcano or, toward the edges of the map area, other volcanoes in the Cascade Range or central Oregon. We estimate that the annual probability of an eruption in this zone or of lava flows invading the zone from vents in zone LA is roughly 1 in 100,000, or less, on the basis of the frequency of lava-flow coverage in the past one million years and the few, widely scattered vents in the region.

Could eruptions occur in Bend? Could La Pine witness the growth of a small cinder cone? Could lava flows reach the Fort Rock Post Office? The answer to all these questions is yes, but the probability is exceedingly small. Pilot Butte and a handful of other small vents have erupted during the past 500,000 years within what is now the city of Bend. Lava flows that erupted from the flanks of Newberry volcano once progressed across the plain north of Bend, reaching 25 km (16 mi) beyond Redmond (fig. 1). Geologically, central Oregon is a volcanic terrane, and volcanic activity can be expected in the future. Fortunately for our homes and businesses, eruptions recur infrequently in these more developed areas.

Hazards from large-magnitude explosive eruptions of low probability

How large an eruption is possible at Newberry volcano? The worst-case scenario is for a large-magnitude explosive eruption or even another caldera-forming eruption, the very process that has occurred at least twice in the past 600,000 years to form Newberry Crater. Such a low frequency of occurrence suggests that the annual probability of another such event is no greater than 1 in 100,000. Another famous example of a caldera-forming eruption created Crater Lake, Oregon, about 100 km (60 mi) southwest of Newberry volcano. A caldera-forming eruption would include violent showers of pumice and ash that could continue for days and deposit several meters of tephra on the volcano. Devastating pyroclastic flows could sweep out for 50 km (30 mi) from the volcano. Today, however, the volcano shows no signs of the volcanic buildup that would precede such a devastating eruption. Although preparing for an event of such small probability is unreasonable, we should nonetheless understand the events that would occur during the maximum credible event.

A question commonly asked is whether Newberry volcano could produce an event similar to the large lateral blast that devastated more than 500 km^2 (200 sq. miles) when Mount St. Helens erupted in May 1980. Prior to eruption, a large landslide slipped from the north side of Mount St. Helens after magma had accumulated in the volcano's throat. The effect was to abruptly uncork a pressurized mixture of magma and gas, freeing it to surge across the landscape. At Newberry volcano, such a lateral blast is unlikely. Newberry is broad and gently

sloping, not a steep-sided cone like Mount St. Helens or other Cascade composite volcanoes. Magma rising into the shallow crust at Newberry volcano would be buttressed by a substantial mass of rock. Small slope failure and associated blasts could conceivably be associated with eruptions near but slightly beyond the caldera walls. The resulting hazards would be confined to the hazard zone for explosive eruptions.

MONITORING AND WARNINGS

Future eruptions at Newberry volcano will be preceded by premonitory activity. Earthquakes associated with rising magma most likely will give days or weeks of advance warning. Changes in the composition, temperature, or volume of volcanic gases emanating from hot springs and fumaroles might also indicate that an eruption is about to occur. Increased gas discharge could lead to tree kills as observed recently at Mammoth Mountain, California, providing another indication that volcanic gas concentrations were increasing to dangerous levels. When any of these events are recognized, emergency-management agencies would be contacted immediately and the level of monitoring would be increased.

Newberry volcano is monitored by the U.S. Geological Survey (USGS). A regional network of seismometers for measuring earthquakes is operated jointly by the USGS and the Geophysics Program at the University of Washington. The USGS conducts periodic leveling surveys across the volcano to assess the volcano's elevation profile. The leveling stations will be remeasured in the event of future earthquake swarms to look for changes that may indicate the volcano is swelling in response to magma injection. Hot-spring gases and caldera lake waters are sampled intermittently. Given Newberry's inactivity, this level of monitoring is appropriate and economical.

At Newberry volcano, much of the area in hazard zones lies within the Deschutes National Forest. The near-absence of people living in the higher-hazard areas on the upper flanks of the volcano simplifies the often complex economic and social aspects of hazard management. Distal parts of the lahar hazard zone on the west flank are already managed as flood plains along Paulina Creek and the Little Deschutes and Deschutes Rivers. Areas subject to lahars that aren't in these flood plains are limited in size but include several subdivisions north of La Pine. People living in these areas at some distance from urban centers need to know about volcano hazards and be prepared to make informed decisions on their own. Planning is prudent because once an emergency begins, public resources may be overwhelmed, and citizens may need to provide for themselves.

SUGGESTIONS FOR FURTHER READING

Volcano hazards in general

Blong, R.J., 1984, Volcanic hazards-—a sourcebook on the effects of eruptions: Orlando, Fla., Academic Press, 424 p.

- Probably the most complete reference on volcanic hazards-—including the effects on people, infrastructure, and economic activity. Many examples from specific volcanoes, but not overly technical in its presentation.

Casadevall, T.J. (ed.), 1994, Volcanic ash and aviation safety: Proceedings of the First International Symposium on Volcanic Ash and Aviation Safety: U.S. Geological Survey Bulletin 2047, 450 p.

- Several near-tragic encounters between jet aircraft and ash during the past two decades have led to an improved protocol for avoiding ash or to escape safely whenever an ash plume is encountered accidentally. This report contains numerous articles that explain the effects of ash on aircraft and provide advice to pilots.

Warrick, R.A, and six other authors, 1981, Four communities under ash: after Mount St. Helens: Boulder, Colo., University of Colorado Institute of Behavioral Science Monograph No. 34, 143 p.

- Written in a clear, nontechnical style, this report compares the effects of ash on transportation, public facilities, and businesses in four towns located at increasing distance downwind from Mount St. Helens. The startling conclusion is that even thin ash deposits can cripple a town or city,

and 0.5 inch or more of ash creates a hazard with impacts lasting for weeks or months. This short book is of special interest to city and county elected officers, city managers, fire and police staff, hospital administrators, or anyone involved in emergency preparedness planning.

Geology and eruptive history of Newberry volcano

Chitwood, L.A., 1990, Newberry, *in* Wood, C.A., and Kienle, Jürgen, eds., Volcanoes of North America: United States and Canada, Cambridge, Mass., Cambridge University Press, 354 p.

- A concise summary of Newberry's volcanic history is found on p. 200-202. Available in many libraries or from local booksellers.

Jensen, R.A., 1988, Roadside guide to the geology of Newberry volcano: Bend, Oreg., CenOreGeoPub (20180 Briggs Road, Bend, OR 97701), 75 p.

- A friendly, descriptive road log for geologic field trips around Newberry volcano and into Newberry Crater.

MacLeod, N.S., Sherrod, D.R., Chitwood, L.A., and Jensen, R.A., 1995, Geologic map of Newberry volcano, Deschutes, Klamath, and Lake Counties, Oregon: U.S. Geological Survey Miscellaneous Investigations Map I-2455, scales 1:62,500 and 1:24,000.

- A full-color geologic map and pamphlet explaining many aspects of the geology at Newberry volcano. Available from stores locally, from Oregon Department of Geology and Mineral Industries (ph: 503-731-4100), or from USGS Distribution Center (ph: 303-202-4693). The Oregon Geology store may have the best price if ordering fewer than four maps.

ENDNOTES

[A] The banks of upper Paulina Creek were stripped of Mazama ash and bedrock channels were eroded sometime after about 7,500 years ago (Jensen, R.A., and Chitwood, L.A., 1996, Evidence for recent uplift of caldera floor, Newberry volcano, Oregon [abs.]: Eos [American Geophysical Union Transactions], v. 77, no. 46, p. F792). Cross sectional areas of the flood channel, determined by finding the height above creek floor at which Mazama ash is preserved, range from 90 to 230 sq. meters (1,000-2,500 sq. ft) (L.A. Chitwood, written commun., 1996). The flow volume and velocity we use in our worst-case flooding analysis [endnote B] requires cross sectional area of 500 sq. meters.

[B] Few published examples are available for volcanoes that have displaced water from their summit lakes during eruptions. A large eruption involving much nonmagmatic debris at Ruapehu Volcano, New Zealand, in 1975 ejected about 23 percent of the water from that lake (roughly 1.6 million cubic meters (m^3) of water and lake-floor sediment) in a few hours (Nairn, I.A., Wood, C.P., and Hewson, C.A.Y., 1979, Phreatic eruptions of Ruapehu: April 1975: New Zealand Journal of Geology and Geophysics, v. 22, no. 2, p. 155-173.). Most of the water was thought to be ejected during surges, and most washed back into the lake following each explosion. The eruptions were not observed because they occurred at night, but they produced floods with maximum estimated discharges as great as 5,000 m^3 per second at gaging stations 5-6 km (3-4 mi) downstream in several drainages. Average flow velocities of the floodwater ranged from about 5.5 m per second to 12 m per second (11 to 27 mi per hour), with higher values close to the volcano in those drainages having higher discharges.

The explosions took place during a heavy rainstorm with strong winds. It was surmised that the winds directed a disproportionate amount of water into those drainages where higher discharges were recorded. The snow pack on the volcano was low, so snowmelt contributed little to the flooding.

The Ruapehu lake is only 500 m in diameter, compared to Paulina Lake's 1,300-m diameter (1,640 ft compared to 4,260 ft diameter). Paulina Lake's larger size might pose a larger hazard, but its larger volume and greater depth would absorb substantially more of the energy released during the explosion, perhaps actually reducing the amount of water expelled.

[C] Maximum discharge on the upper part of Paulina Creek would probably be on the order of a few thousand cubic meters per second, using the Ruapehu example described in note B. To calculate inundation levels on Paulina Creek, a discharge throughout the channel of ~5000 m^3 per second (180,000 cfs) and an average velocity of 10 m per second was assumed (on basis of measurements at Ruapehu).

A flow of 5,000 m^3 per second with a velocity of 10 m per second would raise the stream level such that the inundated cross-sectional area equals

500 m^2. Using 1:24,000-scale topographic maps, the level of inundation required for the flow to occupy 500 m^2 was calculated at stream profiles every 400 m or so down Paulina Creek from Paulina Lake to Paulina Prairie. The inundation remains entirely within the Paulina Creek canyon.

Discharge could either decrease, remain constant, or increase with distance downstream, depending on whether this flood represented a brief surge from the lake, whether it was prolonged, whether it bulked up to a debris flow along the stream course, or whether a snowpack was present in the overflow area. Presuming that discharge remains near-constant downstream as far as Paulina Prairie, then the flood behaves roughly as a steady-state water flood or an impulsive lahar.

For readers interested in comparing these flow rates with the maximum discharge resulting solely from weather-related flooding on central Oregon streams and rivers, we recommend the following reference: Moffatt, R.L., Wellman, R.E., and Gordon, J.M., 1990, Statistical summaries of streamflow data in Oregon: Volume 1—Monthly and annual streamflow, and flow-duration values: U.S. Geological Survey Open-File Report 90-118, 413 p. Some of this data for the Deschutes River basin may be accessed electronically on the World Wide Web using the following Uniform Resource Locator:

http://wwworegon.wr.usgs.gov/data_dir/mans_dir/actv94.html#HDR12

[D] From Paulina Prairie downstream to the Little Deschutes River, the stream valley is too broad to determine inundation levels without far more precise contouring of the ground surface than the 20-ft contour interval shown on published maps. Also, modeling the flow in the absence of confining valley walls is problematic. Consequently, the lahar hazard-zone boundaries have their greatest subjectivity along this stretch of stream. Downstream from Paulina Prairie, the hazard zone is drawn to encompass the flood plain.

From Paulina Prairie downstream, discharge would decrease for lahars, owing to deposition of entrained material. For impulsive floods, discharge would also decrease downstream as the peak flood height attenuates with distance.

[E] Tephra hazard zones generated by computer program developed by R.P. Hoblitt (U.S. Geological Survey, Cascades Volcano Observatory, written commun., 1996).

[F] We are indebted to Norm MacLeod (U.S. Geological Survey, ret.) and Larry Chitwood (U.S. Forest Service, Deschutes National Forest), whose reviews of the manuscript both improved its final presentation and sharpened our thinking about the probability and extent of hazard zones. David Leslie (Deschutes County Community Development Department) provided advice and maps for flood plains and downstream flooding hazards. Bob Jensen (Deschutes National Forest) has continued to probe and describe the geologic mysteries of Newberry volcano, some of which have a bearing on our interpretation of hazards.

MAP EXPLANATION

This map delineates volcano−hazard zones that could be affected by future eruptions and other hazardous volcanic events in the Three Sisters region. As described in the accompanying report, eruptions at the composite volcanoes, including South and Middle Sister, are characterized by explosive venting of tephra, generation of pyroclastic flows, and extrusion of lava flows. Pyroclastic flows can melt snow and ice to produce lahars and floods. Tephra fall from a volcano in the Three Sisters region or one of the other volcanic centers in the Cascade Range can blanket areas far downwind from vents (see **regional tephra-hazard maps** below). Landslides on the high peaks in the Three Sisters region can be triggered by eruptions, but can also occur without eruptive activity. Such landslides, called debris avalanches, can also transform into lahars that surge further downstream. In addition to the composite volcanoes, scores of mafic volcanoes [2],[1] including Mount Washington, Belknap Crater, and Mount Bachelor, are scattered throughout the region and define a broad lava−flow hazard zone within which a new mafic volcano could erupt and generate chiefly tephra falls and lava flows.

Boundaries between hazard zones do not represent sharp changes in hazards. Rather, the degree of hazard decreases gradually in a down−valley direction and, for various types of flows, more rapidly as elevation above valley floors increases.

Rare eruptions of much greater magnitude than those used to define the hazard zones on this map have originated during the past one−half million years in the area occupied by the Three Sisters and Broken Top. Such an eruption today would seriously affect much of the region, including Bend and Sisters, but the annual probability of such great eruptions is very low, less than 1 in 100,000.

[1] Numerals in brackets refer to end notes in report.

Proximal Hazard Zone

Areas subject to rapidly moving, devastating pyroclastic flows, debris avalanches, and lahars [3], some of which could reach the hazard −zone boundary in less than a few minutes. Areas are also subject to ballistic projectiles and lava flows. Several valleys that drain high peaks are also subject to small lahars generated by failure of glacial moraine dams that impound small lakes [4]

Distal Hazard Zones

Valleys heading on high peaks of the Three Sisters region that are subject to lahars generated by pyroclastic flows and to debris avalanches and lahars originating on steep upper volcano flanks. Distal hazard zones are subdivided into three nested zones on the basis of a range of hypothetical lahar volumes and associated ranges of lahar probability [5]. Because large lahars are less likely to occur than are small lahars, the nested distal hazard zones show that the likelihood of lahar inundation decreases as distances from volcanoes and elevations above valley floors increase.

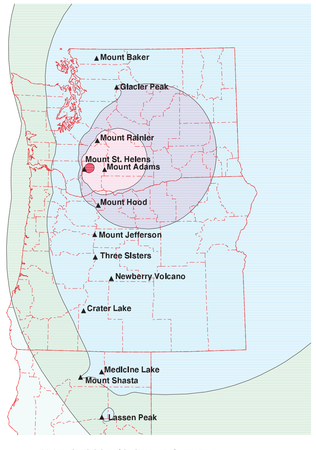
- 20 million cubic meter hypothetical lahar
- 100 million cubic meter hypothetical lahar
- 500 million cubic meter hypothetical lahar

Regional Lava Flow Hazard Zone

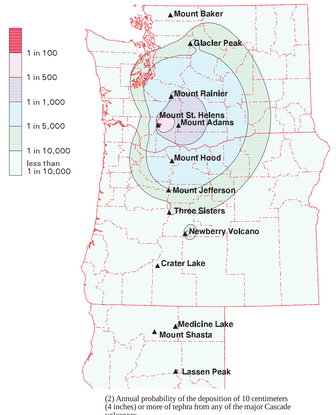
Area that could be affected by eruptions of mafic volcanoes [2]. Hazards include localized thick tephra fall, ballistics, and pyroclastic flows near vents, and lava flows that typically travel less than 10 to 15 kilometers (6 to 9 miles), but rarely 15 to 20 kilometers (9 to 12 miles)

Hazard-zonation map for Mount Jefferson adjoins this map. See USGS Open-File Report 99-24

Regional Tephra- Hazard Maps



(1) Annual probability of the deposition of 1 centimeter (0.4 inches) or more of tephra from any of the major Cascade volcanoes.



(2) Annual probability of the deposition of 10 centimeters (4 inches) or more of tephra from any of the major Cascade volcanoes.

Newberry Volcano Hazard Zones
See USGS Open-File Report 97-513

0 5 10 MILES
0 5 10 KILOMETERS

Contour interval of 50 meters for upper- left and lower- left portion of map. Contour intervals of 40 or 50 meters with supplementary contour interval of 10 meters for upper- right portion of map. Contour interval of 50 meters with supplemental contours of 25 meters for lower- right portion of map.

Base compositied in digital form by Steven P. Schilling from U.S. Geological Survey, Bend (1980), La Pine (1986), Oakridge (1983) and McKenzie River (1983) 1:100,000 scale maps.
Data for hydrography, culture, transportation, and boundaries from U.S. Geological Survey (EROS Data Center) Digital Line Graph files. Digital Line Graph hypsography (topographic contours) created from U.S. Geological Survey blackline clear-films by Pacer Infotec, Inc., Portland, Oregon.

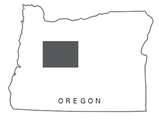
Universal Transverse Mercator projection, Zone 10

1927 North American Datum

VOLCANO HAZARDS IN THE THREE SISTERS REGION, OREGON

By

William E. Scott, Richard M. Iverson, Steven P. Schilling, Bruce J. Fisher



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Volcano Hazards in the Three Sisters Region, Oregon

Open-File Report 99-437

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Volcano Hazards in the Three Sisters Region, Oregon

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Illustrations

Cover photograph: Aerial view from southeast of Three Sisters volcanic center (South, Middle, and North Sister left of center; Broken Top right of center). Light colored areas on south flank of South Sister are 2,000-yr-old lava flows. Much of area on lower flanks of Broken Top is mantled by pumice and ash erupted just prior to emplacement of these lava flows. *Photo by William E. Scott, USGS*

Volcano Hazards in the Three Sisters Region, Oregon

By W.E. Scott, R.M. Iverson, S.P. Schilling, and B.J. Fischer

Summary

Three Sisters is one of three potentially active volcanic centers that lie close to rapidly growing communities and resort areas in Central Oregon. Two types of volcanoes exist in the Three Sisters region and each poses distinct hazards to people and property. South Sister, Middle Sister, and Broken Top, major composite volcanoes clustered near the center of the region, have erupted repeatedly over tens of thousands of years and may erupt explosively in the future. In contrast, mafic volcanoes, which range from small cinder cones to large shield volcanoes like North Sister and Belknap Crater, are typically short-lived (weeks to centuries) and erupt less explosively than do composite volcanoes. Hundreds of mafic volcanoes scattered through the Three Sisters region are part of a much longer zone along the High Cascades of Oregon in which birth of new mafic volcanoes is possible.

This report describes the types of hazardous events that can occur in the Three Sisters region and the accompanying volcano-hazard-zonation map outlines areas that could be at risk from such events. Hazardous events include landslides from the steep flanks of large volcanoes and floods, which need not be triggered by eruptions, as well as eruption-triggered events such as fallout of tephra (volcanic ash) and lava flows. A proximal hazard zone roughly 20 kilometers (12 miles) in diameter surrounding the Three Sisters and Broken Top could be affected within minutes of the onset of an eruption or large landslide. Distal hazard zones that follow river valleys downstream from the Three Sisters and Broken Top could be inundated by lahars (rapid flows of water-laden rock and mud) generated either by melting of snow and ice during eruptions or by large landslides. Slow-moving lava flows could issue from new mafic volcanoes almost anywhere within the region. Fallout of tephra from eruption clouds can affect areas hundreds of kilometers (miles) downwind, so eruptions at volcanoes elsewhere in the Cascade Range also contribute to volcano hazards in Central Oregon.

This report is intended to aid scientists, government officials, and citizens as they work together to reduce the risk from volcano hazards through public education and emergency-response planning.

Introduction

Large snow-covered volcanoes of the Three Sisters volcanic center dominate Central Oregon's landscape between Santiam Pass in the north and Willamette Pass in the south, an area of widespread volcanic activity that for purposes of this report we call the Three Sisters region. Rapidly developing areas in Deschutes County occupy the eastern border of the region, and westward several small communities dot the McKenzie River valley along its course to the Eugene-Springfield metropolitan area. Three Sisters volcanic center, one of three volcanic centers in Central Oregon along with Newberry volcano and Mount Jefferson, has erupted repeatedly for hundreds of thousands of years, most recently about 1,500 years ago. When a volcano erupts again in the Three Sisters region, areas close to the erupting vent will be severely affected. Even areas tens of kilometers (or miles) downstream along the valleys that head near the vent may be at risk, as may be areas hundreds of kilometers (miles) downwind. Moreover, areas along valleys that head on slopes of large, steep volcanoes can be affected by landslides, floods, and debris flows that can occur without eruptive activity. This report describes the kinds of hazardous geologic events that have occurred in the Three Sisters region in the past and shows, in the accompanying volcano-hazard-zonation map, which areas will likely be at risk during future such events.

Past Hazardous Events

The last eruption in the Three Sisters region occurred before written records were kept. Therefore, we rely on geologic study of deposits formed by prehistoric events to assess the frequency, type, and scale of past eruptions, which serve as a guide for forecasting the character of future eruptions *[1; numerals in brackets refer to notes listed at the end of this report]*. We also use data from similar volcanoes around the world to gain a general idea of possible eruption scenarios and hazards.

Two Types of Volcanoes

Two types of volcanoes are found in the Three Sisters region—composite and mafic. ***Composite volcanoes*** are restricted to the Three Sisters volcanic center, erupt episodically over tens to hundreds of thousand of years, build large cones, and can display a wide range of eruption styles and explosivity. Middle and South Sister are composite volcanoes that have been active frequently during the past 100,000 years. Broken Top, a more deeply eroded composite volcano, has probably not been active during this period. ***Mafic volcanoes*** *[2]* typically erupt for brief time intervals (weeks to perhaps centuries), but some can grow almost as large as composite volcanoes. Subsequent eruptions in the region typically issue from new vents and, over tens to hundreds of thousands of years, build broad fields of many volcanoes. Prominent mafic volcanoes in the Three Sisters region include North Sister, Mount Bachelor, Belknap Crater, Black Butte, and Mount Washington. Hundreds more mafic volcanoes form the High Cascades of central Oregon between the neighboring composite volcanoes of Mount Jefferson, 60 kilometers (40 miles) north of Three Sisters, Newberry volcano, a similar distance southeast, and Crater Lake, 120 kilometers (75 miles) south (Figure 1).

Hazardous Events at Composite Volcanoes

All of the types of hazardous events depicted in the accompanying illustration of a composite volcano (Figure 2) have occurred at South and Middle Sister in the past and could occur in the future. Most are driven by the eruption of molten rock, or ***magma***, but some, like debris avalanches and some lahars, can occur even without eruptive activity.

As magma nears the surface, gases dissolved in the magma are released. Rapid release can fragment the magma and propel it upward from the vent in a rush of expanding hot gas. The resulting solidified rock fragments, called ***tephra***, range in size from large bombs (fist-sized up to 1 meter or more in diameter) to fine dust. Large tephra particles will fall back to the ground within a few kilometers (miles) of the vent, but frothy pumice particles and ash (ash is tephra that is sand-sized and finer) can rise more than ten kilometers (30,000 feet) upward in an eruption cloud. As the cloud drifts downwind, tephra falls out and blankets areas for tens to hundreds of kilometers (miles) away. Unless tephra blankets reach thicknesses great enough to collapse roofs, tephra falls offer little direct threat to life or structures, but tephra clouds can create tens of minutes to hours of darkness as they pass over a downwind area, even on sunny days, and reduce visibility on highways. Ash suspended in air can irritate eyes and respiratory systems, and prolonged inhalation of certain kinds of tephra can cause chronic lung disease. Deposits of tephra can topple or short-circuit electric transformers and power lines, especially if the tephra is wet, which makes it adhere to surfaces. Tephra ingested by vehicle engines can clog filters and increase wear. Tephra clouds commonly generate lightning that can interfere with electrical and communication systems and start fires. Finally, and perhaps most importantly, even small, dilute tephra clouds pose great hazards to aircraft that fly into them.

Lessons learned during the 1980 eruption of Mount St. Helens in downwind Washington communities such as Yakima, Ritzville, and Spokane are now used throughout the Pacific Northwest and elsewhere to prepare governments, businesses, and citizens for future tephra falls. These three communities experienced significant disruptions in transportation, business activity, and community services as a result of fallout of

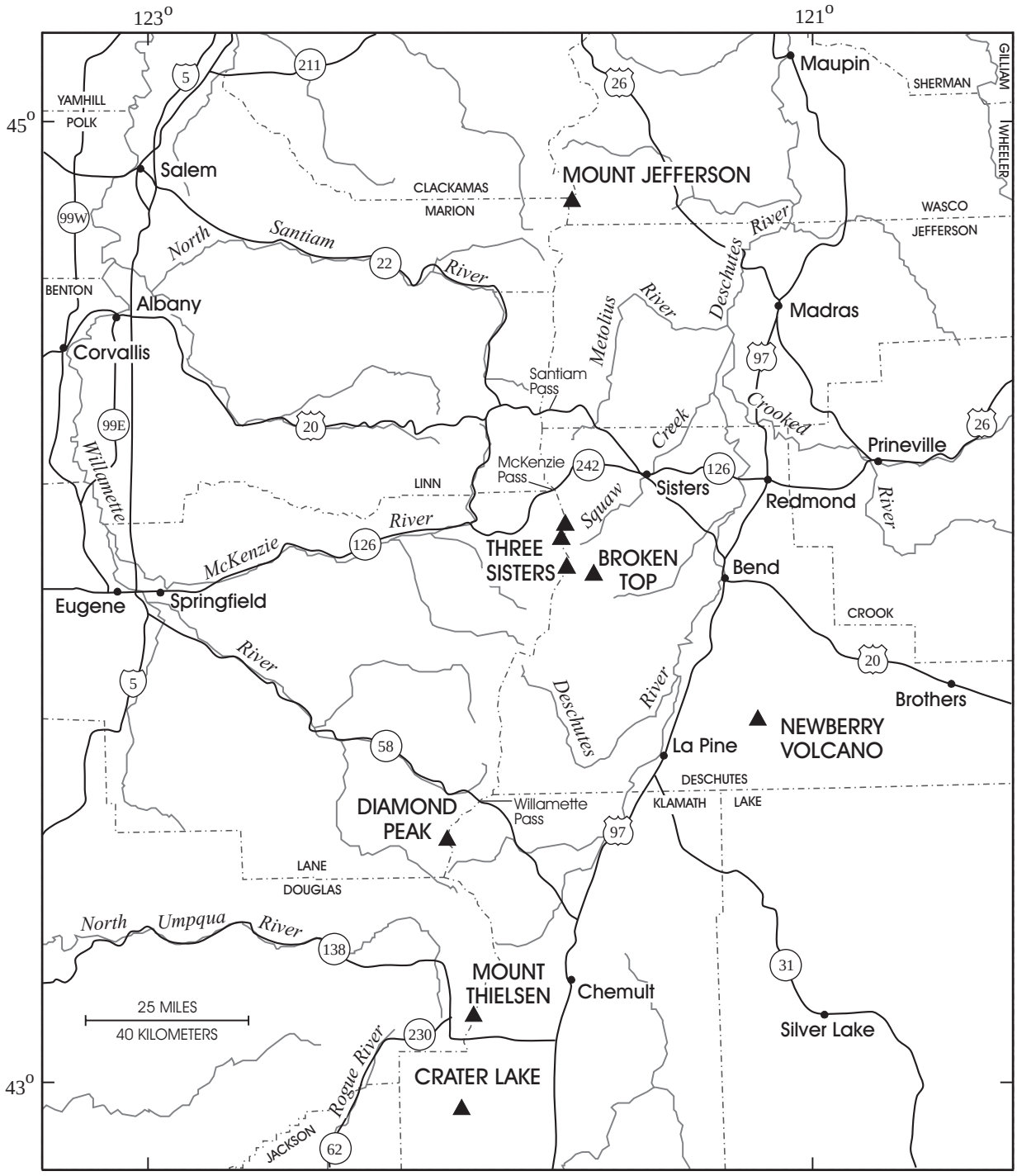

Figure 1. Regional setting of Three Sisters region in Central Oregon showing major rivers, highways, cities, and counties.

from 0.5 to 8 centimeters (1/4 to 3 inches) of tephra. The greater the amount of tephra that fell, the longer a community took to recover. As perceived by residents, tephra falls of less than 0.5 centimeters (1/4 inch) were a major inconvenience, whereas falls of more than 1.5 centimeters (2/3 inch) constituted a disaster. Nonetheless, all three communities recovered to nearly normal activities within two weeks.

If all or part of a rising eruption column is denser than the surrounding atmosphere, a slug of tephra and hot gas can collapse downward to form

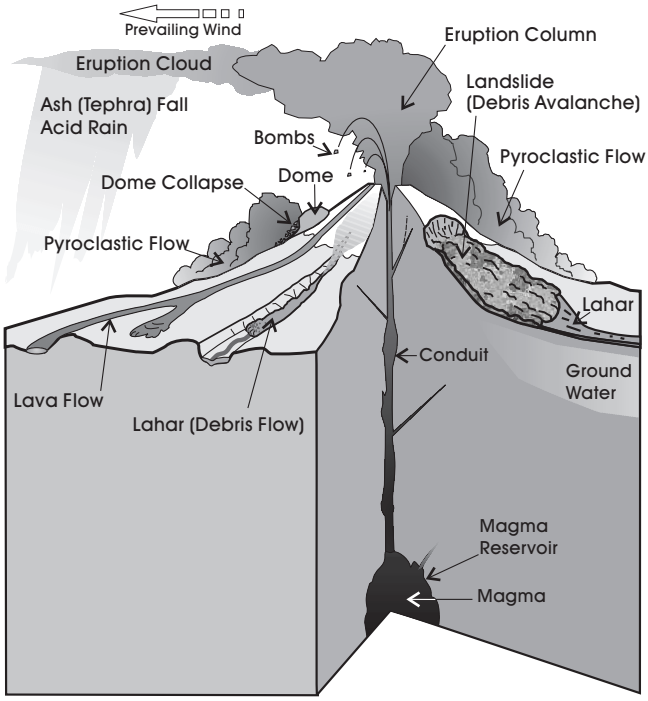

Figure 2. Hazardous events at composite volcanoes. *Illustration modified from USGS Fact Sheet 002-97*

a ***pyroclastic flow***, a mobile, hot (hundreds of degrees) mixture of rock fragments, ash, and gas that surges down the flanks of a volcano at speeds of 50 to more than 150 kilometers per hour (30-90 miles per hour). Most pyroclastic flows are confined to valley floors, but accompanying clouds of hot ash and gas rise higher and can overwhelm even ridge tops. Owing to their great velocity and high temperature, pyroclastic flows are particularly dangerous hazards to life and property, but pyroclastic flows would probably not travel more than 10 kilometers (6 miles) except in extraordinary events.

Less explosive release of gas from ascending magma results in extrusion of lava (magma that reaches Earth's surface) from vents. Depending on its viscosity and rate of discharge, lava will form a bulbous ***lava dome*** over the vent or a ***lava flow*** that extends several to more than 10 kilometers (6 miles) downslope. Observations of lava flows at similar volcanoes elsewhere suggest that lava flows in the Three Sisters region would move down valleys as tongues of liquid lava a few to tens of meters (10-100 feet) thick encased in a thick cover of hardened lava rubble. Such lava flows can destroy all structures in their paths and start forest fires, but they advance so slowly that they seldom endanger people. Lava domes that grow on steep slopes are typically unstable and collapse repeatedly as they grow higher and steeper. Such collapses are another mechanism by which pyroclastic flows can form.

The latest eruptions on South Sister, which occurred in two closely spaced episodes about 2,000 years ago (Figure 3), illustrate a relatively modest scale of eruptive activity. Initial explosive eruptions produced small pyroclastic flows and tephra fallout from several aligned vents low on the south flank. Tephra fallout deposits more than 2 meters (7 feet) thick, composed of pumice, rock fragments, and ash, blanketed areas within 2 kilometers (1 mile) downwind of vents; at 13 kilometers (8 miles) about 10 centimeters (4 inches) fell. Less than one centimeter (0.5 inch) of ash fell at least as far as 40 kilometers (25 miles) south of the vents (at Cultus Lake) and east of the vents (at Bend). Following tephra eruptions, lava emerged from two vent areas, forming a large lava flow, Rock Mesa, and several small lava domes. Decades to a few centuries later, a similar eruptive sequence occurred along a zone of vents that extended from just north of Sparks Lake to high on the southeast flank of South Sister, as well as along a shorter zone on the north flank near Carver Lake. Some of the lava flows and domes of that episode are shown in the accompanying photograph (Figure 4). Similar-style eruptions, but up to about ten times larger in terms of volume of ejecta, occurred during and just before the last ice age, about 30,000 to 15,000 year ago.

The geologic record shows that even much larger eruptions with much wider impact have occurred in the Three Sisters volcanic center. At least four times in the past 700,000 years, explosive eruptions that were probably sited near the present location of Broken Top and Three Sisters produced pyroclastic flows that swept over a broad area from Sisters to south of Bend. A tephra fallout deposit as thick as 13 meters (42 feet) composed largely of fist-sized and smaller white pumice clasts from one of these eruptions is exposed in numerous pumice quarries. Distal

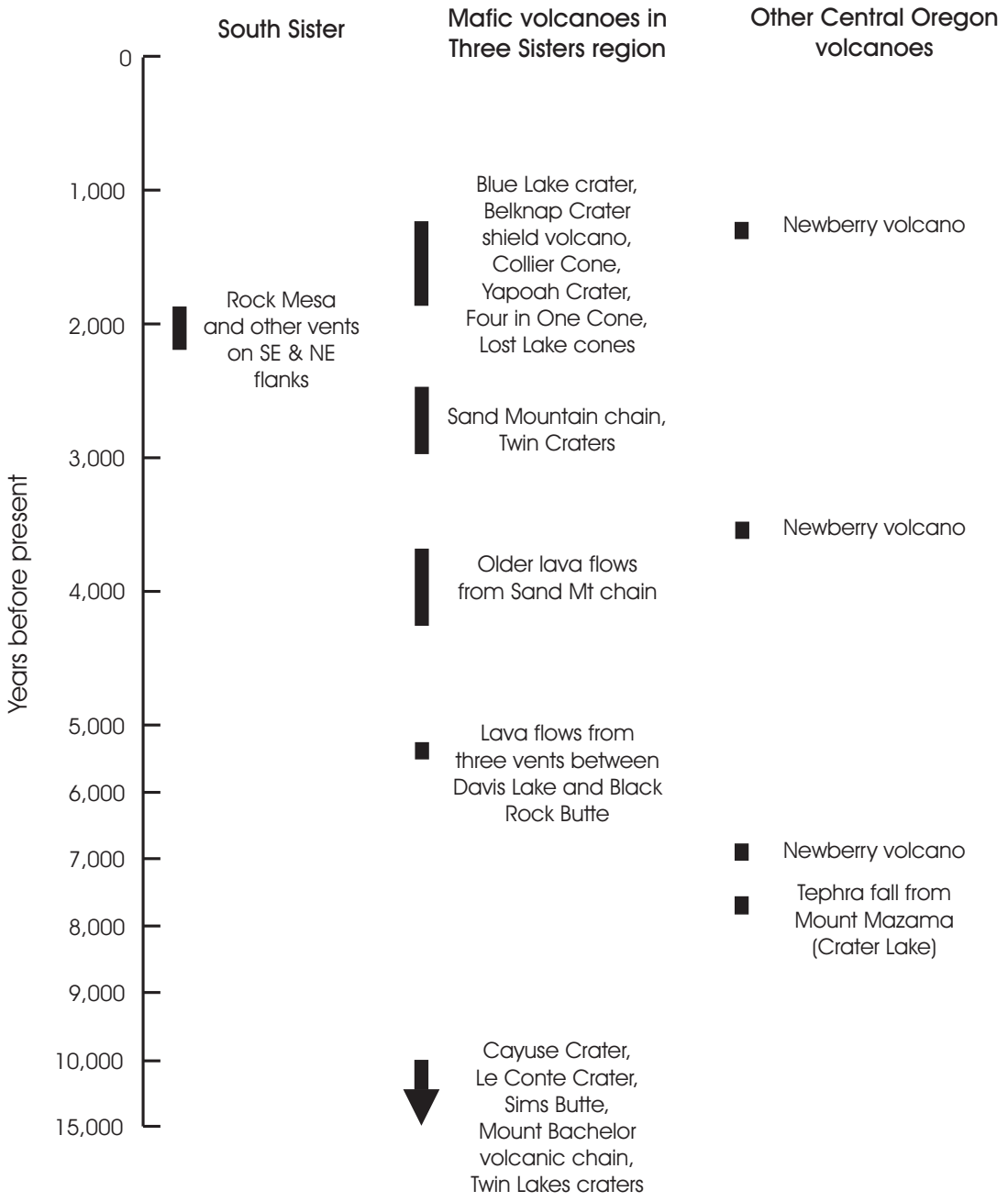

Figure 3. Volcanic activity in the Three Sisters region and other Central Oregon volcanoes during the past 15,000 years *[1]*. Bars indicate approximate age of events or age ranges of several events. Arrow indicates that ages of eruptions are poorly known and may predate 15,000 years ago by several thousand years.

tephra deposits from this event have even been found in northern California and in cores from the northeast Pacific Ocean. Such an event today would be catastrophic for Deschutes County, but, fortunately, events of this magnitude are infrequent. Furthermore, there is no evidence that the large volume of magma necessary to drive such an eruption is present in the Three Sisters region today, nor would such a volume likely be generated in the near future.

Pyroclastic flows on volcanoes like South and Middle Sister can melt snow and glacier ice and

Figure 4. Aerial view of the south flank of South Sister composite volcano showing numerous blocky lava flows erupted about 2,000 years ago. Early eruptions formed Rock Mesa (just above center, far left), a broad flat flow emplaced on nearly level ground. Subsequent eruptions formed a line of lava domes and flows that extend from Sparks Lake meadow (lower right) to Green Lakes (just above center, far right). Several small lava domes were also formed on the northeast flank, out of view. Cratered cone in lower left is Talapus Butte, a basaltic scoria cone. *Photo by William E. Scott, USGS*

generate ***lahars***. Lahars are watery flows of volcanic rocks and mud that surge downstream like rapidly flowing concrete. Lahars can devastate valley floors tens of kilometers (or miles) from volcanoes. Small lahars were generated by eruptions 2,000 years ago. Much larger lahars swept down valleys during earlier eruptions, but their deposits have been largely removed by erosion or buried by younger glacial and stream deposits. During the past century, at least five small lahars were generated by glacier-outburst floods or by failure of glacial-moraine dams that impounded small lakes on each of the Three Sisters and Broken Top. Serious effects of these events were largely restricted to undeveloped areas within 10 kilometers (6 miles) of sources.

The steep upper flanks of volcanoes can collapse and spawn rapidly moving landslides called ***debris avalanches***. Composite volcanoes are particularly susceptible to debris avalanches because ground water warmed by residual volcanic heat and acidified by volcanic gases circulates through porous zones and weakens rock by transforming it to clay. Small debris avalanches produced by failures of rock masses on steep cliffs can be triggered by storms or rapid snowmelt, but the onset of volcanic unrest, with its earthquakes, steam explosions, and intrusion of magma, greatly increases the likelihood of debris avalanches and the probability of catastrophic, large-volume events. The largest debris avalanches involve failure of entire sides of volcanoes, and some contain or acquire sufficient water to transform into lahars that travel down valleys many tens of kilometers (or miles).

Lahars also affect downstream areas by filling stream channels with sediment and by providing a source of sediment for continued erosion and valley filling. Examples from many volcanoes, including Mount St. Helens, show that these effects can persist for years or decades. In such situations channels become unstable and shift rapidly. Channel capacity shrinks and susceptibility to flooding increases.

Hazardous Events at Mafic Volcanoes

Mafic volcanoes typically erupt less explosively than do composite volcanoes, so their eruption impacts are less widespread. Most mafic eruptions in the Three Sisters region have produced limited tephra deposits and lava flows that traveled typically 5-15 kilometers (3-9 miles) and rarely 15-20 kilometers (9-12 miles) from vents. Tephra deposits from such eruptions locally have thicknesses of several meters (6-12 feet) within 2 kilometers (1.2 miles) of vents, but seldom exceed 10 centimeters (4 inches) at distances 10 kilometers (6 miles) away from

vents, and are typically much less. Some eruptions built scoria cones (piles of volcanic rubble centered around vents) with aprons of lava flows, like Pilot Butte in Bend. Others constructed broad shield volcanoes like Belknap Crater (Figure 5) north of McKenzie Pass, which has lava flows that cover 100 square kilometers (40 square miles). At about 1,500 years old, Belknap Crater is one of the youngest mafic volcanoes in the Oregon Cascades. Some mafic eruptions constructed only a single small volcano, probably in a matter of days or weeks, while others involved eruptions along chains of several to tens of vents that may have continued for decades or centuries. The cluster of scoria cones and lava flows in the Sand Mountain area west of Santiam Pass was formed during three eruptive episodes between about 2,000 and 4,000 years ago. Mount Bachelor, a 1,000-meter-high (3,500 feet) mafic shield volcano, lies at the north end of a 25-kilometer-long (15 mile) chain of scoria cones and shield volcanoes that together cover 250 square kilometers (100 square miles). The entire chain formed over a period of several thousand years that ended about 12,000 years ago.

Lava flows that dam or divert streams and rivers generate additional hazards. Lakes formed behind lava dams can submerge large upstream areas depending on dam height and topography. For example, about 7,000 years ago a lava flow from Lava Butte dammed the reach of the Deschutes River just below Sunriver and flooded much of the broad basin from Sunriver to almost La Pine. Popular recreational lakes like Clear Lake in the upper McKenzie valley and Sparks, Elk, and Lava Lakes in the upper Deschutes valley are all dammed by lava flows. Lakes dammed by lava flows can also cause flooding downstream if conditions favor rapid erosion of lake outlets.

The most hazardous events at mafic volcanoes occur when rising magma interacts explosively with surface water or shallow ground water. Such explosions form craters and can generate pyroclastic flows that sweep outward several kilometers. North and South Twin Lakes, near Wickiup Reservoir, fill two of a series of explosion craters formed in this way. Future mafic eruptions in areas of abundant ground or surface water like the basins of Sparks Lake, Crane Prairie, and Wickiup Reservoir might result in this type of explosive activity.

Figure 5. Belknap Crater (on skyline, right of center) and Little Belknap (right) mafic shield volcanoes lie just north of McKenzie Pass. Both are formed of lava flows and scoria deposits that were erupted about 1,500 years ago. *Photo by William E. Scott, USGS*

Volcano-Hazards Zonation Map

The accompanying volcano-hazards zonation map shows areas most likely to be affected by future hazardous geologic events in the Three Sisters region. Individual events typically affect only part of a hazard zone. The location and size of an affected area will depend on the location of the erupting vent or landslide, the volume of material involved, the snow and ice conditions around and down slope from the vent, and the character of an eruption, especially its explosivity.

Hazardous areas around composite volcanoes are divided into ***proximal*** and ***distal hazard zones*** depending on distance from the volcano. Some zones are subdivided further on the basis of their relative degree of hazard. Zone boundaries are positioned on the basis of (1) the magnitude of past events at the volcano, as inferred from deposits; (2) mathematical models that use calibrations from other volcanoes to forecast the probable extent of future pyroclastic flows, debris avalanches, and lahars; and (3) our experience and judgment derived from observations and understanding of events at other similar volcanoes. A regional hazard zone for lava flows of mafic volcanoes is also shown. Hazard zones

for tephra falls are shown as small-scale inset maps.

Although the hazard map shows sharp boundaries for hazard zones, the ***degree of hazard does not change abruptly at these boundaries***. Rather, the hazard decreases gradually as distance from the volcano increases and decreases more rapidly as elevation above valley floors increases. Areas immediately beyond outer hazard zones should not be regarded as hazard-free, because the boundaries can only be located approximately, especially in areas of low relief. Too many uncertainties exist about the source, size, and mobility of future events to locate the boundaries of zero-hazard zones precisely.

Proximal Hazard Zone

The proximal hazard zone includes areas immediately surrounding the three composite volcanoes, Middle and South Sister and Broken Top, and the large mafic volcano, North Sister. This zone, which extends outward from summits for as little as 2 to as many as 10 kilometers (6 miles) depending on local topography, is subject to several types of rapidly moving, devastating flows including pyroclastic flows, debris avalanches, lahars, and dam-break floods *[3]*. Lava flows could also affect these zones, but they would move much more slowly.

On the basis of eruptive activity during the recent geologic past, Middle and South Sister are the most likely locations for explosive eruptions that could generate pyroclastic flows. As in the past, vents may open anywhere on these volcanoes, from the summit to lower flanks. Because such flows are driven by gravity, those that originate at higher altitudes will generally travel farther. Eruptions on these peaks would also melt sufficient snow and ice to generate lahars large enough to extend into the distal hazard zones.

The probability of future explosive eruptions at Middle and South Sister is difficult to estimate from the geologic record owing to its fragmentary nature. Since the last ice age ended, about 12,000 years ago, only two episodes of explosive eruptions occurred at South Sister, and these were so closely spaced in time about 2,000 years ago that we regard them as a single eruptive period that lasted several decades to a few centuries and encompassed numerous separate eruptive events. Erosion by ice-age glaciers makes detailed identification and dating of explosive activity during and prior to the last ice age difficult, but preliminary studies suggest that at least several eruptive periods occurred at South Sister between about 30,000 and 12,000 years ago although none of these periods are well dated *[1]*. This fragmentary record indicates that major periods of eruptive activity may be separated by several thousand to as much as 10,000 years of dormancy, which implies an annual probability of entering a new period of eruptive activity at South and Middle Sister of one in several thousand to 1 in 10,000. However, any signs of restlessness at these volcanoes will increase these probabilities dramatically. Annual probabilities would likewise rise greatly if a volcano were to enter an eruptive period.

South, Middle, and North Sister as well as Broken Top are high, steep-sided peaks that could also produce debris avalanches. Avalanches of modest volume (less than about 10 million cubic meters) are the most probable and would affect areas primarily within the proximal hazard zone. Nevertheless, even modest-sized avalanches that contain sufficient water could transform into lahars that travel well into distal hazard zones. Very large avalanches, those involving hundreds of millions of cubic meters of rock debris would likely be preceded by pronounced volcano deformation driven by intrusion of magma. Such activity would be detectable by seismometers and volcano surveys, and thus would elicit advance warning.

Failure of glacial moraine dams that impound high-altitude lakes around the Three Sisters and Broken Top could release floods of water and debris whose major impact would be restricted to the proximal hazard zone but which could inundate parts of distal hazard zones adjacent to streams. Carver Lake, which lies in the headwaters of the South Fork of Squaw Creek, and the lake on the east side of Broken Top that drains to Sparks Lake by way of Crater Creek and Soda Creek, are judged the most likely lakes to generate future floods or debris flows large

enough to affect areas beyond the proximal hazard zone *[4]*. Others of less hazard include several small lakes in the headwaters of Squaw Creek and the basin (currently with no lake) below Collier Glacier at the head of White Branch.

Distal Hazard Zones

Explosive eruptions or large debris avalanches on the volcanoes in the proximal hazard zone can generate lahars of sufficient volume to travel tens of kilometers (or miles) from source areas. The hazard-zonation map shows that distal hazards from such events are concentrated in the valleys of the McKenzie River and its tributaries (White Branch, Separation Creek, and Horse Creek), the upper Deschutes River, and two Deschutes tributaries (Tumalo and Squaw Creeks). Debris avalanches and lahars will tend to funnel into these valleys as they leave the slopes of the large volcanoes within the proximal hazard zone.

Eruptions 2,000 years ago did not melt enough snow and ice to generate lahars that traveled much beyond the proximal hazard zone. Some previous eruptions probably generated lahars that inundated distal zones, but geologic evidence of such events is scant and provides little guidance to forecasting the extent of lahars that may be produced by future eruptions. Likewise, we have no record of large lahars generated by debris avalanches from which to assess potential hazards. We therefore use a mathematical technique that uses data from other volcanoes to estimate the extent of distal inundation by future lahars of various volumes *[5]*.

For each of the major valleys draining the Three Sisters and Broken Top volcanoes, we computed three nested distal hazard zones that depict anticipated inundation by hypothetical lahars of three volumes. The largest of these hypothetical lahar volumes yields the largest distal hazard zone in each valley; it results from our estimate of the maximum quantity of debris that might descend suddenly from South or Middle Sister. However, such extreme lahars would require wholesale failure of a large part of an upper volcano flank and are unlikely to occur without precursory volcanic activity. The smallest distal hazard zone in each valley depicts anticipated inundation patterns from lahars 25 times smaller, which might occur without volcanic precursors. A hazard zone for only this smallest hypothetical event is shown in the valley of Tumalo Creek on the east side of Broken Top, because larger events are very improbable given the small volume of material available in the drainage area upstream.

Because large lahars are less likely to occur than are small lahars, the nested distal hazard zones show that the likelihood of lahar inundation decreases as distances from volcanoes and elevations above valley floors increase. On the basis of no prior events in the past 10,000 years, we estimate that a lahar voluminous enough to inundate the largest of the distal hazard zones in any valley has an annual probability less than 1 in 10,000. A lahar voluminous enough to inundate the smallest of the distal hazard zones in any valley has a greater annual probability, perhaps between 1 in 1000 to 1 in 10,000. Still smaller lahars that result from phenomena such as moraine-dam failures are much more likely to occur (annual probability greater than 1 in 100 in potentially affected valleys), but are apt to inundate only parts of the smallest distal hazard zones immediately adjacent to streams. In such instances, some debris may travel farther

Figure 6. This house in a distal hazard zone of Mount St. Helens was partly buried by lahars from the 1980 eruption. Note the high mud line on the house and large amounts of woody debris carried by the lahars. *Photo by Lyn Topinka, USGS.*

downstream but stay mostly confined within stream banks.

McKenzie River Valley

White Branch and Separation Creek drain the west slopes of North, Middle, and South Sister. Separation Creek joins the valley of Horse Creek, and the valleys of both Horse Creek and White Branch enter the McKenzie River valley near McKenzie Bridge. Smaller-volume lahars will largely come to rest here as material is deposited in this broad and relatively gently sloping reach of the valley. Parts of these lahars could continue downstream, but be largely restricted to channels and flood plains. The potential exists for deposits in the area around Belknap Springs or McKenzie Bridge to temporarily impound water in the reach of the McKenzie immediately upstream. Breaching of these temporary debris dams could send floods and lahars racing further downstream. Larger-volume lahars will travel much farther westward.

Flushing of sediment from lahar-impacted areas in the years and decades following eruptions could fill the McKenzie River channel, decreasing its capacity to carry flood water and causing the channel to shift across the valley floor. Depending on the volume of lahar deposits and degree of disturbance to the watershed, such effects could spawn ongoing sediment problems in the lower McKenzie valley and along the Willamette River below the McKenzie confluence, far beyond the initial path of lahars.

Upper Deschutes River Valley

The upper Deschutes River valley, which heads on the south flank of South Sister and the south and west slopes of Broken Top, consists of a series of broad lava-dammed basins such as those containing Sparks, Elk, and Lava Lakes and Crane Prairie Reservoir. These basins will effectively retard the downstream advance of lahars by causing deposition. However, persistent sediment problems could follow lahar emplacement as sediment is flushed through these shallow basins, into Wickiup Reservoir, and farther downstream. Large developed areas of Sunriver and Bend lie close to the flood plain of the Deschutes River and could be affected by channel aggradation and migration resulting from increased sediment loads.

Tumalo Creek Valley

Tumalo Creek drains the area east of Broken Top and is unlikely to experience large lahars owing to lack of much volcano mass in its headwaters. Nevertheless, small lahars might descend Tumalo Creek if rapid sedimentation in Crater Creek accompanied a large landslide or failure of the moraine dam on the east side of Broken Top and diverted debris over a low divide into Tumalo Creek. Some debris might also enter Tumalo Creek by way of Crater Creek Ditch to the south of Broken Top.

Squaw Creek Valley

Squaw Creek and its tributaries drain the east flanks of North, Middle, and South Sister and the north flank of Broken Top. The headwater streams join above a narrow valley that opens into a broad, gently sloping debris fan occupied, in part, by the city of Sisters. Below Sisters, Squaw Creek enters a narrow, deepening canyon that joins the canyon of the Deschutes River just upstream from Lake Billy Chinook.

The broad fan of Squaw Creek around Sisters is of particular concern with regard to potential lahar inundation because Squaw Creek drains a large sector of the major volcanoes and the distance to Sisters is relatively short (about 30 kilometers or 20 miles). Typical flow velocities for lahars through terrain like that along Squaw Creek yield travel times to Sisters of as little as 30 minutes to one hour, depending on lahar size and point of origin.

Regional Lava-Flow Hazard Zone

The regional lava-flow hazard zone outlines the area of the Three Sisters region subject to lava flows from eruptions of mafic volcanoes. The zone is defined by the distribution of mafic volcanoes that formed during roughly the past one million years. Hazards from thick tephra fall, ballistic projectiles, and pyroclastic flows would be restricted to within a few kilometers of vents,

but lava flows could travel much farther. As past lava flows from mafic volcanoes in the region traveled typically less than 10 to 15 kilometers (6 to 9 miles) and rarely 15-20 kilometers (9-12 miles) from vents, we locate the hazard zone boundary about 10 kilometers downslope from the margin of the potential vent area, but caution that exceptional lava flows could extend farther. The hazard zone covers a broad area in central Oregon, including Bend, Sisters, and La Pine.

The lava-flow hazard zone includes areas on the lower flanks of Newberry volcano that are described in a report similar to this one (U.S. Geological Survey Open-File Report 97-513, see References and Suggested Additional Reading).

The annual probability of an eruption of a mafic volcano within the Three Sisters region can be estimated from the frequency of past activity as shown in the middle column of Figure 3. During the past 6,000 years, four episodes of activity, each lasting up to several centuries long and consisting of eruption of scoria and lava flows from several vents, have affected the region. Such a frequency suggests that the average annual probability of future mafic eruptions is roughly 1 in 1,500 *[6]*. Because most recent activity has been concentrated in the area between the North Sister and Santiam Pass, future activity is probably more likely there than in other parts of the lava-flow hazard zone to the south and east, which includes most of the settled areas in the region. Furthermore, because only a relatively small part of the entire lava-flow hazard zone is affected during one eruptive episode, the annual probability of any given point in the hazard zone being affected is considerably less than the average annual probability of 1 in 1,500. We estimate the range of annual probabilities falls between 1 in 10,000, for some areas near the Cascade Crest around Three Sisters and on the upper flanks of Newberry volcano, to 1 in 1,000,000 elsewhere.

Tephra Hazard Zones

Eruptions of composite and mafic volcanoes in the Three Sisters region as well as more distant volcanoes in the Cascade Range are all sources of potential tephra fall in local communities. In fact, since the last ice age, the thickest tephra fall in the Bend area, probably about 30 centimeters (one foot), originated from the huge eruption of ancient Mount Mazama that created Crater Lake about 7,600 years ago.

The inset maps on the hazard-zonation map show the annual probability of tephra fall affecting the central Oregon region from all major Cascade volcanic centers. The maps are based on the combined likelihood of tephra-producing eruptions occurring at Cascade centers, the relationship between thickness of a tephra-fall deposit and distance from its source vent, and regional wind patterns *[7]*. Probability zones extend farther east of the range because winds blow from westerly directions most of the time. One map shows annual probabilities for a fall of one centimeter (about 0.4 inch) or more and the other for a fall of 10 centimeters (about 4 inches) or more. The map patterns illustrate clearly the dominating influence of Mount St. Helens as a tephra producer. Because small eruptions are

Figure 7. Even a minor tephra fall can be disruptive in populated areas. Visibility was reduced by this tephra fall of less than 3 millimeters (1/8 inch) in Anchorage, Alaska, produced by an eruption of Mount Spurr, which lies 130 kilometers (80 miles) away. Wind and vehicles resuspended the tephra for days following the initial fall. The simple dust mask worn by the bicycle rider is an effective way to minimize inhaling ash particles. *Photo by Richard Emanuel, USGS.*

more numerous than large eruptions, the probability of a thick tephra fall at a given locality is lower than that of a thin tephra fall. The most densely populated areas of Central Oregon have an annual probability of a tephra fall of 10 centimeters or more of no greater than 1 in 10,000 and an annual probability of a fall of 1 centimeter or more of about 1 in 1,000 to 1 in 5,000. The annual probability of a fall of a few millimeters (fraction of an inch) of tephra is probably greater than 1 in 1,000.

Hazard Forecasts and Warnings

Scientists recognize several signs of impending volcanic eruptions. The upward movement of magma into a volcano prior to an eruption causes changes that can usually be detected by geophysical instruments and visual observation. Swarms of small earthquakes are generated as rocks break to make room for rising magma or as heating of fluids causes underground pressures to increase. Heat from the magma can increase the temperature of ground water and boost temperatures and steaming from fumaroles; it can also generate small steam explosions. The composition of gases emitted by fumaroles can change as magma nears the surface. Injection of magma into the volcano can cause swelling or other types of surface deformation.

A regional seismic network, the Pacific Northwest Seismograph Network, operated jointly by the Geophysics Program at the University of Washington and U.S. Geological Survey has located few earthquakes in the Three Sisters region during the past two decades. The onset of earthquake activity would quickly gain scientists' attention and prompt deployment of additional seismometers to better locate earthquakes. At monitored volcanoes elsewhere in the world similar to those in the Three Sisters region, a notable increase in seismicity has occurred days to months before eruptions. Earthquakes associated with volcanic unrest are typically small (rarely exceeding magnitude 4) and generally pose little direct hazard to structures in surrounding communities.

Scientists have conducted other studies aimed at developing baseline data to help detect precursory activity at South Sister. A network of precisely surveyed points has been remeasured several times. An increase in seismicity would prompt the resurvey of this network or creation of new networks to look for slight ground movements that might indicate upward movement of new magma. Concurrently, ground-based and airborne techniques would be employed to search for signs of volcanic gas release, another sign of magma movement.

Periods of unrest at volcanoes are usually times of great uncertainty. Although outstanding advances have been made in volcano monitoring and eruption forecasting over the past few decades, scientists are often able to make only very general statements about the probability, type, and scale of an impending eruption. Precursory activity can go through accelerating and decelerating phases, and sometimes die out without leading to eruption. Government officials and the public must realize the limitations in forecasting eruptions and be prepared for such uncertainty.

Protecting Our Communities and Ourselves From Volcano Hazards

Communities, businesses, and citizens need to plan ahead to mitigate the effects of future eruptions, debris avalanches, and lahars. Long-term mitigation includes using information about volcano hazards when making decisions about land use and siting of critical facilities. For example, development could avoid areas judged to have an unacceptably high risk or be planned to reduce the level of risk.

When volcanoes erupt or threaten to erupt, appropriate emergency responses are needed. Such responses will be most effective if citizens and public officials have an understanding of volcano hazards and have planned the actions needed to protect communities. Because an eruption can occur within days to months of the first precursory activity and because some hazardous events can occur without warning, suitable emergency plans should be made beforehand. Public officials need to consider issues such as public education, communications,

and evacuations. Emergency plans already developed for floods may apply, with modifications, to hazards from lahars.

Businesses and individuals should also make plans to respond to volcano emergencies. Planning is prudent because once an emergency begins, public resources can often be overwhelmed, and citizens may need to provide for themselves and make informed decisions. The Red Cross recommends numerous items that should be kept in homes, cars, and businesses for many types of emergencies that are much more probable than a volcanic eruption. A map showing the shortest route to high ground will also be helpful.

The most important additional item is knowledge about volcano hazards and, especially, a plan of action based on the relative safety of areas around home, school, and work. Lahars pose the biggest sudden threat to people living in valleys that drain the Three Sisters. The best strategy for avoiding a lahar is to move to the highest possible ground. A safe height above river channels depends on many factors including size of the lahar, distance from the volcano, and shape of the valley. For areas beyond the proximal hazard zone, all but the largest lahars will probably rise less than 30 meters (100 feet) above river level.

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End Notes

[1] The geologic data upon which this report is based comes from many published reports and maps about the Three Sisters region. Sources include: Hill, B.E., and Taylor, E.M., 1990, Oregon central High Cascade pyroclastic units in the vicinity of Bend, Oregon: Oregon Geology, v. 52, no. 6; Mimura, Koji, 1992, Reconnaissance geologic map of the west half of the Bend and the east half of the Shevlin Park 7½‘ quadrangles, Deschutes County, Oregon: U.S. Geological Survey Miscellaneous Field Investigations Map MF-2189; Peterson, N.V., Groh, E.A., Taylor, E.M., and Stensland, D.E., 1976, Geology and mineral resources of Deschutes County, Oregon: Oregon Department of Geology and Mineral Industries Bulletin 89; Sarna-Wojcicki, A.M., Morrison, S.D., Meyer, C.E., and Hillhouse, J.W., 1987, Correlation of upper Cenozoic tephra layers between sediments of the western United States and eastern Pacific Ocean and comparison with biostratigraphic and magnetostratigraphic age data: Geological Society of America Bulletin, v.98, no. 2; Scott, W.E., 1987, Holocene rhyodacite eruptions on the flanks of South Sister volcano, Oregon: Geological Society of America Special paper 212; Scott, W.E., and Gardner, C.A., 1992, Geologic map of the Mount Bachelor volcanic chain and surrounding area, Cascade Range, Oregon: U.S. Geological Survey Miscellaneous Investigations Map I-1967; Sherrod, D.R., Taylor, E.M., Ferns, M.L., Scott, W.E., Conrey, R.M., and Smith, G.A., in press, Geologic map of the Bend 30- by 60-minute quadrangle, central Oregon: U.S. Geological Survey Miscellaneous Investigations Map I-2683; Taylor, E.M., 1965, Recent volcanism between Three Fingered Jack and North Sister, Oregon Cascade Range: Part I: History of volcanic activity: Ore Bin, v. 27, no. 7; Taylor, E.M., 1978, Field geology of S.W. Broken Top quadrangle, Oregon: State of Oregon Department of Geology and Mineral Industries, Special Paper 2; Taylor, E.M., 1987, Field geology of the northwest quarter of the Broken Top 15’ quadrangle, Deschutes County, Oregon: State of Oregon Department of Geology and Mineral Industries, Special Paper 21; Taylor, E.M., MacLeod, N.S., Sherrod, D.R., and Walker, G.W., 1987, Geologic map of the Three Sisters Wilderness, Deschutes, Lane, and Linn counties, Oregon: U.S. Geological Survey Miscellaneous Field Studies Map MF-1952.

[2] Mafic refers to the type of lava erupted by these short-lived volcanoes. Most are composed of basalt or basaltic andesite—a few are andesite. This contrasts with composite volcanoes that erupt mafic lava as well as more silica-rich lava such as dacite or rhyolite. Eruption of silica-rich lava is typically more explosive than that of mafic lava.

[3] The proximal hazard zone was created by projecting so-called energy cones described by $H/L = 0.2$ from the summits of four high peaks (South, Middle, and North Sister and Broken Top) on a digital topographic base map of the Three Sisters area (*cf. e.g.*, Malin, M.C., and Sheridan, M.F., 1982, Computer-assisted mapping of pyroclastic surges, Science, 217, 637-640; Hayashi, J.N., and Self, S., 1992, A comparison of pyroclastic flow and debris avalanche mobility, Journal of Geophysical Research, 97(B), 9063-9071; Iverson, R.M., Schilling, S.P. and Vallance, J.W., 1998, Objective delineation of lahar-inundation zones: Geological Society of America Bulletin, 110, 972-984). Here H is the vertical distance of descent from the summit, and L is the horizontal distance of travel from the summit. Pyroclastic flows typically exhibit energy-cone slopes no lower than $H/L = 0.2$. Debris avalanches of large volume (more than 100 million cubic meters) can exhibit lower energy-cone slopes than do pyroclastic flows (travel farther for a given drop), and most such far-traveled avalanches at Three Sisters would funnel from the proximal hazard zone into valleys encompassed within distal hazard zones.

[4] Detailed assessments of floods and lahars associated with emptying of moraine-dammed lakes in the Three Sisters region have been described elsewhere (Laenen, A., Scott, K.M., Costa, J.E., and Orzol, L.L., 1987, Hydrologic hazards along Squaw Creek from a hypothetical failure of the glacial moraine impounding Carver lake near Sisters, Oregon, U.S. Geological survey Open-file Report 87-41; O'Connor, J.E., Hardison III, J.H., and Costa, J.E., in press, Debris flows from failures of Neoglacial moraine dams in the Three Sisters and Mt. Jefferson Wilderness Areas, Oregon, U.S. Geological Survey Professional Paper 1608). These assessments indicate that moraine-dammed lakes in the Three Sisters region contain less than 1 million cubic meters of water each. On the basis of this water volume, lake geometry, and the past behavior of dam-breach floods in the Three Sisters region and elsewhere (i.e., Walder, J.S., and O'Connor, J.E., 1997, Methods for predicting peak discharge of floods caused by failure of natural and constructed earthen dams, Water Resources Research, 33, 2337-2348), we estimate that water discharges resulting from future failures of moraine dams in the Three Sisters region will probably not exceed 300 cubic meters per second (10,000 cubic feet per second). Flood magnitude might increase where substantial volumes of sediment are entrained to form lahars, but the resulting lahar volume is unlikely to exceed several million cubic meters. The resulting areas of downstream innundation will probably be smaller than those shown for the smallest (inner) distal hazard zone shown on the map.

[5] Distal lahar hazard zones were constructed by assuming hypothetical lahar volumes of 20 million, 100 million, and 500 million cubic meters. Using mathematical and digital cartographic techniques described by Iverson, R.M., Schilling, S.P., and Vallance, J.W., 1998, Objective delineation of lahar-inundation zones: Geological Society of America Bulletin, v. 110, p. 972-984, these three volumes were used to compute the probable extent of inundation downstream from the proximal hazard zone. The largest assumed volume (500 million cubic meters) represents the largest event that we believe could occur at the Three Sisters, and it produces the largest distal hazard zones. The smaller assumed volumes produce smaller nested hazard zones.

[6] The average frequency is one eruptive episode per 1,500 years ($6{,}000 \div 4 = 1{,}500$). The average annual probability of the onset of a future episode is therefore 1 in 1,500.

[7] Tephra-hazard maps were generated by computer program developed by R.P. Hoblitt (U.S. Geological Survey, Cascades Volcano Observatory, 1996).

Wildfire
Hazard Annex

This annex covers the wildfire hazard and includes detailed information on the hazard that is specific to the County. The annex includes some actual documents when digital copies were available; other resources are on file with the Malheur County Planning Department in its Multi-Jurisdictional Natural Hazards Mitigation Plan File and can be accessed upon request, as the county does not have the ability to scan these documents. Annex materials may include existing ordinances; supplemental information for Section 3 hazard vulnerabilities, and potential losses when local data is available.

Hazard Resources

- *Ordinances*
  - New buildings in the county located in a Wildland-Urban Interface area are given instructions from the appropriate fire district to ensure fire access for their structure. This is not, however, a binding ordinance, but is based on recommended state standards.
- *Studies/Reports*
  - BLM's 2002 Community-at-Risk reports for key WUI areas in the county provide the best currently available information on wildfire vulnerability in those areas. They are included in this plan.
- *State Natural Hazard Risk Assessment*
  - The state risk assessment chapter on wildfire events provides a useful overview of volcanic risks in Oregon and documents historic fire activity.
- *Technical Resource Guide*
  - This guide lists basic mitigation strategies for wildfire, including examples from other communities in Oregon. See Appendix D for information on how to access this document.
- *Emergency Operations Plans*
  - As part of the CWPP process, the county will look at its fire emergency response in 2008. When this plan is updated, it will be included here.
- *Maps*
  - Maps of wildfire-prone areas in the county will be available when the CWPP is complete in 2008.

Hazard Vulnerability

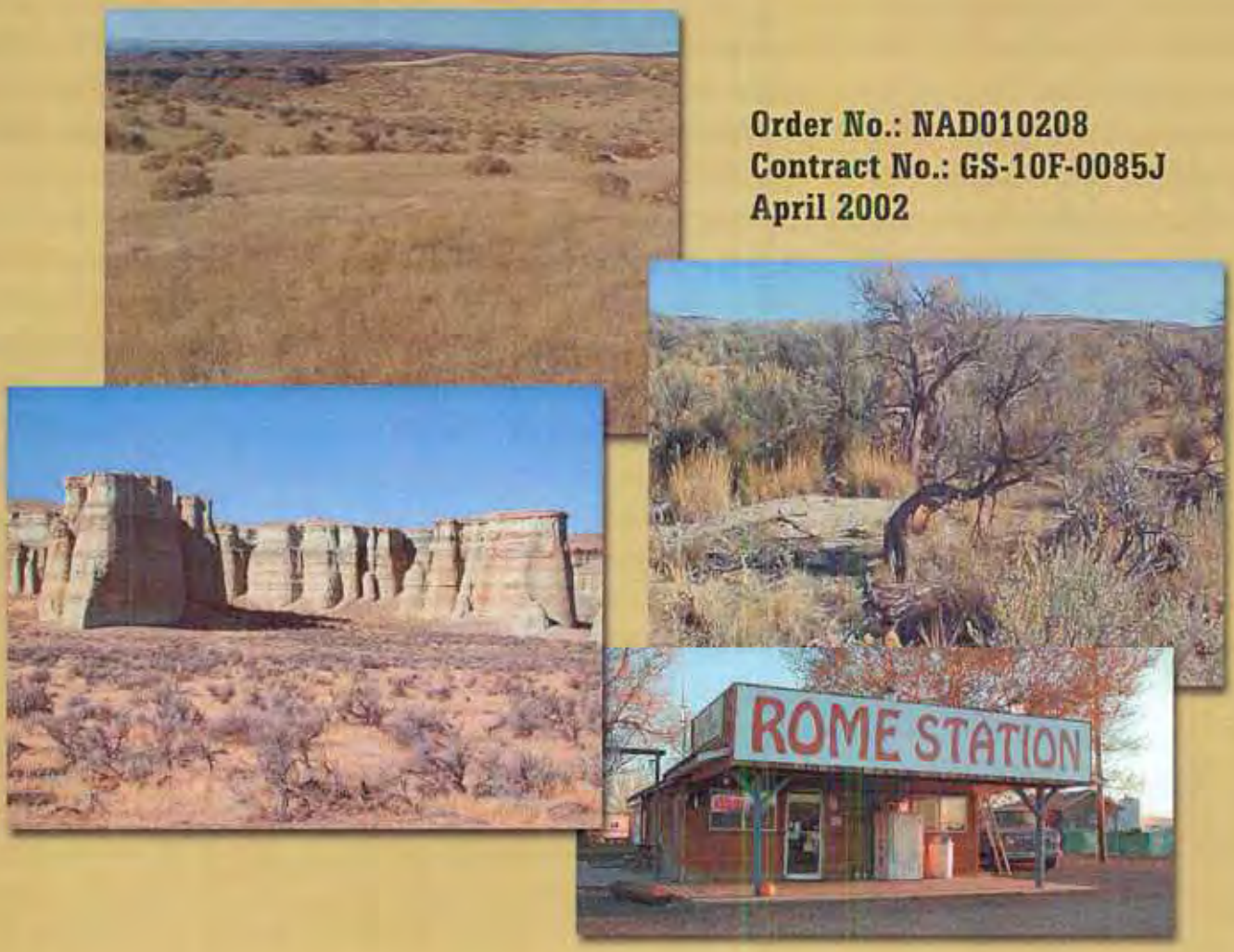
Comprehensive hazard vulnerability information will be available when the county's Community Wildfire Protection Plan is complete. What information is currently available is located in Section 3: Wildfire Hazard Summary.

Potential Losses

Currently the County does not have sufficient data to calculate potential wildfire losses. This is due both to the unpredictability of wildfire severity, location, and size, and to limited local records.

WILDLAND-URBAN INTERFACE COMMUNITIES-AT-RISK PROGRAM

Final Mitigation Recommendations
BLM Vale District
Jordan Valley, Arock, Rome Assessment Area



Order No.: NAD010208
Contract No.: GS-10F-0085J
April 2002

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FINAL
WILDLAND-URBAN INTERFACE, COMMUNITIES-AT-RISK MITIGATION RECOMMENDATIONS

VALE DISTRICT
JORDAN VALLEY, AROCK, ROME ASSESSMENT AREA

Prepared for:

U.S. Department of Interior
Bureau of Land Management
Vale District
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Order Number: NAD010208
Contract No.: GS-10F-0085J
Date Prepared: April 2002

DISCLAIMER

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TABLE OF CONTENTS

ACRONYM LIST

amsl	above mean sea level
BLM	Bureau of Land Management
FEMA	Federal Emergency Management Agency
GPS	Global Positioning System
JVAR	Jordan Valley, Arock, Rome Assessment Area
WRCC	Western Regional Climate Center

APPENDIX A

Maps

APPENDIX B

1.0 EXECUTIVE SUMMARY

During the 2000 fire season more than 6.8 million acres of public and private lands were burned by wildfire, resulting in loss of property, damage to resources, and disruption of community services. Many of these fires occurred in wildland-urban interface areas and exceeded fire suppression capabilities. In response, the President of the United States directed the Secretaries of the Departments of Agriculture and the Interior to increase federal investments in projects to reduce the risk of wildfire in the wildland-urban interface. The Bureau of Land Management (BLM), Vale District is currently in the process of forming partnerships with local governments to plan fuels reduction treatments and other mitigation measures targeted at the wildland-urban interface in the vicinity of public lands. These partnerships are indicative of a shared responsibility to reduce wildland fire risks to communities.

The wildland-urban interface occurs where manmade structures meet or intermix with wildland vegetation. In certain situations, specific actions such as fuels reduction around communities, forest and rangeland restoration, infrastructure improvements, and public education and outreach may reduce the risk of catastrophic fire in the wildland-urban interface. To this end, the Vale District BLM implemented the Communities-at-Risk, Wildland-Urban Interface Program. The program seeks to reduce the hazard of wildland fires to communities through public outreach, the reduction or prevention of fuel build-up, and increasing the fire protection capabilities of communities. The communities of Jordan Valley, Arock and Rome were selected to assess the hazard of wildland fire and to identify specific actions that may reduce the risk of loss and disruption of services from wildland fire.

Dynamac Corporation was contracted to support the BLM in their assessment of wildfire risk to the Jordan Valley, Arock and Rome communities in the wildland-urban interface. Dynamac scientists conducted fuel surveys by categorizing the vegetation, slope, and aspect of the land in the Jordan Valley-Arock-Rome (hereafter JVAR) assessment area. The risk of wildland fire to homes, structures, and cultural resources on private land was also evaluated according to building materials, the presence of survivable space, road access, and the response time of the local fire department. Dynamac assessed the adequacy of the community's service infrastructure (including roads, water supplies, and fire fighting equipment) by systematic observation, and by interviewing community officials and fire prevention personnel. A community open house was held to disseminate information about the Communities-at-Risk, Wildland-Urban Interface Program to citizens, to afford them the opportunity to identify resources that are of value to the community, and to have them identify actions that may reduce the risk of wildland fire. The

information gathered from the fuel surveys, structural surveys, interviews, infrastructure assessments, and community profile was integrated into two reports: a hazard assessment report and mitigation recommendations. The following action items were identified to reduce the wildfire threat in the JVAR assessment area.

- Provide assistance to the Jordan Valley Fire Department in obtaining a pumper truck;
- Establish a rural Fire Department in the Rome and Arock area;
- Develop and maintain a water-storage tank near Arock to improve the availability of water resources and to reduce the time needed to refill pumper trucks;
- Wildland fire training courses taught to Jordan Valley fire department by NFPA- or NWCG certified instructors for volunteer fire fighters;
- Develop an ongoing education and outreach program throughout the assessment area to encourage firewise practices; and
- Establish a mutual aid agreement with the Jordan Valley Fire Department.

2.0 GOALS AND OBJECTIVES

The goals of the JVAR wildfire hazard assessment and mitigation plan are to evaluate the hazards of wildland fire within the assessment area and then identify specific actions that could reduce the risks. The objectives are to decrease the chances of wildfire spreading from public lands onto private lands, while correspondingly decreasing the risk of wildfire spreading from private lands onto public lands.

3.0 BACKGROUND

Wildland fire is an integral component of many forest and rangeland ecosystems. In the conterminous United States before European settlement, an estimated 145 million acres were annually scorched by wildfire. In comparison, only about 14 million acres are currently burned annually due to increased agriculture, urbanization, habitat fragmentation, and fire suppression programs. This change from the historical fire regime to the present day has caused a shift in the native vegetation composition and structure of fire-prone ecosystems such as some forests and rangelands resulting in a dangerously high accumulation of fuels. As a result, when wildland fires do occur, they may burn larger and hotter than those in the past and pose an increased risk to human welfare and ecological integrity.

The hazard of wildland fires is compounded by the increasing occurrence of human structures and activities in fire-prone ecosystems. The wildland-urban interface occurs where manmade structures meet or intermix with wildland vegetation. In certain situations, specific actions such as fuels reduction around communities, forest and rangeland restoration, infrastructure improvements, and public outreach may reduce the risk of losses to catastrophic fire in the wildland-urban interface. The Vale District BLM implemented the Communities-at-Risk, Wildland-Urban Interface Program to determine what these specific actions might be, and where they are needed. The program seeks to reduce the hazard of wildland fires to communities through public education and outreach, the reduction or prevention of fuel buildup, and increasing the fire protection capabilities of communities. The communities of Jordan Valley, Arock and Rome were selected to assess the threat of wildland fire and to identify specific actions that may reduce the risk of loss.

The BLM Vale District intends to use the mitigation measures identified in this document as a guide and prioritization tool in implementing the Communities-at-Risk Program. The District is committed to working with any partners (private, local government, state, and federal) in order to accomplish mutual goals and objectives identified in the recommendations. The recommendations that the District chooses to implement will go through the NEPA process and will be accomplished as funding, policy and regulations permit.

4.0 EXISTING SITUATION

Jordan Valley, Arock and Rome are situated in the Jordan Creek Valley in southeastern Oregon. The Assessment Area is located in Malheur County approximately 90 miles south of Vale, Oregon and 55 miles southeast of Boise, Idaho. The assessment area included the towns of Jordan Valley, Arock, Rome, Danner, and Burns Junction, and consisted of portions of township 27S range 45E; T27S R46E; T28S R41E; T28S R42E; T28S R43E; T28S R44E; T28S R45E; T28S R46E; T29S R40E; T29S R41E; T29S R42E; T29S R43E; T29S R44E; T29S R45E; T29S 46E; T30S R40E; T30S R41E; T30S R42E; T30S R43E; T30S R44E; T30S R45E; T30S R46E; T31S R39E; T31S R40E; T31S R41E; T31S R42E; T31S R43E; T31S R44E; T31S R45E; T31S R46E; T32S 39E; T32S R40E; T32S R41E; T32S 42E; T32S R43E; T32S R44E; T32S R45E; T32S R46E; T33S 39E; T33S R40E; T33S R41E, T33S 42E; T33S R43E; T34S R41E and T34S R42E. Within the assessment area are ranches, residential areas, and historic structures and sites.

The topography of the assessment area is hilly with some areas of steeper cliffs and rock formations. The city of Jordan Valley is at approximately 4,400 feet above mean sea level

(amsl) and the elevation of the assessment area ranges from 3,400 feet to 5,500 feet amsl. There are concentrated residential areas in Jordan Valley and Arock that are surrounded by ranches. The town of Rome is a cluster of buildings located near the Rome Station restaurant. The approximate population of the assessment area is 700. The predominant vegetation throughout the assessment area is sagebrush and grasses (e.g., cheatgrass and bunchgrass). Large bushes and trees are only found near a source of water (e.g., spring) or near residential areas. The Owhyee River Canyon traverses the assessment area and there are other geologically significant features of the assessment area, including Jordan Crater and the Rome Cliffs.

Agricultural production is primarily cattle ranching; to a much lesser degree grain and hay production and sheep ranching occur within the assessment area. There is open rangeland throughout the entire assessment area. The rangeland is important for livestock grazing, wildlife habitat, and recreation.

The only major paved road throughout the assessment area is Highway 95. There are paved streets in the city of Jordan Valley. Four-wheel drive and all-terrain vehicle roads are extensive throughout the assessment area, aiding in accessibility. However, access to public land can be difficult since most of the private land surrounding public land is gated and locked.

The population and housing in the assessment area is very stable. The community centers and their immediate surrounding areas are where dense residential housing is located. Outside the city limits or community centers are individual homes and ranches.

The climate of the assessment area is characterized by warm, dry summers with maximum average temperatures reaching 92° Fahrenheit (F) in July, and an average daily summertime low of 45-51°F. Winter months are typically cool, with average daily temperatures from November to March ranging from 18 to 55°F. Precipitation is typically low with an average annual precipitation of 8.21 inches. July has the lowest average precipitation with 0.37 inches and May has the most with 1.18 inches. Between November and March precipitation arrives as snowfall and from April through June as rain (WRCC, 2001).

The Hazard Assessment Report for the JVAR assessment area presents and summarizes data for fuel and terrain conditions; those data can be summarized as follows:

- **Slope:**

  Class A - 57% of the points were flat land (less than 10% slope).

  Class B - 38% of the points were moderate slope (10%-30% slope).

  Class C - 5% of the points were steep slopes (greater than 30% slope).

- **Aspect:**

  Class A - 28% of the points faced north.

  Class B - 40% of the points faced east.

  Class C - 32 % of the points faced south and west.

- **Elevation:**

  Class A - 0% of the points were at elevations greater than 5,000 feet amsl.

  Class B - 93% of the points were at elevations between 3,500 and 5,500 feet amsl.

  Class C - 7% of the points were at elevations lower than 3,500 feet.

- **Fuel Type:**

  Class A - 37% of the points had small, light fuels (grass, weeds, shrubs).

  Class B - 61% of the points had medium fuels (brush, medium shrubs, small trees).

  Class C - 2% of the points had heavy fuels (timber, woodland, large brush or heavy planting of ornamentals).

- **Fuel Density:**

  Class A - 18% of the points had a non-continuous fuel bed (less than 30% cover).

  Class B - 55% of the points had a broken moderate fuel bed (31 to 60% cover).

  Class C - 27% of the points had a continuous fuel bed (greater than 60% cover).

- **Fuel Bed Depth:**

  Class A - 20% of the points had a low fuel bed depth (less than 1 foot).

  Class B - 77% of the points had a moderate fuel bed depth (1-3 feet).

  Class C - 3% of the points had a high fuel bed depth (greater than 3 feet).

The second component of the Hazard Assessment Report is the characterization of structures in the assessment area for structure density, building materials, proximity to fuels, presence of survivable space, and roads/accessibility. Results of the structure survey can be summarized as follows:

- **Structure Density (percentage based on all sections surveyed):**

  Class A - 1.0% of the sections had at least one structure per five acres.

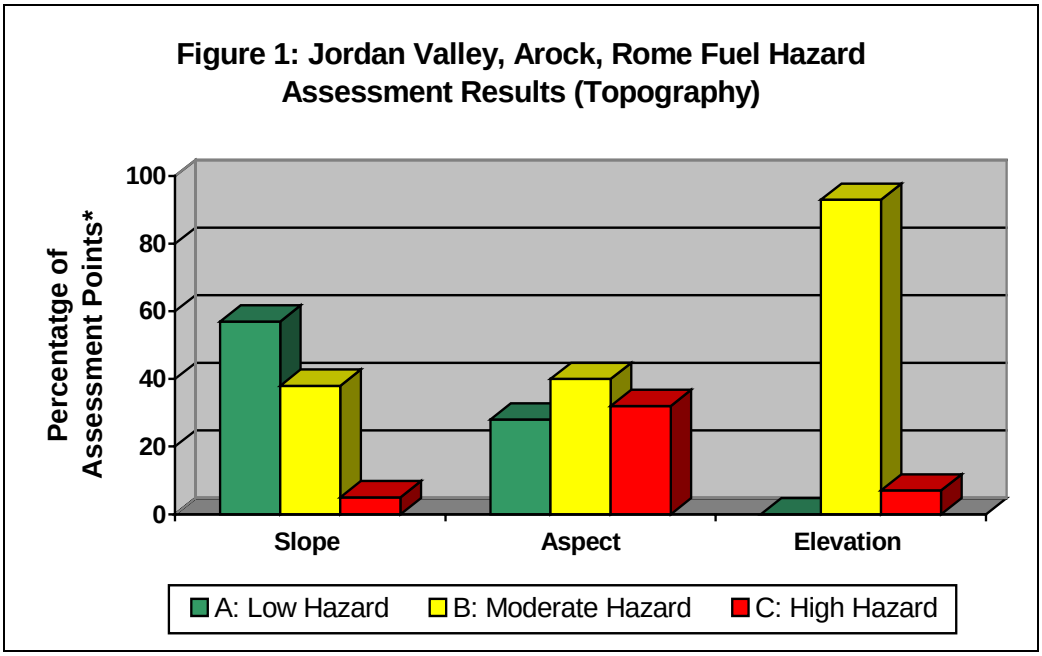
  Class B - 0.5% of the sections had one structure per 5-10 acres.

  Class C - 98.5% of the sections had less than one structure per 10 acres.

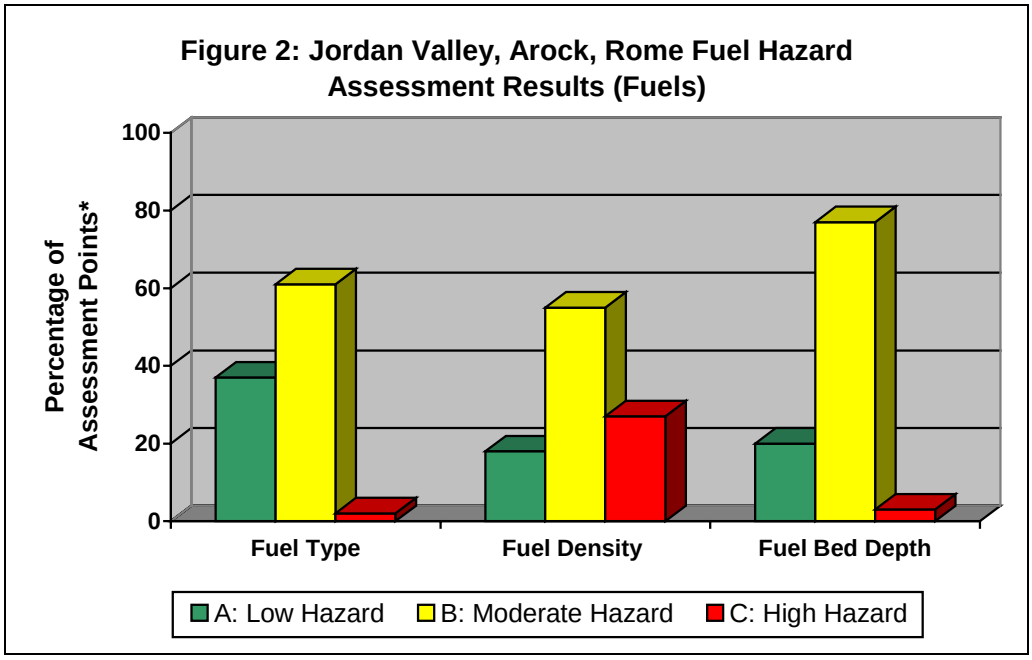
The remaining percentages (excluding response times) were calculated based on only the 80 sections that contained structures.

- **Proximity to Structures:**
  - Class A - 33% of the sections had flammable wildland fuels greater than 100 feet from the structures.
  - Class B - 62% of the sections had wildland fuels 40 to 100 feet away.
  - Class C - 5% of the sections had fuels less than 40 feet from the structures.
- **Predominant Building Materials:**
  - Class A - 57% of the sections had a majority of homes constructed with fire-resistant roofs and/or siding.
  - Class B - 34% of the sections had 10-50% of the homes built with fire resistant roofs and/or siding.
  - Class C - 9% of the sections had less than 10% of the homes built with resistant roofs and/or siding.
- **Survivable Space:**
  - Class A - 79% of the sections had a majority of homes with improved survivable space around the homes (greater than 50%).
  - Class B - 16% of the sections had 10-50% of homes with improved survivable space.
  - Class C - 5% of the sections had less than 10% of homes with improved survivable space.
- **Roads:**
  - Class A - 11% of the sections had wide looped roads that were maintained, paved or solid, and surfaced with shoulders.
  - Class B - 81% of the sections had maintained, two-lane roads, with no shoulders.
  - Class C - 8% of the sections had narrow, steep, rutted roads.
- **Response Time (percentage based on all sections surveyed):**
  - Class A - 17% of the sections had a response time of less than 20 minutes.
  - Class B - 18% of the sections had a response time of 20 to 40 minutes.
  - Class C - 65% of the sections had a response time of greater than 40 minutes.
- **Access:**
  - Class A - 6% of the sections had multiple entrances and exits that were suitable for trucks with turnarounds.
  - Class B - 81% of the sections had limited access routes.
  - Class C - 13% of the sections had poor access routes.

The data from the fuels hazard assessment are also graphically depicted in **Figures 1 and 2.** The charts depict the percentage of assessment points, based on a total of 80 points surveyed, that received a high, moderate, or low hazard ranking.



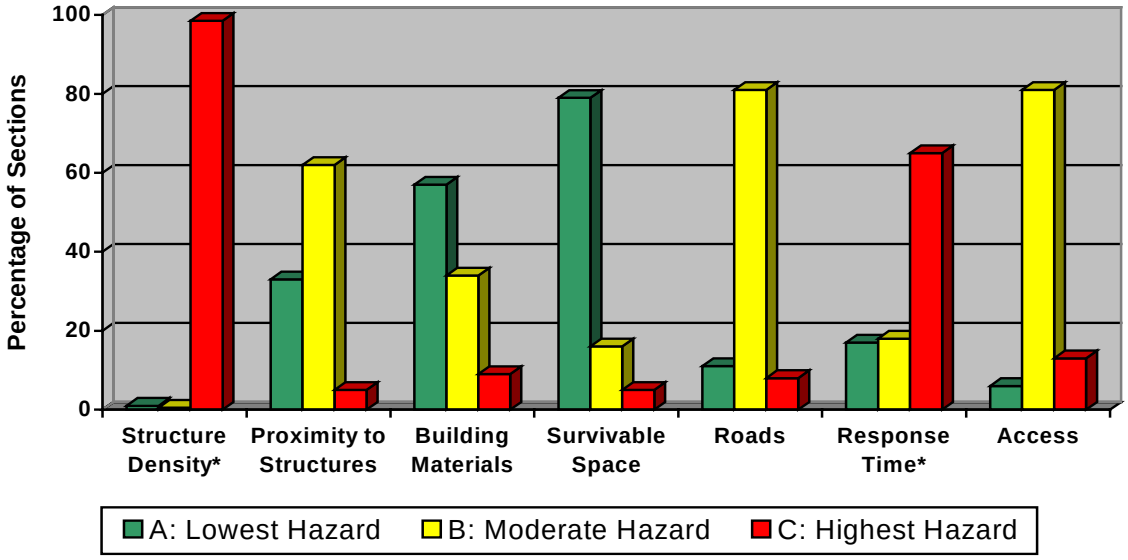
* Percentages for Figure 1 based on 106 fuel assessment points surveyed.



* Percentages for Figure 2 based on 106 fuel assessment points surveyed.

The percentages of assessment points for hazards to structures are graphically depicted in **Figure 3**. It should be noted that, with the exception of structure density and response times, these percentages are based on the 80 sections *with* structures in the assessment area and not on all 271 sections surveyed (191 of which had no structures.) The areas of greatest risk in terms of fuels and fire suppression efforts (low structure density) are depicted on **Map 2** in the Appendix.

Figure 3: Jordan Valley, Arock, Rome Structure Risk Assessment Results for 80 Sections with Structures



* Percentages for Figure 3 based on 271 sections with structures.

5.0 PUBLIC COMMENT SUMMARY

Through discussions with community leaders, fire officials, and residents of Jordan Valley, Arock, Rome, and the surrounding wildland-urban interface lands, the following actions were suggested to improve fire preparedness and prevention measures along the wildland-urban interface. All of these have been developed into recommendations (See Section 8.0, Proposed Projects) for lessening the risk posed by fire.

- A new pumper truck for the Jordan Valley Fire Department;
- Additional communication equipment for the Jordan Valley Fire Department;
- Establishing a Rural Fire Department in the Rome-Arock area;
- Increased ability to control wildland fires by pre-positioning a water source near Arock;
- Wildland fire training courses provided to Jordan Valley Fire Department;

- Area-wide adoption of firewise practices in residential building and landscaping; and
- Mutual aid agreement between the Jordan Valley Fire Department and BLM.

6.0 NEED FOR ACTION

Wildfire frequency in the JVAR assessment area is not uncommon, and results predominantly from natural causes and also from human origins. At risk are dwellings and other structures on private land near the wildland-urban interface and the open rangeland. To reduce the risks of wildfire in the assessment area both general and specific actions are needed. In general, the residents and their public agencies should support activities that promote safety for dwellings, structures and rangeland at risk.

7.0 METHODOLOGY

The mitigation actions proposed herein for the Jordan Valley, Arock and Rome assessment area are based on information acquired from fuel and structure surveys, a public meeting, interviews of community officials, and surveys filled out and submitted by residents of Jordan Valley, Arock and Rome. The majority of information presented in this report was gathered between November 5 and November 14, 2001. A Draft Hazard Assessment Report has been completed for the area and is available at the Vale District Office.

Dynamac characterized land and fuels at 106 points on public land within a 15-mile radius of Jordan Valley, Arock and Rome (excluding land within Idaho), concentrating on sections of land near inhabited areas. As not all sections of public land were accessible, Dynamac endeavored to choose fuel survey points that were representative of surrounding sections. The rating elements included slope, aspect, elevation, fuel type, fuel density, and fuel bed depth, and were assigned to a risk category of low, moderate, or high (See Hazard Assessment Report, Table 3, and Appendix B). At each survey point, the field crew recorded the location in UTM coordinates using a Trimble hand-held global positioning unit (GPS), and photographed the surrounding area in the four cardinal directions. A wildland fuels fire hazard assessment form (Form 1) was completed which rated the characteristics of the land features and fuel sources.

Dynamac staff also collected information on the flammability and defensibility of structures on private land from over 271 sections located within one mile of public lands, within the assessment area. The structural hazard assessment rated the structures based on the resistance of building materials to fire, and the distance of flammable fuels to the structures located within a

section. The rating elements included structure density, proximity of flammable fuels to the structures, building materials, survivable space, and types of roads, response times, and accessibility. Each element was assigned a rating of low, medium, or high hazard category (See Hazard Assessment Report, Table 4, and Appendix C).

A public open house was convened on November 13, 2001 at the Jordan Valley Lions Club, from 12:30 - 3:30 p.m. The community was invited to attend through announcements posted in public places such as the post office, restaurants and stores. A meeting announcement was sent to 362 mailing addresses in the JVAR assessment area. Dynamac and BLM staff attended the public meeting to hand out firewise brochures, obtain information from the community on hazardous fire situations and desired conditions, and to be an informational resource to those attending the meeting. Residents attending the meeting were asked to fill out a survey form regarding their perceptions and concerns about wildland fire in their communities. Several survey forms were also received from people that did not attend the meeting. (See Hazard Assessment Report, Appendix D.)

The Dynamac Community Relations Specialist conducted interviews with numerous local public officials and residents. Individuals or groups interviewed included the Jordan Valley mayor, members of the Jordan Valley Fire Department, and members of the ranching community (See Hazard Assessment Report, Appendix E).

A second public open house was held on March 20, 2002, at the same location in Jordan Valley. Publicity for this meeting included a direct mailing to 362 residences, and also mailing a letter and a factsheet about findings from the community assessment to 13 people who attended the first meeting and signed the mailing list, or were interviewed. Six people attended the second open house. Dynamac's team lead for the JVAR assessment area presented a short slide show of the fuel hazard and structure hazard assessments that had been conducted the previous November. Residents were encouraged to provide commentary on the meeting or the proposed mitigation recommendations for the area, and were given a week to do so. Dynamac received comments from an Oregon Department of Fish and Wildlife representative. These comments, as well as a summary of the March 20, 2002, meeting, have been included in the Hazard Assessment Report, Appendix F.

8.0 PROPOSED PROJECTS

The projects proposed are based on information obtained from the fuel and structure surveys, community meeting, and interviews. The following specific action items were identified to reduce the hazard of wildfire in the JVAR assessment area:

- Provide assistance to the Jordan Valley Fire Department in obtaining a pumper truck;
- Provide guidance to the communities in establishing a rural fire department and assist in identifying methods for obtaining equipment and training;
- Establish a mutual aid agreement with the Jordan Valley Fire Department;
- Develop an on-going education and outreach program throughout the assessment area to encourage firewise practices;
- Provide wildland fire training to the Jordan Valley Fire Department; and
- Develop and maintain water storage tanks.

8.1 Local Fire Department Assistance

Purpose of Local Fire Department Assistance: The ability of the Jordan Valley Fire Department to respond to wildland fires would be greatly enhanced by the addition of a 3,000-gallon pumper truck. Currently, the only piece of equipment the Jordan Valley Fire Department has to combat wildland fires is a 350-gallon water wagon. The pumper would enable the Jordan Valley Fire Department to meaningfully combat fires outside the city limits of Jordan Valley. The Fire Department applied for, but was not awarded, a Federal Emergency Management Agency (FEMA) grant to obtain a pumper truck. The Jordan Valley Fire Department has three hand-held radios. Additional hand-held radios would greatly enhance their ability to communicate and coordinate with other fire-fighting organizations (e.g., BLM Guard Station) thereby increasing their effectiveness against wildfires.

Necessity for Assistance: Currently, the Jordan Valley Fire Department cannot combat structure or wildland fires outside the city limits of Jordan Valley due to a lack of equipment. Having one pumper truck would enable the fire department to combat a fire outside the city limits. Of the three hand-held radios, one is in the truck that must stay within the city limits, another is at the fire station and there is a third radio that can be used as needed.

Project Timing: The Jordan Valley Fire Department should request BLM's assistance in obtaining a BLM surplus pumper truck and additional communications equipment by obtaining grant money as soon as possible.

8.2 Establishment of Rural Fire Department

Purpose of Establishment of Rural Fire Department: The only established firefighting entities in the assessment area are the Jordan Valley Fire Department and the BLM Guard Station. The Jordan Valley Fire Department's fire truck is restricted to the city limits of Jordan Valley (approximately 1.25 square miles). The BLM Guard Station (seasonally operational) combats wildfires that threaten public land. Guard Station personnel are not trained to combat structural fires by federal policy and they rarely combat wildfires that only threaten private property. Therefore, a large percentage of the assessment area is without any formal fire protection. By establishing a rural fire department, equipment and training can be obtained, greatly increasing the protection of people, structures, and rangeland. During the community meeting, a community resident of Rome stated that another community member had identified and volunteered the old Rome Station location and building for a Rural Fire Department that could serve the Rome and Arock communities.

Necessity for Assistance: By establishing a rural fire department, equipment and training can be obtained greatly increasing the protection of people, structures and rangeland. BLM's role in this process can be as an advisor on the process of establishing a rural fire department and as a source of information on obtaining equipment and training.

Project Timing: There was strong support for this project from members of the community. The community should contact the Oregon Fire Marshall to determine the state requirements for recognition as a fire department. **Appendix B** of this report provides a list of action items required to form a rangeland fire protection association. During this process the community should request information and assistance from BLM. Once the Oregon Fire Marshall recognizes the fire department, it can work with BLM in obtaining grant money and submitting grant proposals for federal assistance funds. The overall timing of this project is dependent on the actions of the community members, but should occur as soon as possible.

8.3 Mutual Aid Agreement

Purpose of Mutual Aid Agreement: Misconceptions of the roles and responsibilities of the BLM Guard Station staff are common among residents of the assessment area, especially with respect to structure fires, fires on private land and firefighting in general. These misunderstandings have resulted in unfavorable views of BLM by some members of the community. For example, while members of the Jordan Valley Fire Department understand that Guard Station personnel cannot combat a structure fire they question why Guard Station personnel cannot assist by providing water to their water wagon (assuming they have the equipment available). There are some areas where a common interest in protecting private structures and public and private land could be translated into a mutual aid agreement between BLM and the community. This would increase the wildfire firefighting capability in the area and would improve the public perception of BLM's commitment to the area. A mutual aid agreement would serve to delineate these areas, increase public awareness of BLM's role in combating wildfire, and mutually benefit private landowners, the Jordan Valley Fire Department and BLM by forming a basis for cooperation among all groups.

Necessity for Assistance: The process of establishing a mutual aid agreement will make clear to all concerned the limits on roles and responsibilities which have caused unfavorable views of BLM. In addition, a mutual aid agreement has the potential to increase the area's firefighting capability by forming a basis for cooperation among parties, and improve communication and coordination between BLM, Jordan Valley Fire Department, and private landowners.

Project Timing: The Jordan Valley Fire Department should initiate the establishment of a mutual aid agreement with the BLM as soon as possible. If a rural fire department is created in the Jordan Valley area (see Section 8.2, above), this department should also be included in the mutual aid agreement.

8.4 Community Education and Outreach Recommendations

Purpose of Public Education and Outreach: The purpose of the community-wide education program is to 1) educate the public of the dangers of wildfire in the area, 2) urge residents to take responsibility in reducing the risk of wildfire and to create defensible space around their residence, 3) publicize the BLM dispatch phone number for reporting wildfires in order to reduce response times, and 4) increase awareness of the natural role of fire in forest and rangeland ecosystems, and the benefits of occasionally managing natural wildland fires to achieve

ecological benefits, while maintaining firefighter and public safety as the top priority. The public education and outreach program could be co-sponsored by the BLM and Jordan Valley Fire Department along with the Cattlemen's Association.

Outreach Occurrence: An annual "Firewise Clean-Up Day" is one tool that is recommended to encourage residents to create defensible/survivable space around their residence. In conjunction with the Firewise Clean-Up Day, specific demonstration projects may be designed and utilized to educate residents about longer-term investments they could make to increase fire safety. The clean-up day would occur in conjunction with public demonstrations, education programs, and speakers on wildfire and firewise practices. Members of the community thought conducting outreach activities in conjunction with a school event would reach a large part of the assessment area population. Working through the Cattlemen's Association to reach the large ranching population was also suggested.

Outreach Timing: Within the general guidelines set forth above, the annual "Firewise Clean-Up Day", education program, and public demonstrations would be most effective in the spring, to remind people to prepare their properties for the coming fire season. However, to take advantage of the school schedule, the fall would also provide opportunities for educational outreach, such as during a football game.

Outreach Necessity: Citizen involvement in wildfire mitigation in and around communities is a necessary element for success. Public education and outreach is an effective means of engaging the public in the process of reducing risks to a community. Such education and outreach has been shown to motivate homeowners to take measures around their individual property, thereby contributing to the reduction of wildfire hazards in a community. Further, a community education and outreach program will help identify problems and solutions for both public and private landowners, and offer opportunities for partnerships and agreements. Implementation of the program, and appropriate action by homeowners, will reduce fire risk to structures in the assessment area.

8.5 Providing Wildland Firefighting Training

Purpose of Providing Wildland Fire Training: The Jordan Valley Fire Department is staffed entirely by 10 volunteers, with 7 or 8 active participants. Training is mostly through videos and trainers coming to Jordan Valley, and is focused on structural fires. However, none of the volunteers have attended a fire training school, and none are certified in NWCG wildland

firefighting. Members of the Jordan Valley Fire department requested that a NWCG-certified instructor come to Jordan Valley to teach the wildfire-fighting courses. In addition, training offered at the Guard Stations could be extended to the volunteer firefighters.

Necessity for the Project: Such training would vastly improve the wildfire fire-fighting capabilities of the Jordan Valley Fire Department, thereby potentially reducing the occurrence of wildfire and reducing the time to extinguish them.

Project Timing: Because most of the volunteer firefighters have full-time jobs, the timing of the training needs to be coordinated to ensure a maximum turnout. The winter, when fire season is slow, would be a good time to teach the wildfire-fighting courses. In addition, when training is offered at the Guard Stations during the fire season, BLM could invite the volunteer firefighters to participate.

8.6 Water Storage Tank

Purpose of Construction of a Water Storage Tank: There is no water storage capability in the assessment area. As discussed above, there is a long response time for fires in the Arock and Rome area, and the Jordan Valley Fire Department has only a 350-gallon water wagon to supply water for remote fire-fighting. To facilitate fire-fighting efforts, BLM, the Jordan Valley Fire Department, and the Jordan Valley Irrigation District could coordinate the establishment of the water storage tank. The proposed location, identified by a member of the Jordan Valley Fire Department, is next to the irrigation ditch near Arock (shown on **Map 3**). The water storage tank should be about 10,000 gallons in size and properly equipped to fill a pumper truck. The proposed location was suggested because it serves an area that has no formal firefighting capability and there is a ready source of water. This location was also chosen because when the fire season is over the water could then be used for agricultural purposes.

Necessity of Assistance: The average response time for the Arock-Rome area is greater than 30 minutes. When the Jordan Valley Fire Department does respond it is with a 350-gallon water wagon. Having a consistent water supply available during the fire season will enable quicker response and enable a sustained response.

Project Timing: This project should be initiated after Jordan Valley and the proposed new rural fire department have pumper and tanker trucks that can be refilled. However, it may require lengthy negotiations to come to agreement on the tank location and to address stakeholder's concerns (e.g., water board).

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Video: Firewise Landscaping, Part 2-Design and Installation.

Video: Firewise Landscaping, Part 3-Maintenance.

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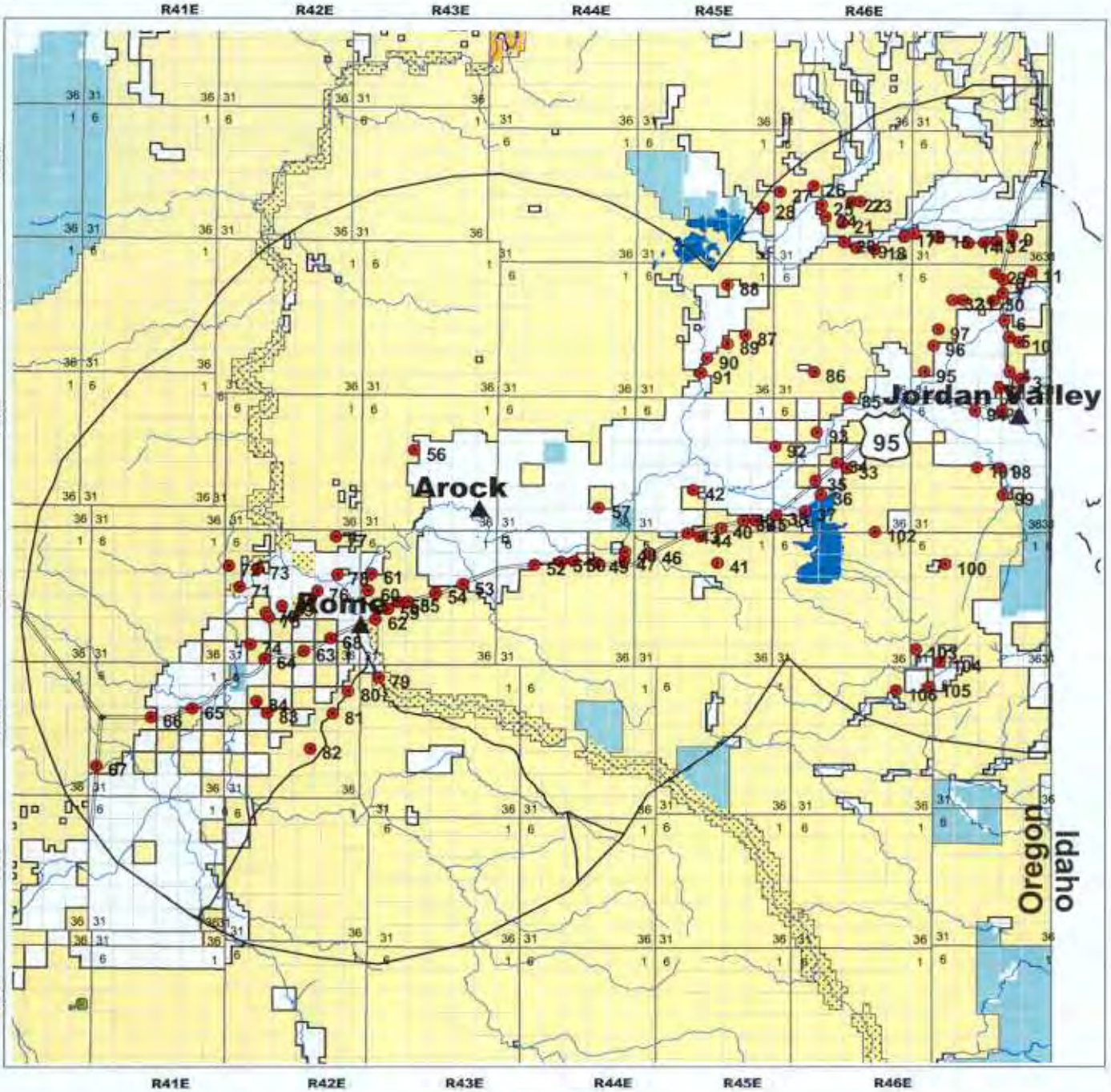
Appendix A

Maps

Map 1: Jordan Valley, Arock, Rome (JVAR), Assessment Area and Fuel Survey Points



N

2 0 2 4 6 8 10 Miles

Scale 1:450,000

Ownership:

- BLM
- U.S. Forest Service
- Bureau of Indian Affairs
- U.S. Fish & Wildlife
- Bureau of Reclamation
- FERC
- Private
- State
- Federal Aviation

Actual Assessment Point

Assessment Area

Highway

Road

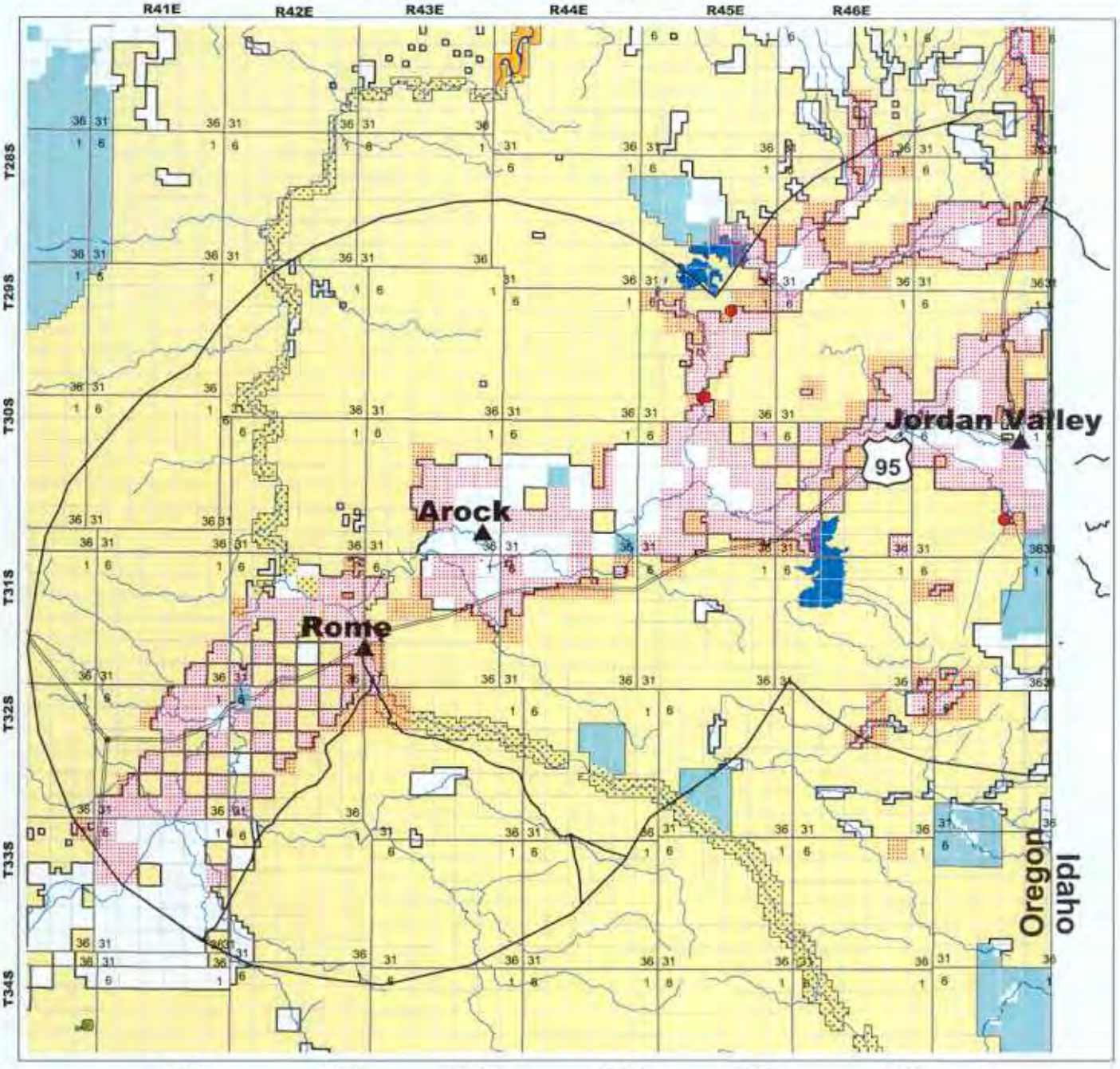
Stream

Surface Water

DYNAMAC CORPORATION
Environmental Services

Map created by April 2002

Map 2: Highest Risk Areas for Fuel and Fire Suppression within the JVAR Assessment Area



N

2 0 2 4 6 8 10 Miles

Scale 1:450,000

Ownership:

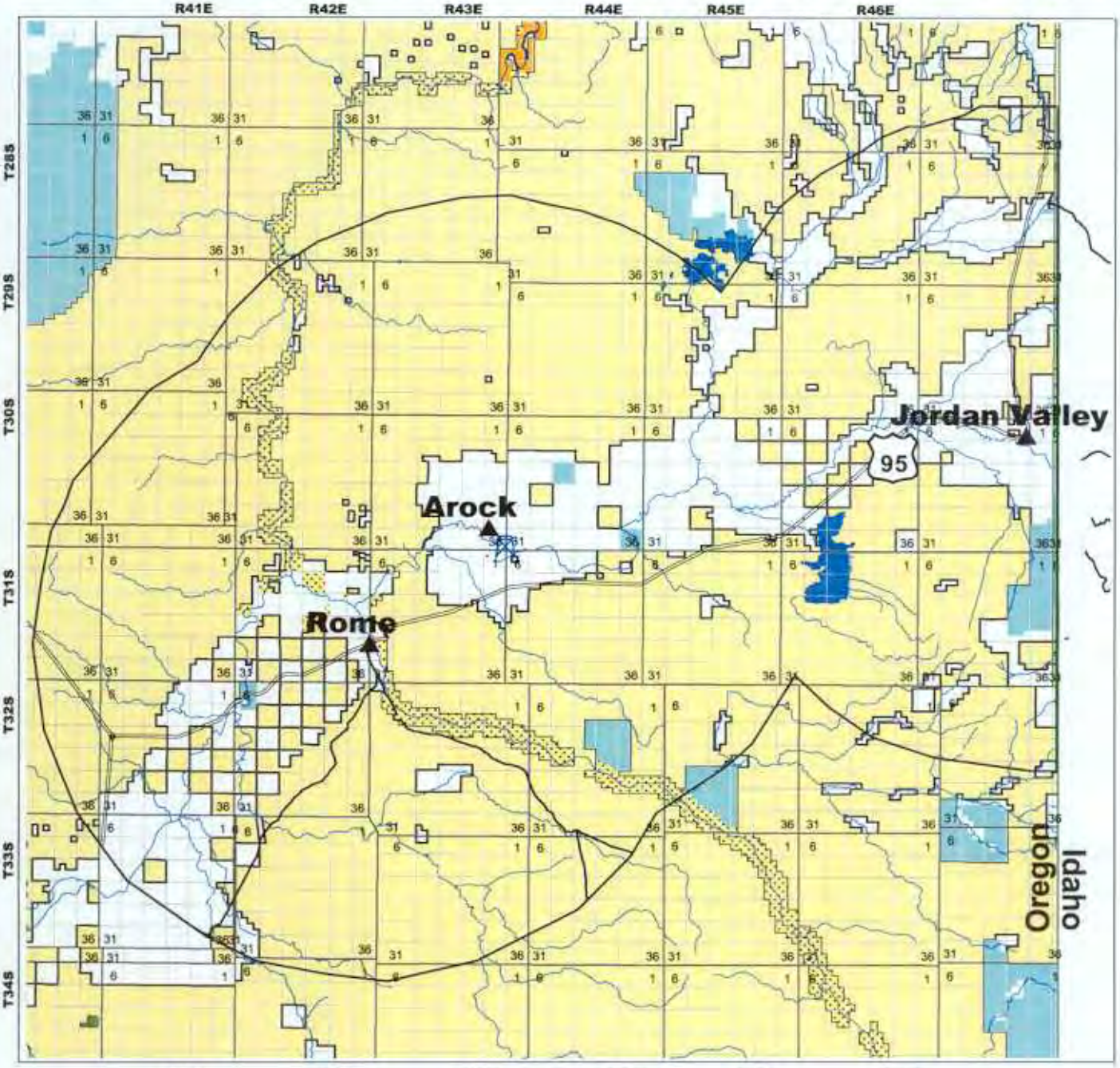
- BLM
- U.S. Forest Service
- Bureau of Indian Affairs
- U.S. Fish & Wildlife
- Bureau of Reclamation
- FERC
- Private
- State
- Federal Aviation
- Assessment Area
- Highway
- Road
- Stream
- Surface Water

- Highest Risk Fuel Areas within the Assessment Area
- High Risk Fuel Areas within the Assessment Area
- Highest Risk To Fire Suppression Areas (Low Structure Density) within the Assessment Area

DYNAMAC CORPORATION
Environmental Services

Map created by April 2002

Map 3: Proposed Mitigation Recommendations in the JVAR Assessment Area



N

2 0 2 4 6 8 10 Miles

Scale 1:450,000

Ownership:

- BLM
- U.S. Forest Service
- Bureau of Indian Affairs
- U.S. Fish & Wildlife
- Bureau of Reclamation
- FERC
- Private
- State
- Federal Aviation
- Assessment Area
- Highway
- Road
- Stream
- Surface Water

Mitigation:

- Proposed Water Tank

DYNAMAC CORPORATION
Environmental Services

Map created by April 2002

Appendix B

Action Items Required to form a Rangeland Fire Protection Association

ACTION ITEMS REQUIRED TO FORM A
RANGELAND FIRE PROTECTION ASSOCIATION
ORS 477.320 & 477.325
REVISED: 20 APR 00 FILE: RFPA FORMATION

Rangeland owners write letter to Board of Forestry requesting formation of a RFPA.
Responsible party: Rangeland owners

Board of Forestry acknowledges rangeland owners request via letter and appoints a local Department of Forestry contact.
Responsible party: Salem Fire Staff

Board of Forestry agenda item is requested regarding formation of requested RFPA.
Responsible party: Salem Fire Staff

Board of Forestry orders the holding of a public hearing into the formation of a RFPA.
Responsible party: Board of Forestry

Date, time and location of the public hearing are arranged.
Responsible party: Salem Fire Staff, District and RFPA

Board of Forestry public hearing officer is appointed.
Responsible party: Salem Fire Staff

Board of Forestry public hearing is scheduled; time and place are determined.
Responsible party: Salem Fire Staff and District

News release about Board of Forestry public hearing is issued.
Responsible party: Salem Fire Staff and Salem Public Affairs

Local notice is given about Board of Forestry public hearing.
Responsible party: District

Board of Forestry public hearing is conducted.
Responsible party: Salem Fire Staff

Board of Forestry public hearing records are filed.
Responsible party: Salem Fire Staff

Board of Forestry agenda item is requested regarding formation of requested RFPA.
Responsible party: Salem Fire Staff

Board of Forestry authorizes the formation of the requested RFPA.
Responsible party: Board of Forestry

Bylaws of the RFPA are developed.
Responsible party: Rangeland owners

Draft Memorandum of Understanding is developed to define the extent and type of protection to be conducted by the RFPA.

Responsible party: Salem Fire Staff, District and RFPA

Memorandum of Understanding, which defines the extent and type of protection to be conducted by the RFPA, is signed.
Responsible party: Salem Fire Staff, District and RFPA

Develop and sign a Mutual Aid Agreement between the District and the RPFA.
Responsible party: District and RFPA

Facilitate acquisition of FEPP equipment by RFPA.
Responsible party: District and RFPA

Facilitate acquisition of VFA federal grant funds by RFPA.
Responsible party: Salem Fire Staff

Develop first budget and forward to Board of Forestry.
Responsible party. RFPA

Board of Forestry agenda item is requested regarding RFPA budget.
Responsible party: Salem Fire Staff

Board of Forestry approves RFPA budget.
Responsible party: Board of Forestry

WILDLAND-URBAN INTERFACE COMMUNITIES-AT-RISK PROGRAM

Final Hazard Assessment Report
BLM Vale District
McDermitt Assessment Area

Order No.: NAD010208
Contract No.: GS-10F-0085J
April 2002

DYNAMAC
CORPORATION
www.dynamac.com

FINAL
WILDLAND-URBAN INTERFACE COMMUNITIES-AT-RISK MITIGATION RECOMMENDATIONS

VALE DISTRICT
MCDERMITT ASSESSMENT AREA

Prepared for:

U.S. Department of Interior
Bureau of Land Management
Vale District
100 Oregon Street
Vale, Oregon 97918
(541) 473-3144

Prepared by:

Dynamac Corporation
20440 Century Boulevard
Suite 100
Germantown, Maryland 20874

Order Number: NAD010208
Contract No.: GS-10F-0085J
Date Prepared: April 2002

DISCLAIMER

This Report was prepared for the Department of the Interior, Bureau of Land Management, Vale District under Order Number NAD010208, Contract No. GS-10F-0085J. This is not a decision document and reflects no commitment without appropriate planning, analysis, and funding. This Report is intended solely as guidance by which contractor support services will be provided to BLM. Any reports or analyses prepared by the contractor pursuant to this Report do not constitute or reflect legal opinions or analyses, or any position or opinion attributable to BLM. Any such reports or analyses are not intended, nor can they be relied upon, to create any rights, substantive or procedural, enforceable by any party in litigation with the United States. The BLM reserves the right to act at variance with any such reports or analyses, and to change them at any time without public notice.

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FIGURES

ACRONYM LIST

amsl	Above mean sea level
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CCC	Civilian Conservation Corps
EOG	Emergency Operations Group
FERC	Federal Regulatory Commission
GPS	Global Positioning System
LEPC	Local Emergency Planning Committee
NAD	North American Datum
NFPA	National Fire Protection Association
NWCG	National Wildfire Coordination Group
ODF	Oregon Department of Forestry
RFD	Rural Fire Department
SOW	Statement of Work
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
WRCC	Western Regional Climate Center

APPENDIX A

Maps

APPENDIX B

1.0 EXECUTIVE SUMMARY

During the 2000 fire season more than 6.8 million acres of public and private lands were burned by wildfire, resulting in loss of property, damage to resources, and disruption of community services. Many of these fires occurred in wildland-urban interface areas and exceeded fire suppression capabilities. To reduce the risk of fire in the wildland-urban interface, the President of the United States directed the Secretaries of the Departments of Agriculture and the Interior to increase federal investments in projects to reduce the risk of wildfire in wildland-urban interface areas. The Bureau of Land Management (BLM), Vale District is currently in the process of forming partnerships with local governments to plan fuels reduction treatments and other mitigation measures targeted at the wildland-urban interface in the vicinity of public lands. These partnerships are indicative of a shared responsibility to reduce wildland fire risks to communities.

The wildland-urban interface occurs where manmade structures meet or intermix with wildland vegetation. In certain situations, specific actions such as fuels reduction around communities, forest and rangeland restoration, infrastructure improvements, and public education and outreach may reduce the risk of catastrophic fire in the wildland-urban interface. To this end, the Vale District BLM implemented the Communities-at-Risk Wildland-Urban Interface Program. The program seeks to reduce the hazard of wildland fires to communities through public outreach, the reduction or prevention of fuel build-up, and increasing the fire protection capabilities of communities. The McDermitt community was selected to assess the hazard of wildland fire and to identify specific actions that may reduce the risk of loss and disruption of services from wildland fires.

Dynamac Corporation was contracted to support the BLM in their assessment of wildfire risk to the McDermitt community in the wildland-urban interface. Dynamac scientists conducted fuel surveys by categorizing the vegetation, slope, and aspect of the land in the McDermitt assessment area. The risk of wildland fire to homes, structures, and cultural resources on private land was also evaluated according to building materials, the presence of survivable space, road access, and the response time of the local fire department. Dynamac assessed the adequacy of the community's service infrastructure (including roads, water supplies, and fire fighting equipment) by systematic observation, and by interviewing community officials and fire prevention personnel. A community open house was held to disseminate information about the Communities-at-Risk, Wildland-Urban Interface Program to citizens, to afford them the

opportunity to identify resources that are of value to the community, and to have them identify actions that may reduce the risk of wildland fire. The information gathered from the fuel surveys, structural surveys, interviews, infrastructure assessments, and community profile was integrated into two reports: a hazard assessment report and mitigation recommendations. The following action items were identified to reduce the wildfire threat in the McDermitt assessment area.

- Provide assistance to the McDermitt Fire District in obtaining an additional pumper truck;
- Construct firebreaks at specific locations to the west and northwest of McDermitt;
- Establish a Rural Fire Department (RFD) on the Fort McDermitt reservation;
- Reduce fuel loads on specified sections by spraying and re-seeding;
- Modifications to an existing water-storage tank approximately 12 miles north of McDermitt on Highway 95 and the addition of two other water sources to improve the availability of water resources and to reduce the time needed to refill pumper truck; and
- Develop an ongoing education and outreach program throughout the assessment area to encourage firewise practices.

2.0 GOALS AND OBJECTIVES

The goals of the McDermitt wildfire hazard assessment and mitigation recommendations are to evaluate the hazards of wildland fire within the assessment area and then identify specific actions that could reduce the risks. The objectives are to decrease the chances of wildfire spreading from public lands onto private lands, and from private lands onto public lands.

3.0 BACKGROUND

Wildland fire is an integral component of many forest and rangeland ecosystems. In the conterminous United States before European settlement, an estimated 145 million acres were annually scorched by wildfire. In comparison, only about 14 million acres are currently burned annually due to increased agriculture, urbanization, habitat fragmentation, and fire suppression programs. This change from the historical fire regime to the present day has caused a shift in the native vegetation composition and structure of fire-prone ecosystems such as some forests and rangelands, resulting in a dangerously high accumulation of fuels. As a result, when wildland fires do occur, they may burn larger and hotter than those in the past and pose an increased risk to human welfare and ecological integrity.

The hazard of wildland fires is compounded by the increasing occurrence of human structures and activities in fire-prone ecosystems. The wildland-urban interface occurs where human structures meet or intermix with wildland vegetation. In certain situations, specific actions such as fuels reduction around communities, forest and rangeland restoration, infrastructure improvements, and public outreach may reduce the risk of losses to catastrophic fire in the wildland-urban interface. The Vale District BLM implemented the Communities-at Risk Wildland-Urban Interface Program to determine what these specific actions may be, and where they are needed. The program seeks to reduce the hazard of wildland fires to communities through public education and outreach, the reduction or prevention of fuel build-up, and increasing the fire protection capabilities of communities. The McDermitt community was selected to assess the threat of wildland fire and to identify specific actions that may reduce the risk of loss.

The BLM Vale District intends to use the mitigation measures identified in this document as a guide and prioritization tool in implementing the Communities at Risk program. The District is committed to working with any partners (private, local government, state, and federal) in order to accomplish mutual goals and objectives identified in the recommendations. The recommendations that the District chooses to implement will go through the NEPA process and will be accomplished as funding, policy and regulations permit.

4.0 EXISTING SITUATION

The town of McDermitt straddles the Oregon-Nevada state line with the major portion of the town in Nevada. The ranchers living in Oregon receive their mail and other services in McDermitt. The entire assessment area is situated in a large valley in southeastern Oregon. The assessment area is located in Malheur County, Oregon, and Humboldt County, Nevada, and is approximately 144 miles south of Vale, Oregon, and 73 miles north of Winnemucca, Nevada. The assessment area includes the town of McDermitt, Nevada, and consists of portions of townships T38S R40E; T38S R41E; T38S R42E; T38S R43E; T38S R44E; T38S R45E; T39S R40E; T39S R41E; T39S R42E; T39S R43E; T39S R44E; T39S R45E; T40S R40E; T40S R41E; T40S R42E; T40S R43E; T40S R44E; T40S R45E; T41S R40E; T41S R41E; T41S R42E; T41S R43E; T41S R44E; and T41S R45E. Within the assessment area are ranches, residential areas, and historic structures and sites.

The assessment area is in a wide valley in the high desert. Surrounding this wide valley are cliffs and rock formations. McDermitt is at approximately 4,300 feet above mean sea level (amsl) and the elevation of the assessment area ranges from 4,200 feet to 4,800 feet amsl. There is a concentrated residential area in McDermitt but scattered ranches populate the surrounding portion of Oregon. The approximate population of the assessment area is 433. The predominant vegetation throughout the assessment area is sagebrush and grasses (e.g., cheatgrass and bunchgrass). Large bushes and trees are only found near residential areas. The Fort McDermitt reservation is within the assessment area, although the portion of the reservation in Oregon is unpopulated.

Agricultural production is primarily cattle ranching. There is open rangeland throughout the entire assessment area. The rangeland is important for livestock grazing, wildlife habitat, and recreation.

The climate of the assessment area is characterized by warm, dry summers with maximum average temperatures reaching 91° Fahrenheit (F) in July, and an average daily summertime low of 43-47° F. Winter months are typically cool, with average daily temperatures from November to March ranging from 30 to 40°F. Precipitation is typically low with an average annual precipitation of 9.43 inches. July has the lowest average precipitation with 0.35 inches and May has the most with 1.38 inches. Between November and March precipitation arrives predominantly as snowfall and from April through October as rain (WRCC, 2002).

The Hazard Report for the McDermitt assessment area reported on a fuel and structure surveys. The fuel survey consisted on 31 fuels assessment points, and at each site six fuel variables were rated as to low hazard (Class A), moderate hazard (Class B), and high hazard (Class C). The fuel survey data are summarized as follows:

- **Slope:**

  Class A - 64.5% of the points were flat land (less than 10% slope).
  Class B - 29% of the points were moderate slope (10 to 30% slope).
  Class C - 6.5% of the points were steep slopes (greater than 30% slope).

- **Aspect:**

  Class A - 10% of the points faced north.

  Class B - 71% of the points faced east or were flat land.

  Class C - 19% of the points faced south and west.

- **Elevation:**

  Class A - 3% of the points were at elevations greater than 5,000 feet amsl.

  Class B - 97% of the points were at elevations between 3,500 and 5,500 amsl.

  Class C - 0% of the points were at elevations lower than 3,500 feet amsl.

- **Fuel Type:**

  Class A - 23% of the points had small, light fuels (grass, weeds, shrubs).

  Class B - 74% of the points had medium fuels (brush, medium shrubs, small trees).

  Class C - 3% of the points had heavy fuels (timber, woodland, large brush, or heavy planting of ornamentals).

- **Fuel Density:**

  Class A - 26% of the points had a non-continuous fuel bed (less than 30% cover).

  Class B - 71% of the points had a broken moderate fuel bed (31 to 60% cover).

  Class C - 3% of the points had a continuous fuel bed (greater than 60% cover).

- **Fuel Bed Depth:**

  Class A - 13% of the points had a low fuel bed depth (less than 1 foot).

  Class B - 84% of the points had a moderate fuel bed depth (1-3 feet).

  Class C - 3% of the points had a high fuel bed depth (greater than 3 feet).

Data from the fuels hazard assessment are also depicted on **Figures 1 and 2**.

The second component of the Hazard Assessment was to characterize structures in the assessment area for structure density, building materials, proximity to fuels, presence of survivable space, and roads/accessibility. Again, these variables were rated as low hazard (Class A), moderate hazard (Class B), and high hazard (Class C). Results of the structure survey are summarized as follows:

- **Structure Density:**

  Class C - 100% of all sections surveyed had less than one structure per 10 acres.

- **Proximity to Structures:**

  Class A - 5% of the sections with structures had flammable wildland fuels greater than 100 feet from the structures.

  Class B - 80% of the sections with structures had wildland fuels 40 to 100 feet away from the majority of structures.

  Class C - 15% of the sections with structures had fuels less than 40 feet from the structures.

- **Predominant Building Materials:**

  Class A - 35% of the sections with structures had more than 50% of homes built with fire-resistant roofs and/or siding.

  Class B - 50% of the sections with structures had 10-50% of the homes built with fire-resistant roofs and/or siding.

  Class C - 15% of the sections with structures had less than 10% of the homes built with resistant roofs and/or siding.

- **Survivable Space:**

  Class A - 40% of the sections with strucures had a majority of homes with improved survivable space around the homes (greater than 50%).

  Class B - 45% of the sections with structures had 10-50% of homes with improved survivable space around them.

  Class C - 5% of the sections with structures had less than 10% of homes with improved survivable space around them.

- **Roads:**

  Class A - 29% of the sections where roads were observed had wide looped roads that were maintained, paved or solid, and/or surfaced, with shoulders.

  Class B - 57% of sections with roads had maintained, two-lane roads with no shoulders.

  Class C - 14% of the sections surveyed had narrow, steep, rutted roads.

- **Response Time:**

  Class A - 21% of all sections surveyed had a response time of less than 20 minutes.

  Class B - 62% of all sections surveyed had a response time of 20 to 40 minutes.

  Class C - 17% of all sections surveyed had a response time of greater than 40 minutes.

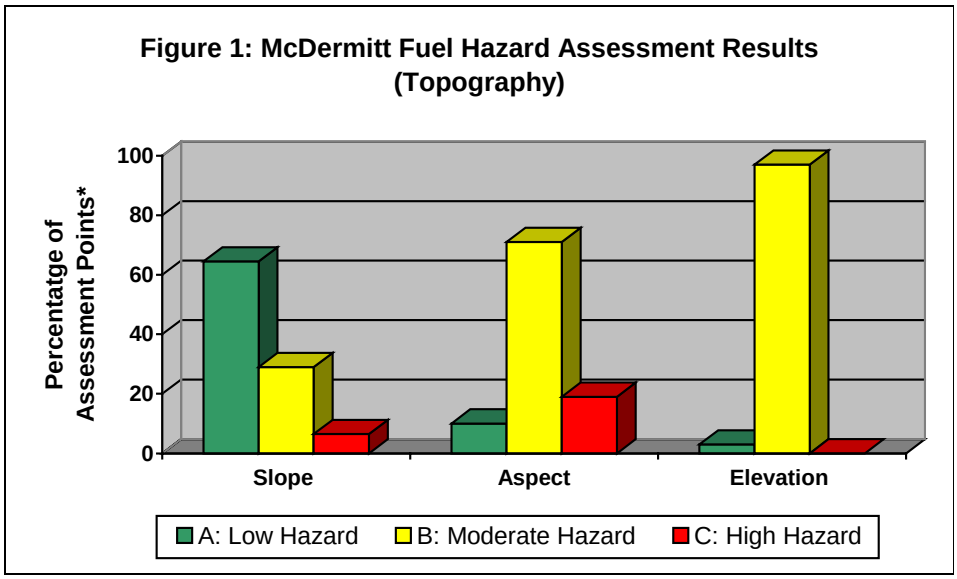
- **Access:**

  Class A - 10% of the sections with roads had multiple entrances and exits that were suitable for trucks with turnarounds.

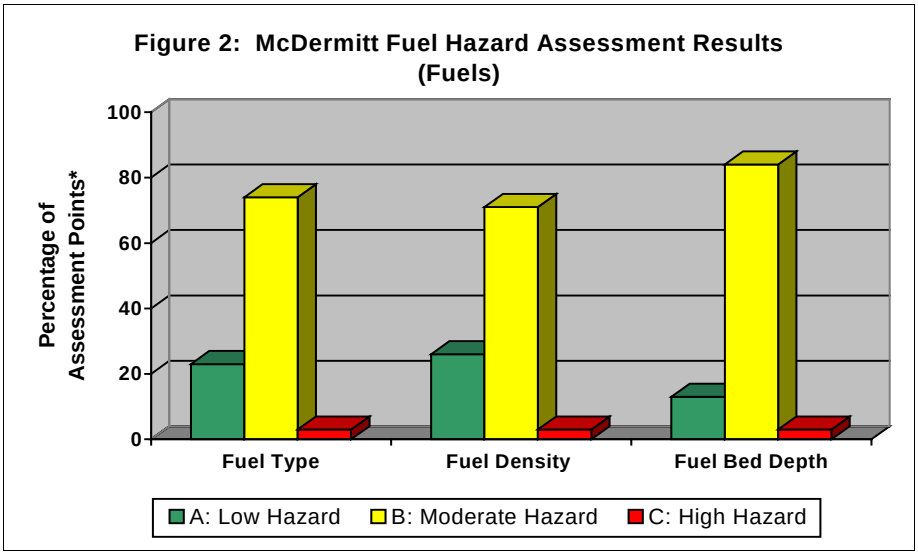
  Class B - 86% of the sections had limited access routes.

  Class C - 4% of the sections had poor access routes.

Areas of highest risk in terms of fuel hazards and difficulty in fire suppression are shown on **Map 2** in Appendix A. The data from the fuels hazard assessment are also graphically depicted in **Figures 1 and 2.** The charts depict the percentage of assessment points, based on a total of 31 points surveyed, which received a high, moderate, or low hazard ranking for hazards posed by fuels and topography of the assessment area. The percentages of assessment points for hazards to structures are graphically depicted in **Figure 3**. It should be noted that data reported for structure density and response times refers to all sections surveyed within the assessment area; proximity to fuels, building materials, and survivable space, refer to 20 sections *with structures* in the assessment area; and roads and access percentages are based on the 21 sections with roads that were observed in the assessment area. The reason for the discrepancy in numbers of sections where road characteristics were observed and where structural features were observed is that in one section, a locked and gated, but observable road across private land prevented Dynamac from observing any possible structures which may have been on the other side of a ridge. This occurred in only one section.

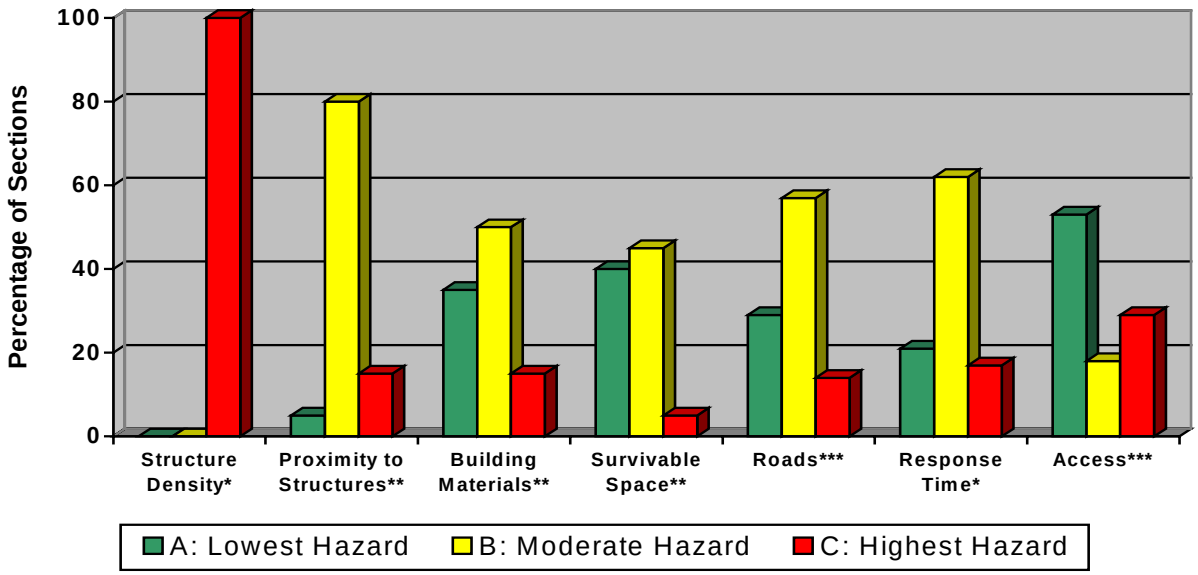


*Percentage of assessment points based on 31 points surveyed in McDermitt assessment area.



*Percentage of assessment points based on 31 points surveyed in McDermitt assessment area.

Figure 3: McDermitt Structure Risk Assessment Results



* Based on all 87 sections surveyed within the assessment area.
** Based on 20 sections with observable structures within the assessment area.
*** Based on 21 sections with structures and roads within the assessment area.

5.0 PUBLIC COMMENT SUMMARY

Through discussions with community leaders, fire officials, and residents of McDermitt and the surrounding wildland-urban interface lands, the following actions were suggested to improve fire preparedness and prevention measures along the wildland-urban interface. Most of these have been developed into recommendations (See Section 8.0, Proposed Projects) for lessening the risk posed by fire.

- A pumper truck for the McDermitt Fire Department;
- Construct firebreaks at specific locations to the west and northwest of McDermitt;
- Spray and re-seed specific sections to reduce the fuel load;
- Increased ability to control wildland fires by pre-positioning water sources for firefighting;
- Increased ability to control wildland fires by modifying an existing water storage tank to accommodate pumper trucks;
- Establishment of a rural fire department on the Fort McDermitt reservation; and
- Area-wide adoption of firewise practices in residential building and landscaping.

6.0 NEED FOR ACTION

Wildfire frequency in the McDermitt assessment area is not uncommon, and results predominantly from natural causes and also from human causes. At risk are dwellings and other structures on private land near the wildland interface and the open rangeland. To reduce the risks of wildfire in the assessment area both general and specific actions are needed. In general, the residents and their public agencies should support activities that promote safety for dwellings, structures and rangeland at risk.

7.0 METHODOLOGY

The mitigation actions proposed herein for the McDermitt assessment area are based on information acquired from fuel and structure surveys, a public meeting, interviews of community officials, and surveys filled out and submitted by residents of McDermitt. The majority of information presented in this report was gathered between November 13 and November 16, 2001. A Hazard Assessment Report has been completed for the area and is available at the BLM-Vale District Office in Vale, Oregon.

Dynamac characterized land and fuels at 31 points on public land within a 15-mile radius of McDermitt (for the most part, excluding land within Nevada), concentrating on sections of land near inhabited areas. As not all sections of public land were accessible, Dynamac endeavored to choose fuel survey points that were representative of surrounding sections. The rating elements included slope, aspect, elevation, fuel type, fuel density, and fuel bed depth, and were assigned to a risk category of low, medium, or high (See Hazard Assessment Report, Table 3, and Appendix B). At each survey point, the field crew recorded the location in UTM coordinates using a Trimble hand-held global positioning unit (GPS), and photographed the surrounding area in the four cardinal directions. A wildland fuels fire hazard assessment form (Form 1) was completed which rated the characteristics of the land features and fuel sources.

Dynamac staff also collected information on the flammability and defensibility of structures on private land from 87 sections located within one mile of public lands, within the assessment area. The structural hazard assessment rated the structures based on the resistance of building materials to fire, and the distance of flammable fuels to the structures located within a section. The rating elements included structure density, proximity of flammable fuels to the structures, building materials, survivable space, and types of roads, response times, and accessibility. Each

element was assigned a rating of low, moderate, or high hazard category (See Hazard Assessment Report, Table 4, and Appendix C).

A public open house was convened on November 13, 2001, at the McDermitt Community Hall, from 7:00 to 10:00 p.m. The community was invited to attend through announcements posted in public places such as the post office, restaurants and stores. A meeting announcement was sent to 290 mailing addresses in McDermitt. Dynamac and BLM staff attended the public meeting to hand out firewise brochures, obtain information from the community on hazardous fire situations and desired conditions, and to be an informational resource to those attending the meeting. Residents attending the meeting were asked to fill out a survey form regarding their perceptions and concerns about wildland fire in their communities. (See Hazard Assessment Report, Appendix D.)

The Dynamac Community Relations Specialist conducted interviews with numerous local public officials and residents. Individuals or groups interviewed included the Acting McDermitt Fire District Chief, McDermitt Combined School principal, Oregon Fire Board Treasurer, and the Fort McDermitt Tribal Chairman. (See Hazard Assessment Report, Appendix E).

A second public meeting was convened on March 20, 2002, to present the findings of the hazard assessment and discuss with the public potential mitigation actions that may reduce the risk of wildfire in the assessment area. A direct mailing was used to notify 290 residences of this meeting. The meeting was held at the McDermitt Community Hall from 7:00 to 9:30 p.m. Eighteen people attended the meeting in addition to BLM and Dynamac staff. The proceedings of the meeting are also in Appendix F. A question and answer period followed a presentation on the findings of the hazard assessment and the mitigation recommendations. In addition, the meeting participants were requested to provide comments on the report to either BLM or Dynamac Corporation within one week. Comments were received during the meeting and were also received in writing from community members. (See Hazard Assessment Report, Appendix F).

8.0 PROPOSED PROJECTS

The following projects are proposed based on information obtained from the fuel and structure surveys, the community meeting, and interviews. The following specific action items were identified to reduce the hazard of wildfire in the McDermitt assessment area:

- A pumper truck for the McDermitt Fire Department;
- Construct and maintain firebreaks at specific locations to the west and northwest of McDermitt;
- Provide guidance to the Fort McDermitt tribal office in establishing a rural fire department and assist in identifying methods for obtaining equipment and training;
- Reduction of fuel loads on specific sections within the assessment area by spraying and re-seeding;
- Increased ability to control wildland fires by pre-positioning water sources for firefighting;
- Increased ability to control wildland fires by modifying an existing water tank for firefighting; and
- Area-wide adoption of firewise practices in residential building and landscaping.

8.1 Local Fire Department Assistance

Purpose of Local Fire Department Assistance: The ability of the McDermitt Fire District to respond to wildland fires would be greatly enhanced by the addition of a pumper truck. The additional pumper truck would be pre-positioned during the fire season in a location that does not have an adequate water supply, requires a long response time from current firefighting capabilities, and also has volunteers to man the truck in case of fire. Currently, the McDermitt Fire District pre-positions a small pumper truck for this purpose. An additional pumper truck would provide some redundancy and allow this practice to continue. According to the acting Fire Chief, this was a very effective strategy. The area where the pumper truck was pre-positioned was in Oregon near Kimble Wilkinson's ranch. The location was chosen for the reasons already stated, and because this location also had good access to the interface between the Fort McDermitt reservation and land protected by the McDermitt Fire District.

Necessity for Assistance: An additional pumper truck would enable the fire district to continue to pre-position a pumper truck at areas that are difficult to reach quickly and that have no water supply.

Project Timing: The McDermitt Fire District should request BLM's assistance in obtaining a pumper truck as soon as possible. The McDermitt Fire District should work with the BLM in obtaining grant money as soon as possible. The McDermitt Fire District would initiate application for grant monies, and the BLM could offer advice, and assistance through any means

necessary, and also write a recommendation that the McDermitt Fire District should receive grant monies.

8.2 Firebreaks

Construction and Location of Firebreaks: The locations of the proposed firebreaks is shown on **Map 3.** The proposed firebreaks are predominantly on BLM land but also cross private land and follow existing roads and topography. To create and increase their use as firebreaks would require either widening roads to 50 feet, or clearing areas adjacent to roadways approximately 15 feet on either side. Clearing the roads could be accomplished by mechanical treatment, either discing or by mowing. BLM and private landowners could share in the responsibility of maintenance of the firebreak.

Project Timing: BLM generally times projects in the following manner: Year One is the year identification and justification of projects occurs, and treatment objectives are determined. Field surveys begin. In Year Two, projects that require compliance with the National Environmental Policy Act (NEPA) are planned, analyzed, and designed. In Year Three, NEPA projects begin implementation. All steps are contingent on available funding. In Year Four, project monitoring begins.

Project Necessity: Firebreaks have been shown to be effective in reducing the risk of loss from fire in the wildland-urban interface. Firebreaks are also beneficial by making fires that do occur easier to suppress.

8.3 Establishment of Rural Fire Department

Purpose of Establishment of Rural Fire Department: The Fort McDermitt reservation receives fire protection from the BLM Guard Station located adjacent to the reservation on Highway 95. The Guard Station is restricted by federal policy from combating structural fires. Therefore, the Fort McDermitt reservation, a large portion of the assessment area, has no organized firefighting capability for structural fires. By establishing an RFD, equipment and training can be obtained, greatly increasing the protection of people, structures and rangeland. There is interest at the tribal office level and among the residents of the reservation. In addition, many residents of the reservation have been members of fire teams and have firefighting experience.

Necessity for Assistance: By establishing an RFD, the McDermitt area as a whole, and the Fort McDermitt Reservation specifically, can obtain equipment and training, greatly increasing the protection of people, structures, and rangeland. BLM's role in this process can be as an advisor on the process of establishing an RFD, and as a source of information on obtaining equipment and training.

Project Timing: There was strong support for this project from members of the community. The community should contact the Oregon Fire Marshall to determine the state requirements for recognition as a fire department. **Appendix B** provides a list of action items required to form a rangeland fire protection association. During this process the community should request information and assistance from BLM. Once the Oregon Fire Marshall recognizes the fire department, it can work with BLM in obtaining grant money and submitting grant proposals for Federal assistance funds. The overall timing of this project is dependent on the actions of the community members, but should occur as soon as possible.

8.4 Water Storage Tanks

Purpose of Modification and Construction of a Water Storage Tank: There is no water storage capability in the Oregon portion of the assessment area and there is limited capability in the Nevada portion of the assessment area. When fighting a fire, trucks must return to McDermitt to refill, which reduces their capability to fight fires. To facilitate fire-fighting efforts, BLM and the McDermitt Fire Department could coordinate the modification of an existing BLM tank so that it can be used to fill tanker trucks and also provide a quick fill capability. The tank is located near the Civilian Conservation Corps (CCC) camp off of Oregon Canyon Road. Two other locations, in Nevada, have been identified that already have wells that can be used to fill tanks. The locations are approximately 15 miles south of McDermitt off of Highway 95 and approximately 2 miles southwest of McDermitt on BIA land. The tanks would need to be constructed and put in place but the water source is already established. The proposed locations of the new tanks (identified by members of the community) and the location of the existing tank, are shown on **Map 3**. These additional water sources would enable the McDermitt fire district to more rapidly respond to fires throughout the assessment area.

Necessity of Assistance: Having a consistent water supply will lower response times and enable a sustained response uninterrupted by return trips to McDermitt to refill trucks.

Project Timing: This project may require lengthy negotiations to come to agreement on the tank location and to address stakeholder's concerns (e.g., water board). Therefore, discussions among the McDermitt Fire Department, BLM, and stakeholding parties should begin as soon as time and funding permit.

8.5 Community Education and Outreach Recommendations

Purpose of Public Education and Outreach: The purpose of the community-wide education program is to 1) educate the public about the dangers of wildfire in the area, 2) urge residents to take responsibility in reducing the risk of wildfire and to create defensible space around their residence, and 3) increase awareness of the natural role of fire in forest and rangeland ecosystems, and the benefits of occasionally managing natural wildland fires to achieve ecological benefits, while maintaining firefighter and public safety as the top priority. The public education and outreach program should be co-sponsored by the BLM and McDermitt Fire Department. In addition, the Fort McDermitt tribal council should be included in the program.

Outreach Occurrence: An annual "Firewise Clean-Up Day" is one tool that is recommended to encourage residents to create defensible/survivable space around their residence. In conjunction with the Firewise Clean-Up Day, specific demonstration projects may be designed and utilized to educate residents about longer-term investments they could make to increase fire safety. The clean-up day would occur in conjunction with public demonstrations, education programs, and speakers on wildfire and firewise practices.

Outreach Timing: Within the general guidelines set forth above, the annual "Firewise Clean-Up Day," education program, and public demonstrations would be most effective in the spring, to remind people to prepare their properties for the coming fire season.

Outreach Necessity: Citizen involvement in wildfire mitigation in and around communities is a necessary element for success. Public education and outreach is an effective means of engaging the public in the process of reducing risks to a community. Such education and outreach has been shown to motivate homeowners to take measures around their individual properties, thereby contributing to the overall reduction of wildfire hazards in a community. Further, a community education and outreach program will help identify problems and solutions for both federal and private landowners, and offer opportunities for partnerships and agreements. Implementation of

the program, and appropriate action by homeowners, will reduce fire risk to structures in the assessment area.

8.6 Fuels Reduction

Areas to receive Herbicide Treatment and Re-seeding: The location of the proposed herbicide treatment and re-seeding is shown on **Map 3.** The proposed areas are predominantly on BLM land but also include some private land. After the areas have been treated they will be re-seeded with perennial grasses that create less of a fire hazard. The re-seeded areas will have to be fenced until the new grasses have sufficiently established themselves. This will impact some community members who use the land for grazing.

Project Timing: BLM generally times projects in the following manner: Year One is the year identification and justification of projects occurs, and treatment objectives are determined. Field surveys begin. In Year Two, projects that require compliance with the National Environmental Policy Act (NEPA) are planned, analyzed, and designed. In Year Three, NEPA projects begin implementation. All steps are contingent on available funding. In Year Four, project monitoring begins.

Project Necessity: Fuels reduction has been shown to be effective in reducing the risk of loss from fire in the wildland-urban interface.

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Video: Firewise Landscaping, Part 2-Design and Installation.

Video: Firewise Landscaping, Part 3-Maintenance.

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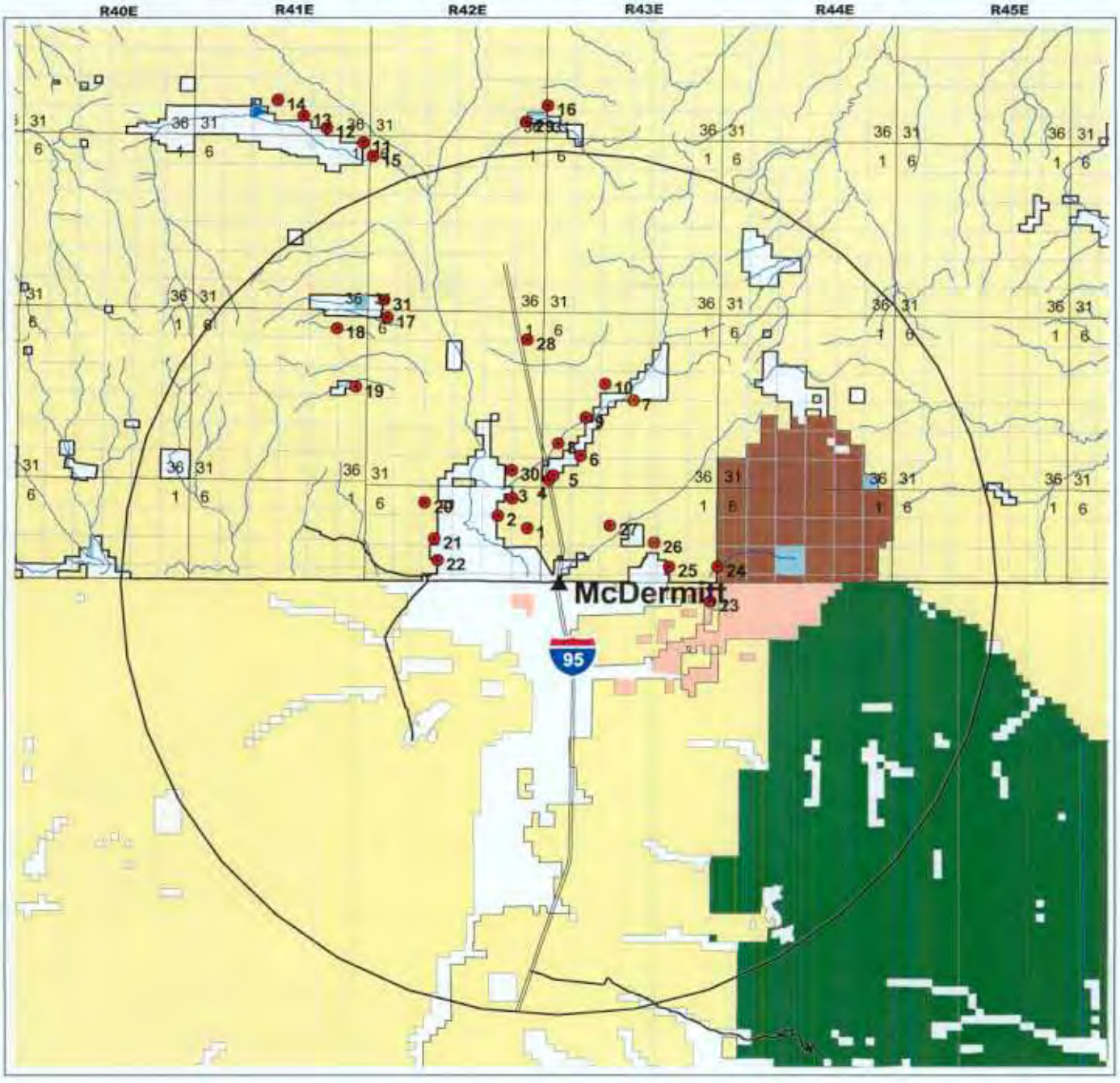
AppendixA

Maps

Map 1: McDermitt Assessment Area and Fuel Survey Points



N

2 0 2 4 6 8 Miles

Scale 1:350,000

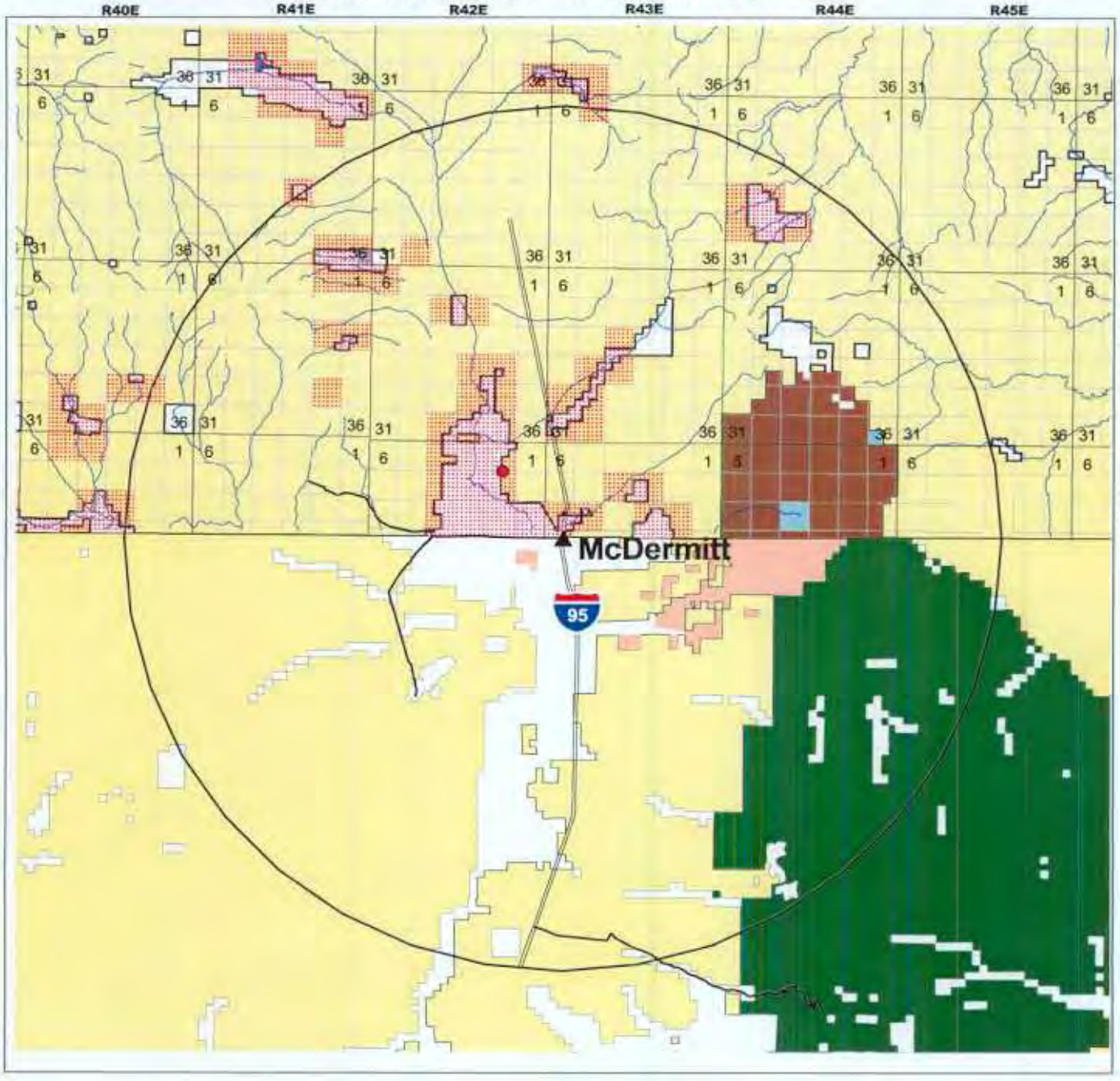
Ownership:
- BLM
- U.S. Forest Service
- Oregon BIA
- Nevada BIA
- Private
- State
- Assessment Area
- Highway
- Stream
- Surface Water

Actual Assessment Point

DYNAMAC CORPORATION
Environmental Services

Map created by April 2002

Map 2: Highest Risk Areas for Fuel and Fire Suppression within the McDermitt Assessment Area



N

2 0 2 4 6 8 10 Miles

Scale 1:350,000

Ownership:
- BLM
- U.S. Forest Service
- Oregon BIA
- Nevada BIA
- Private
- State
- Assessment Area
- Highway
- Stream
- Surface Water

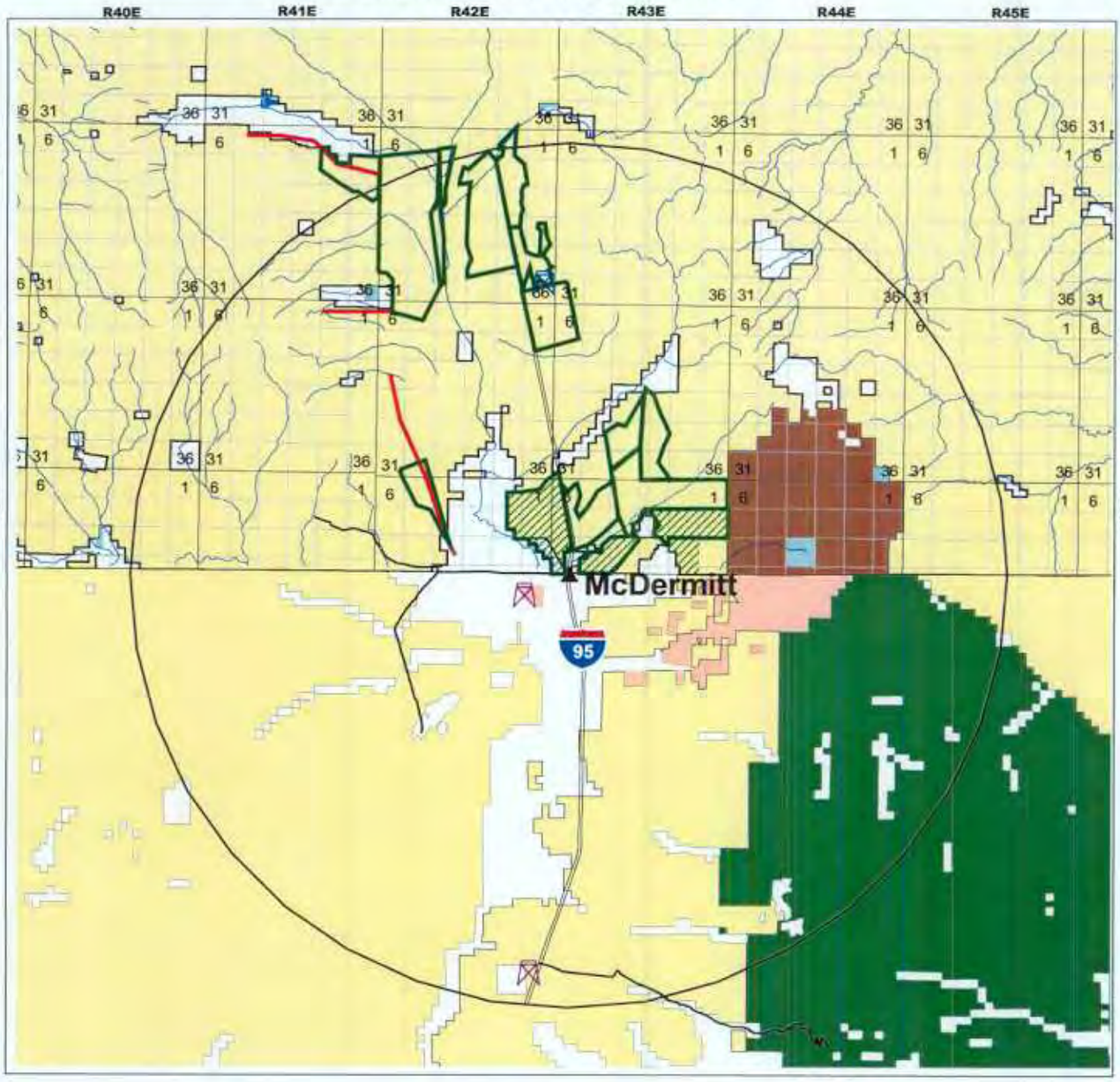
Highest Risk to Fire Suppression Areas (Low Structure Density) within the Assessment Area

Highest Risk Fuels Areas within the Assessment Area

DYNAMAC CORPORATION
Environmental Services

Map created by April 2002

Map 3: Proposed Mitigation Recommendations in the McDermitt Assessment Area



N

2 0 2 4 6 8 Miles

Scale 1:350,000

Ownership:
- BLM
- U.S. Forest Service
- Oregon BIA
- Nevada BIA
- Private
- State
- Assessment Area
- Highway
- Stream
- Surface Water

Mitigation:
- Modify Existing Water Tank
- Proposed Water Tank
- Proposed Fire Break
- Proposed BLM Projects
- Herbicide Treatment and Re-seeding

DYNAMAC CORPORATION
Environmental Services

Map created by April 2002

Appendix B

Action Items Required to form a Rangeland Fire Protection Association

ACTION ITEMS REQUIRED TO FORM A
RANGELAND FIRE PROTECTION ASSOCIATION
ORS 477.320 & 477.325
REVISED: 20 APR 00 FILE: RFPA FORMATION

Rangeland owners write letter to Board of Forestry requesting formation of a RFPA.
Responsible party: Rangeland owners

Board of Forestry acknowledges rangeland owners request via letter and appoints a local Department of Forestry contact.
Responsible party: Salem Fire Staff

Board of Forestry agenda item is requested regarding formation of requested RFPA.
Responsible party: Salem Fire Staff

Board of Forestry orders the holding of a public hearing into the formation of a RFPA.
Responsible party: Board of Forestry

Date, time and location of the public hearing are arranged.
Responsible party: Salem Fire Staff, District and RFPA

Board of Forestry public hearing officer is appointed.
Responsible party: Salem Fire Staff

Board of Forestry public hearing is scheduled; time and place are determined.
Responsible party: Salem Fire Staff and District

News release about Board of Forestry public hearing is issued.
Responsible party: Salem Fire Staff and Salem Public Affairs

Local notice is given about Board of Forestry public hearing.
Responsible party: District

Board of Forestry public hearing is conducted.
Responsible party: Salem Fire Staff

Board of Forestry public hearing records are filed.
Responsible party: Salem Fire Staff

Board of Forestry agenda item is requested regarding formation of requested RFPA.
Responsible party: Salem Fire Staff

Board of Forestry authorizes the formation of the requested RFPA.
Responsible party: Board of Forestry

Bylaws of the RFPA are developed.
Responsible party: Rangeland owners

Draft Memorandum of Understanding is developed to define the extent and type of protection to be conducted by the RFPA.

Responsible party: Salem Fire Staff, District and RFPA

Memorandum of Understanding, which defines the extent and type of protection to be conducted by the RFPA, is signed.
Responsible party: Salem Fire Staff, District and RFPA

Develop and sign a Mutual Aid Agreement between the District and the RPFA.
Responsible party: District and RFPA

Facilitate acquisition of FEPP equipment by RFPA.
Responsible party: District and RFPA

Facilitate acquisition of VFA federal grant funds by RFPA.
Responsible party: Salem Fire Staff

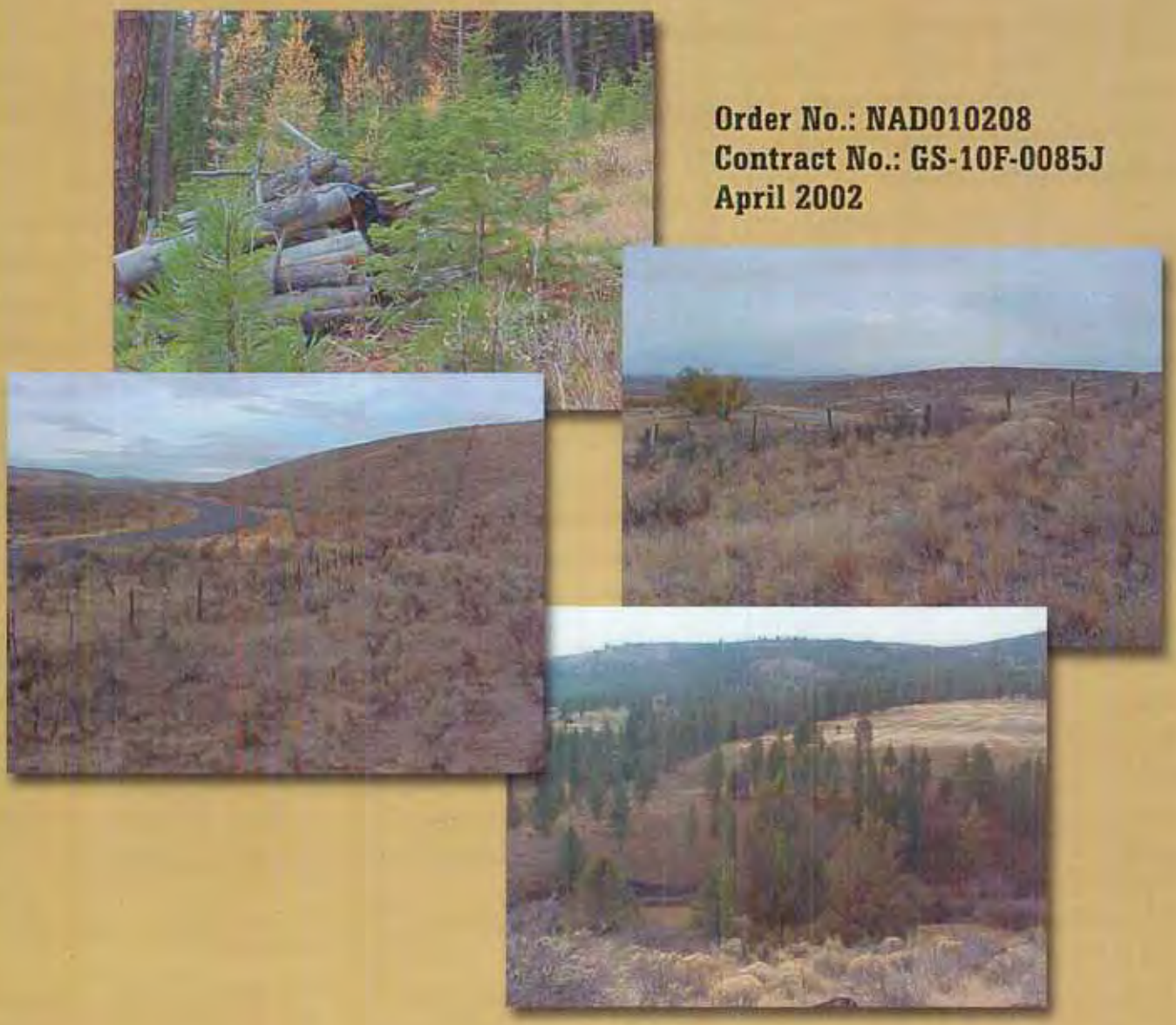
Develop first budget and forward to Board of Forestry.
Responsible party. RFPA

Board of Forestry agenda item is requested regarding RFPA budget.
Responsible party: Salem Fire Staff

Board of Forestry approves RFPA budget.
Responsible party: Board of Forestry

WILDLAND-URBAN INTERFACE COMMUNITIES-AT-RISK PROGRAM

Final Mitigation Recommendations
BLM Vale District
Vale-Ontario Assessment Area



Order No.: NAD010208
Contract No.: GS-10F-0085J
April 2002

DYNAMAC
CORPORATION
www.dynamac.com

FINAL
WILDLAND-URBAN INTERFACE, COMMUNITIES-AT-RISK MITIGATION RECOMMENDATIONS

VALE DISTRICT
VALE-ONTARIO ASSESSMENT AREA

Prepared for:

U.S. Department of Interior
Bureau of Land Management
Vale District
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Vale, Oregon 97918
(541) 473-3144

Prepared by:

Dynamac Corporation
20440 Century Boulevard
Suite 100
Germantown, Maryland 20874

Order Number: NAD010208
Contract No.: GS-10F-0085J
Date Prepared: April 2002

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ACRONYM LIST

amsl	above mean sea level
ATV	all-terrain vehicle
BLM	Bureau of Land Management
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
GPS	Global Positioning System
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NWCG	National Wildfire Coordination Group
RFD	Rural Fire Department
UTM	Universal Transverse Mercator
WRCC	Western Regional Climate Center

FIGURES

APPENDIX: Maps

1.0 EXECUTIVE SUMMARY

During the 2000 fire season, more than 6.8 million acres of public and private lands were burned by wildfire, resulting in loss of property, damage to resources, and disruption of community services. Many of these fires occurred in wildland-urban interface areas and exceeded fire suppression capabilities. To reduce the risk of fire in the wildland-urban interface, the President of the United States directed the Secretaries of the Departments of Agriculture and the Interior to increase federal investments in projects to reduce the risk of wildfire in the wildland-urban interface. The Bureau of Land Management (BLM), Vale District is currently in the process of forming partnerships with local governments to plan fuels reduction treatments and other mitigation measures targeted at the wildland-urban interface in the vicinity of public lands. These partnerships are indicative of a shared responsibility to reduce wildland fire risks to communities.

The wildland-urban interface occurs where manmade structures meet or intermix with wildland vegetation. In certain situations, specific actions such as fuels reduction around communities, forest and rangeland restoration, infrastructure improvements, and public education and outreach may reduce the risk of catastrophic fire in the wildland-urban interface. To this end, the Vale District BLM implemented the Communities-at-Risk Wildland-Urban Interface Program. The program seeks to reduce the hazard of wildland fires to communities through public outreach, the reduction or prevention of fuel build-up, and increasing the fire protection capabilities of communities. The communities of Vale, Oregon Slope, Ontario Heights (Vale-Ontario) were selected to assess the hazard of wildland fire and to identify specific actions that may reduce the risk of loss and disruption of services from wildland fire. The community of Adrian was added shortly before the assessment began because it is a high-risk community located at the boundary of the assessment area and Adrian provides assistance to the Vale-Ontario area during fires.

Dynamac Corporation (Dynamac) was contracted to support the BLM in their assessment of wildfire risk to the Vale-Ontario community in the wildland-urban interface. Dynamac scientists conducted fuel surveys by categorizing the vegetation, slope, and aspect of the land in the assessment area. The risk of wildland fire to homes, structures, and cultural resources on private land was also evaluated according to building materials, the presence of defensible space, road access, and the response time of the local fire department. Dynamac assessed the adequacy of the community's service infrastructure (including roads, water supplies, and fire fighting equipment) by systematic observation, and by interviewing community officials and fire prevention personnel. A community meeting was held to disseminate information about the

Communities-at-Risk, Wildland-Urban Interface Program on Tuesday, November 6, 2001, at the Vale High School. The meeting provided residents the opportunity to identify resources that are of value to the community and to have residents identify actions that have the potential to reduce the risk of wildland fire in their community. The information gathered from the fuel surveys, structural surveys, interviews, infrastructure assessments, community profile and the community meeting was integrated into two draft reports: the Hazard Assessment Report and this Mitigation Recommendations report for the Vale District, Vale-Ontario assessment area. These draft reports were presented for comment and later amended and finalized by Dynamac Corporation following a second community open house meeting on March 18, 2002.

This Mitigation Recommendations report provides a list of all the public concerns and comments that Dynamac obtained from the community during the community meeting, and through interviews with the local officials and citizens. The public comments represent actions suggested by the community that if implemented, greatly reduce the threat of wildland fire to an urban interface area. From the list of public comments, Dynamac evaluates those that are consistent with the scope of the Communities-at-Risk Program and presents them as proposed mitigation recommendations. The proposed mitigation recommendations for the Vale-Ontario assessment area fall under three main objectives:

- Develop community education and outreach programs throughout the assessment area to encourage firewise practices;
- Establish a fuels reduction program to decrease fire risk to residential areas and the watershed; and
- Provide assistance to the rural fire departments (RFDs) in the assessment area in obtaining funding for additional equipment.

2.0 GOALS AND OBJECTIVES

The goals of the Vale-Ontario assessment are to evaluate the hazards of wildland fire within the assessment area and identify specific mitigation recommendations to reduce those hazards through interviews with the community. The objectives are to decrease the chance of wildfire spreading from public lands onto private lands and from private lands onto public lands.

3.0 BACKGROUND

Wildland fire is an integral component of many forest and rangeland ecosystems. In the conterminous United States before European settlement, an estimated 145 million acres were annually scorched by wildfire. In comparison, only about 14 million acres are currently burned annually due to increased agriculture, urbanization, habitat fragmentation, and fire suppression programs. This change from the historical fire regime to the present day has caused a shift in the native vegetation composition and structure of fire-prone ecosystems such as some forests and rangelands resulting in a dangerously high accumulation of fuels. As a result, when wildland fires do occur, they may burn larger and hotter than those in the past and pose an increased risk to human welfare and the ecological integrity of those areas.

The hazard of wildland fires is compounded by the increasing occurrence of human structures and activities in fire-prone ecosystems. The wildland-urban interface occurs where human structures meet or intermix with wildland vegetation. In certain situations, specific actions such as fuels reduction around communities, forest and rangeland restoration, infrastructure improvements, and public outreach may reduce the risk of losses to catastrophic fire in the wildland-urban interface. The Vale District BLM implemented the Communities-at Risk, Wildland-Urban Interface Program to determine what these specific actions may be, and where they are needed. The program seeks to reduce the hazard of wildland fires to communities through public education and outreach, the reduction or prevention of fuel build-up, and increasing the fire protection capabilities of communities. The Vale-Ontario communities were selected to assess the threat of wildland fire and to identify specific actions that may reduce the risk of loss.

The Vale District intends to use the mitigation measures identified in this document as a guide and prioritization tool in implementing the Communities-at-Risk program. The District is committed to working with any partners (private, local government, state, and federal) in order to accomplish mutual goals and objectives identified in the recommendations. The recommendations that the District chooses to implement will go through the NEPA process and will be accomplished as funding, policy and regulations permit.

4.0 EXISTING SITUATION

4.1 Vale-Ontario Assessment Area

The Vale-Ontario assessment area is located in the sagebrush-grassland area of eastern Oregon. The assessment area includes the towns of Vale, Ontario, Nyssa and Adrian Oregon and occupies portions or complete sections of the following townships: T15S R45E; T15S R46E; T15S R47E; T16S R43E; T16S R44E; T16S R45E; T16S R46E; T17S R43E; T17S R44E; T17S R45E; T17S R46E; T17S R47E; T18S R42E; T18S R43E; T18S R44E; T18S R45E; T18S R46E; T18S R47E; T19S R42E; T19S R43E; T19S R44E; T19S R45E; T19S R46E; T19S R47E; T20S R43E; T20S R44E; T20S R45E; T20S R46E; T21S R45E; and T21S R46E. The assessment area is in the Snake River Resource Area (Soil Survey for Malheur County, Oregon, Northeastern Part, September 1980) and includes the lowland areas along the Snake, Malheur, and Owyhee Rivers and Willow Creek where development and farming occur.

Ontario is located on the Idaho-Oregon border on the Snake River. Oregon Slope and Ontario Heights are large residential and farming communities located northwest of the city of Ontario. Adrian is a small town located 20 miles south of Ontario. Vale is located 16 miles west of Ontario and is in the center of the assessment area. Vale is known historically for its location on the Oregon Trail, where pioneers could wash the dust off in the hot springs near the town. Today, Vale is the county seat for Malheur County and contains many historic buildings and murals. One of the oldest buildings in Malheur County is the Rinehart Stone House that was built in 1872, and it served as a way station on the Oregon Trail. The building is listed in the National Register of Historic Places.

Land use in the assessment area is mainly residential, ranches and farms. In addition, the assessment area includes historic buildings, several roadside informational signs, the Vale District BLM office, industrial/processing facilities and an outdoor art gallery consisting of 23 murals depicting life and settlement activities in this area. Open water bodies in the assessment area include the Snake, Malheur, and Owyhee Rivers, Willow, and Bully Creeks and Bully Reservoir. Numerous canals and irrigation ditches are present throughout the assessment area providing water for agriculture.

Farming is the primary industry in the area followed by cattle and sheep ranching. Agriculture and row crop farming produces beets, potatoes, grain, corn, onions, alfalfa, and grass for hay, with most of the crops irrigated. The rangeland is important for wildlife habitat, recreation and

livestock grazing. In particular, large tracts of low elevation shrub land are used for big game winter range. Deer, elk, pronghorn, chukar, migrating waterfowl and game birds, such as ring-necked pheasant and California quail, provide good hunting opportunities in this area.

The climate of the Vale-Ontario area is characterized by hot, dry summers with average daily high temperatures reaching 93 degrees Fahrenheit (°F) in July, and an average daily summertime low of 56°F. Winter months are typically cold, with average monthly temperatures from December through February between 20° to 40 °F. Precipitation is typically low with an average annual precipitation of 9.47 inches. Most precipitation arrives between November and February as snowfall and between March and June as rain (WRCC, 2001).

Hot, dry summer winds generally moving west to east increase the risk of wildland fires to these communities, as was the case with the 'Jackson' fire during the summer of 2000 that caused significant damage in the Ontario Heights area. Structural fires in the assessment area were handled by the RFDs of Vale, Ontario, Nyssa, and Adrian, with assistance from the Payette and Weiser Fire Departments in Idaho. The majority of the RFDs were not equipped to respond to wildfires nor did they have adequate wildland fire fighting training and capabilities.

The cities of Vale and Ontario are fairly well-protected due to volunteer fire departments situated within the town, and because of significant amounts of row crops and rangelands surrounding the towns, which form a 'buffer zone' of defensible space around the town. In addition, the Malheur River borders the south side of Vale and acts as a firebreak for the city.

The dominant vegetation in the assessment area is big sagebrush and cheatgrass. Public lands are predominantly managed by BLM, which totals approximately 180,000 acres within the assessment area. Other public lands include Bureau of Reclamations land on Bully Creek Reservoir and Malheur River, and land managed by the State of Oregon (state prison). There are roughly 200,000 acres of public land in the 15-mile radius of the assessment area. Many of the towns and communities are adjacent to or east of the public lands.

Significant interface areas exist within the assessment area, specifically around Vale and west of the Oregon Slope and Ontario Heights areas. These areas have subscription fire department services, which report that approximately 50% of people within their boundaries do not subscribe to the service. In addition, parts of these areas that subscribe to fire department services, are located the farthest away from fire stations, and are typically adjacent to dense fuel areas such as gullies and rangeland. The upper slopes in these areas also receive lightning strikes on a regular

basis. While many of these homes are surrounded by farmland, this farmland is adjacent to rangeland, and no buffer exists between the two areas. **Map 2** indicates defined high-risk interface areas for close-proximity fuels, minimal fire suppression, or areas with poor access.

The Oregon Department of Fish and Wildlife indicated homes near "Canyon 2" and "Canyon 3" as well as homes between Nyssa and Ontario, west of Highway 201 along the desert fringe as having the highest fire risk in the area. The 'Dead Ox Flat' was also indicated as a specific area within Ontario Heights that is at high risk.

Some fire hazard mitigation actions have been undertaken by the BLM in the Vale-Ontario area. These include seeding with crested wheatgrass and other bunchgrasses, and education through radio and newspaper media during fire season, which warns and reminds residents of fire risks. In addition, the highway department currently sprays weeds along some roadways. The BLM also sponsors educational programs in schools, bringing Smokey the Bear into several classrooms every year in cooperation with local fire departments, and the Vale Fourth of July parade.

4.2 Summary of the Hazard Assessment Survey

The Hazard Assessment Report for the Vale-Ontario assessment area presents and summarizes data for fuel and terrain conditions. Six fuel variables were classified as to low hazard (Class A), moderate hazard (Class B), or high hazard (Class C) at 35 fuels survey points located throughout the assessment area. The fuel survey data can be summarized as follows:

- **Slope:**
  - Class A - 46% of the points had flat land (less than 10% slope).
  - Class B - 31% had moderate slopes (10-30% slope).
  - Class C - 23% had steep slopes (greater than 30% slope).
- **Aspect:**
  - Class A - 40% of the points had north facing slope (NW, N, NE).
  - Class B - 23% had east facing or level slope.
  - Class C - 37% had south or west facing slope (SE, S, SW, W).
- **Elevation:**
  - Class C - All of the points were below 3,500 feet amsl.

- **Fuel Type:**

  Class A - 86% of the points had small light fuels (grass, weeds, small shrubs).

  Class B - 11% had medium fuels (brush, medium shrubs, small trees).

  Class C - 3% had heavy fuels (woodland, large brush, ornamentals).

- **Fuel Density:**

  Class A - 0% of the points had non-continuous fuel beds (<30 % cover).

  Class B - 14% had broken moderate fuels (31% to 60% cover).

  Class C - 86% had continuous fuel beds (>60% cover and conductive to crown or surface high intensity fires).

- **Fuel Bed Depth:**

  Class A - 54% of the points had low fuel bed depths (average <1 foot).

  Class B - 46% had moderate fuel bed depths (1 to 3 feet).

  Class C - 0% had high fuel bed depths (average >3 feet)

Map 1 shows the locations of all fuel survey points. Data from the fuels hazard assessment are also graphically depicted in **Figures 1** and **2**. The charts depict the percentage of assessment points, based on a total of 35 points surveyed, which received a high, moderate, or low hazard ranking.

Data from the fuels hazard assessment are also graphically depicted on **Figures 1 and 2.** In general, the data collected for the topographic features slope and aspect are mixed between the hazard classes.

It is important to note that overall hazard as related to fuels may be underestimated in many parts of the assessment area, specifically those areas dominated by cheatgrass and other annual grasses. While considered small, light fuels (Class A), cheatgrass and other annual grasses are naturally more prone to burning than native plant species such as bunchgrasses and sagebrush. Although wildfires are sometimes rapidly suppressed in these fuels, their very dense, fine-textured nature increases both the chance of ignition and the rate of spread of wildfires. During years when the production of annual grasses is high, resistance to control is extreme, and it can be very dangerous to try and suppress wildfires in this fuel type. Native perennial grasses do not mature until late August and September, whereas cheatgrass matures in June. The dominance of cheatgrass thus not only changes the type of fire that occurs, but also extends the fire season by almost two months. The presence of continuous stands of flammable cheatgrass and other annual grasses such as medusahead rye at many sites around the Vale-Ontario community probably makes for a higher hazard than the fuel survey indicates.

4.3 Summary of the Structure Assessment (Form 2)

A second component of the Hazard Assessment Report was to characterize structures and in the assessment area for structure density, building materials, proximity to fuels, presence of a survivable space, and roads and accessibility. These variables were classified as low hazard (Class A), moderate hazard (Class B), or high hazard (Class C) on 299 sections in the assessment area. However, only 131 sections were found to contain structures. For the data below, percentage of structure density and response times are based on all 299 sections surveyed. The percentage for the rest of the rating elements is based on only the 131 sections that contained structures such as homes or buildings. Results of the structure survey can be summarized as follows:

- **Structure Density:**
  - Class A - 4% of the sections had at least one structure per 5 acres.
  - Class B - 0% had one structure per 5-10 acres.
  - Class C - 96% had less than one structure per 10 acres.
- **Proximity to Structures:**
  - Class A - 22% of the sections had flammable fuels an average of more than 100 feet from the structure(s).
  - Class B - 43% had flammable fuels an average of 40 to 100 feet from the structure(s).
  - Class C - 35% had flammable fuels an average of less than 40 feet from the structure(s).
- **Building Materials:**
  - Class A - 84% of the sections had a majority of homes built with fire resistant roofs and/or siding.
  - Class B - 12% had 10 to 50% of homes built with fire resistant roofs and/or siding.
  - Class C - 4% had less than 10% of homes with fire resistant roofs and/or siding.
- **Defensible Space:**
  - Class A - 59% of the sections had a majority of homes with improved defensible space around the property.
  - Class B - 34% had 10 to 50% of homes with improved defensible space.
  - Class C - 7% had less than 10% of homes with improved defensible space.

- **Roads:**

  Class A - 28% of the sections had wide looped roads that are maintained, paved or solid, surface with shoulders.

  Class B - 67% had roads are maintained, narrow two lane roads with no shoulders.

  Class C - 5% had narrow and/or single-lane, minimally maintained roads with no shoulders

- **Response Time:**

  Class A - 100% of response times were 20 minutes or less.

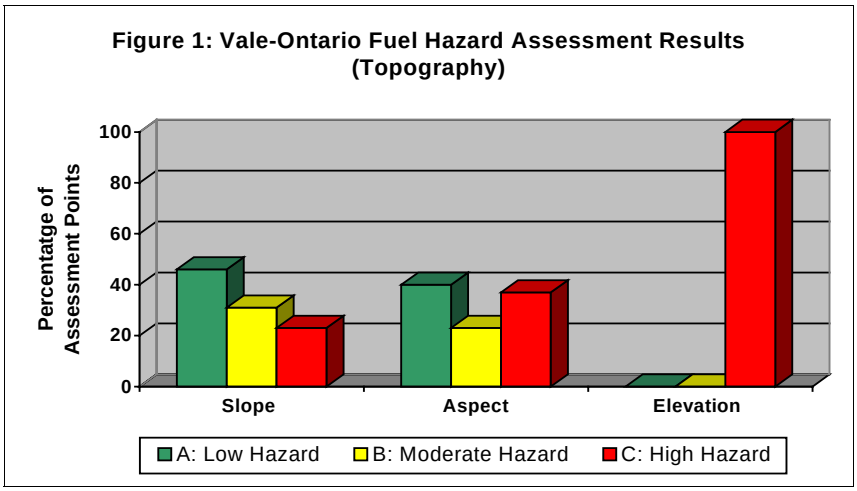
- **Access:**

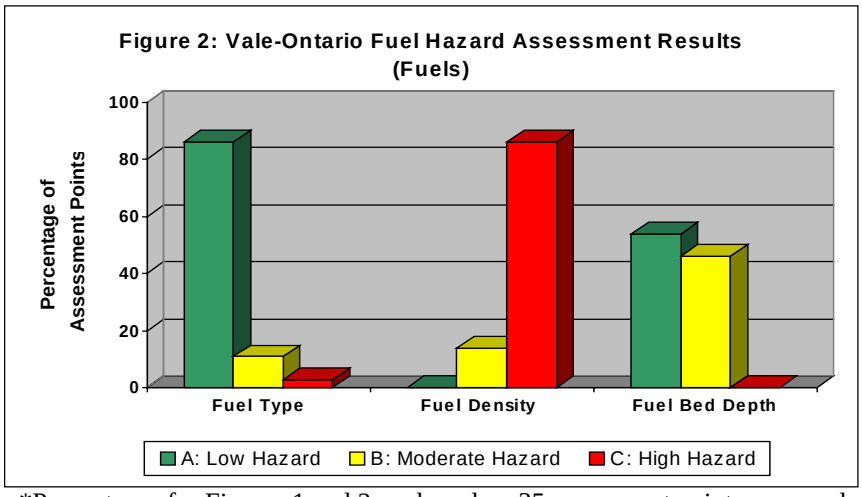
  Class A - 29% of the sections had structure access with multiple entrances, exits and turnarounds that are all well equipped for trucks.

  Class B - 59% had limited access routes, with moderate grades, and two ways in and out.

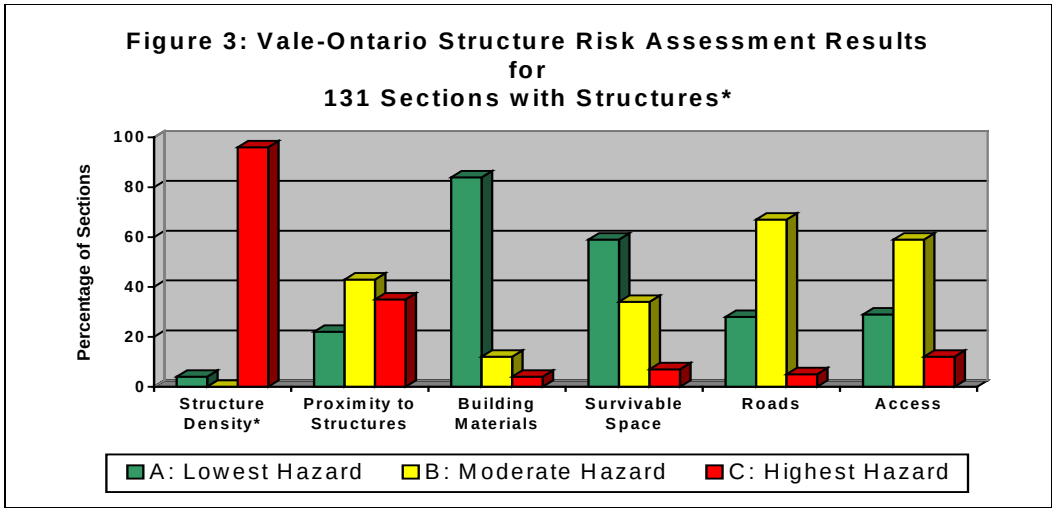
  Class C - 12% had narrow dead end roads or one-way in and out access with steep grades.

The percentages of sections that received a hazard ranking of high, moderate, or low for the risk assessment to structures in the assessment area are graphically depicted in **Figure 3.** It should be noted that, with the exception of structure density and response times, these percentages are based on the 131 sections *with* structures in the assessment area and not on all 299 sections surveyed (168 of which had no structures.) Response times are not depicted because *all* sections within the assessment area had a response time of less than 20 minutes (100% rated low risk.)





*Percentages for Figures 1 and 2 are based on 35 assessment points surveyed.



*Structure Density is a percentage of all 299 sections in the Assessment Area rather than only the 131 in which there were structures.

In general, an assessment of the structures indicates that the density of the homes and structures are spread out, making it more difficult for the rural fire departments to respond during wildland fires. Flammable fuels are also, on the average, located close to structures, with 78% of sections with structures having fuels less than 100 feet away from the structures. Generally, roofs are constructed of fire-resistant materials such as metal or composite shingles. In addition, homes generally had improved defensible space around them such as maintained lawns or parking areas. Hazard ranking for roads, response times, and access to structures were mostly rated as low to medium for fire departments to respond to structures within the assessment area.

5.0 PUBLIC CONCERNS AND COMMMENTS

The focus of the community assessment is to determine local needs in terms of ability to combat, guard against, prevent or reduce the risk of wildland fire to the community. During interviews with community officials, the community meeting, and discussions with residents, the public identified numerous concerns and made many comments on Dynamac's and BLM's work in the area. These concerns and comments, if incorporated into mitigation measures, may reduce the threat of wildland fire to interface areas and improve fire-fighting capability in the Vale-Ontario assessment area. This section of the Mitigation Recommendations report provides a list of all the concerns and comments that were obtained through community outreach activities.

Comments were evaluated to determine if they met the intent of the Communities-At-Risk Program. Comments that did not meet the intent of the program, or comments that did not meet current policies established by federal agencies, were not analyzed for use as a final proposed recommendation (Section 5.1). However, these comments represent established community concerns, and therefore can and should be addressed through local citizen groups, if the community feels these issues warrant further action in reducing the risk of wildland fires.

Section 5.2 of this report lists the concerns and comments that Dynamac evaluated as those that are consistent with the scope of the Communities-at-Risk Program. These comments have been developed into proposed mitigation recommendations, and are listed in Section 8.0, Proposed Mitigation Recommendations and Priority.

5.1 List of Public Concerns and Comments Not Analyzed

Not all concerns and comments fall within the scope of the Communities-At-Risk Program set forth by Congress through the National Fire Plan. The funding that Congress has provided for this program is primarily for fuels reduction, community education and rural assistance. The following public concerns and comments have not been analyzed further for proposal as mitigation recommendations because they are not within the original intent of the Communities-At-Risk Program, are outside the current policies established by federal agencies, or because they have already been resolved.

1. **Adopt firewise ordinances.** The adoption of firewise ordinances and practices countywide in residential and commercial building and landscaping was suggested as a desired condition. Jon Beal, the Malheur County Planner, indicated he would like to see a countywide fire protection accessibility assessment done prior to the review of county firewise ordinances. He would like to do this in conjunction with the local fire departments. Mr. Beal indicated that approximately 15 to 20% of homes in Malheur County have inadequate access. In particular danger are conditional-use homeowners who do not have farmland around them, which is ordinarily a source of defensible space. Besides accessibility, however, building codes should be updated to provide for and require firesafe materials, particularly in interface areas.

2. **Improve Emergency Operations Plan (EOP).** As shown by numerous communication difficulties during the 2000 'Jackson' fire, the EOP needs significant updating. Of primary concern is communication and coordination between BLM, the fire departments, and the Emergency Operations Center (EOC). Not all of the fire departments know the frequency of the EOC, and the BLM should provide updates on the fire to the EOC readily.

3. **Develop an EOP specifically for response to wildland fires.** This need also became apparent during the 'Jackson' fire. No emergency plan exists specifically for the threat of wildland fire. One such plan should be developed.

4. **Outlaw fireworks.**

5. **Require 4,000-gallon water tank installation** with any new home over 3,200 square feet in the Oregon Slope area. This requirement already exists in Idaho, and the Weiser Rural Fire

Department, which covers portions of Oregon Slope, felt this would be a good mitigation action for the area.

6. **A new fire station for the City of Vale.**

7. **The addition of two full time firefighters for the Ontario Fire Department and the addition of a second fire station (sub-station).**

8. **Fire fighting equipment for the Weiser Rural Fire Department.**

9. **Rotation of crops and increased irrigation water.**

10. **Wildfire Training.** Wildland fire training for Vale Volunteer Fire Department and the Adrian Volunteer Fire Department.

11. **Mutual indemnification and certification training course.** Ranchers and farmers typically respond to fires on their land using tractors and discing methods to suppress fires. However, they cannot fight wildland fires located on public lands. A request by the ranchers and farmers has been made to obtain training to assist in fighting wildland fires on public lands and accepting mutual indemnification so they could not sue federal agencies in the event of injury or loss during a fire on public land.

12. **Cattle Grazing**. Allowing cattle to graze on allotments where a fire has occurred was suggested. Currently, a federal law prohibits cattle from grazing on land that has been burned in the past two years. This is a good mandate for certain types of lands that have sustained a fire, but in the event of a fire where native grasses have been completely burned, cheatgrass can move in quickly and prevent recovery of native grasses. If cattle were allowed to graze sooner, cattle might keep the cheatgrass growth down, and allow for the native plants to recover. In addition, general use of cattle as a fuel-reducing agent has proven to be a fire hazard mitigation technique.

The first seven aforementioned comments have not been developed into proposed mitigation recommendations because they are not within the original intent of the Communities-at-Risk Program. These are functions that should be implemented on a county or city level. However, the comments are listed because they are critical issues for the community and can be pursued through other funding vehicles, grants or community efforts.

Fire fighting equipment for the Weiser Rural Fire Department was not carried forward because Weiser is located in Idaho. Funding for Weiser should be obtained through the Idaho Department of Lands. Alternatively, Weiser could attempt to partner with nearby Payette, Idaho, to obtain funding through BLM. Payette underwent a fire hazard assessment through the Communities-at-Risk Program sponsored by BLM's Lower Snake River District in summer 2001.

Crop rotation and increased irrigation water is a local issue that could best be handled through the proposed County Fire Council which has been carried forward as a mitigation recommendation. The introduction of crops such as sugar beets or alfalfa that are green at the height of fire season every year, and ceasing to grow wheat in high-risk areas, would be an alternative that should be evaluated further by a County Fire Council.

Wildland fire training is lacking in almost all fire departments associated with the Vale-Ontario assessment area. Particularly, the Vale Volunteer Fire Department and the Adrian Volunteer Fire Department require assistance in training their volunteers. This issue, however, was not carried forward since it can be addressed through a recent grant obtained through the Snake River Valley Fire Protection Association. An instructor certified by the National Fire Protection Association (NFPA) or National Wildfire Coordination Group (NWCG) could conduct wildland fire training locally during the winter (when fire season is slow). Basic wildland fire training courses meeting NWCG standards are recommended. These include S-130, S-190, and the Standards for Survival classes.

Mutual indemnification and training was not developed into a mitigation recommendation because providing for mutual indemnification would require changes in agency policy for fighting fires on public lands. Entering into areas where a policy has been lawfully established to protect the public is beyond the original intent of the Communities-at-Risk Program. Training farmers and ranchers to fight wildland fires or operate equipment was also not analyzed further because it is an issue that can be addressed easily through volunteering through the RFDs. An organization, such as a RFD, that has established a cooperative agreement with state or federal agency is allowed to fight fires on public land. Residents who volunteer to serve as members of that organization can fight fires on public land under the auspices of that organization. There are also avenues to certify privately owned equipment, according to agency policy, by the BLM so that it can be used to defend against wildfire on public lands.

Allowing cattle to graze on allotments that have sustained a burn before a two-year grazing moratorium has passed was not analyzed further because it also requires changes in agency policy. The two-year period is generally accepted as the average time needed for an allotment to rejuvenate itself after a fire. There are many variables that need to be taken into consideration such as the need to promote perennials and reduce cheatgrass, or to limit noxious weeds. Because public land has multiple uses, these factors must be balanced with grazing needs. The BLM can authorize an allotment be grazed after only one year, but it requires a review and approval process which still may be turned down within the federal agency because of policy or management decisions. The formation of a County Fire Council has been advocated as a forum to discuss fire issues in the community (see Section 8.1.1).

5.2 Public Concerns and Comments Analyzed Further

The following list includes the public concerns and comments suggested by the Vale-Ontario community that are consistent with the intent of the Communities-At-Risk Program. Because these comments do fall within the intent of the program, they have been analyzed further and developed into mitigation recommendations presented in Section 8.0.

1. **Recreational User Education**
   a. Post signs identifying BLM land, fire hazards associated with the land, and a number to call in the event of a fire.
   b. Air public announcements to address off-road use and dispersed camping during periods of high fire danger by showing videos of fires. A message from the Governor may also command increased attention.

2. **Enforce fire bans**. Malheur County and BLM should work cooperatively to increase enforcement during periods of high fire danger.

3. **Formation of a County Fire Council**. Composed of residents, representatives of special interest groups and government agencies, and RFDs, living and working in high-risk areas, this Council could meet quarterly to discuss problems, solutions and progress regarding wildland fire issues, and would open a clear and consistent line of communication between the public and government agencies. This open communication between the community, state, and federal agencies would help to resolve some of the issues raised that involve policy decisions.

4. **Develop a fire-safe community**. Advocated by Randy Simpson, the Ontario Fire Chief, the existence of such a community would serve as an example for the entire county. New developments could follow this as an example, and existing residents could also use this community as a model for their own improvements. One such community already exists in Burns, Oregon.

5. **General public education**.
   a. Many residents do not understand why they are not allowed to fight fire on public land. Educational efforts could be initiated to inform residents as to when they can and cannot help the BLM and the reasoning behind both.
   b. Many residents are also not aware of the various things that can be done to protect a home. Educational materials could be mailed, put in newspapers, or provided through the BLM and local fire departments.

6. **Pre-defined discing**. Once high-risk areas are identified, disc lines could be established and disked periodically as a preventative measure. One suggestion was to disc along the drift fences.

7. **Fuel breaks** could be established in the Oregon Slope area (See **Map 3**). In addition, planting herbaceous firebreaks, or greenstrips, along the interface area was suggested.

8. **Controlled Burns** were suggested in order to eliminate excess fuels in the Ontario Heights area and weeds along the roadside.

9. **Assess allotments individually.** Some allotments have invading cheatgrass and some do not. Those that have significant amounts of cheatgrass pose a higher fire risk and could be grazed more heavily until perennial grasses rehabilitate the area.

10. **Fire Department Needs:** It should be noted that if RFDs were equipped with adequate water tankers, fire insurance rates for many homeowners would be reduced.
    a. Educational materials regarding wildland fires should be distributed to all fire departments. Educational programs are often initiated, but do not focus on wildland fires. If materials are provided to the fire departments regarding wildland fire, this information could easily be folded into pre-existing educational efforts. It is also important to note that more than one fire department indicated they did not feel their community saw wildland fire as a risk. In addition, approximately 50% of the residents in the Oregon

Slope and Vale area elect to subscribe to the services of their local fire departments, which makes the need for residential education even greater.

b. The Vale Volunteer Fire Department needs a better water tanker, a BLM heavy brush truck and a portable floating pump.
c. The Adrian Rural Fire Department needs to replace or update a 1978 tender.
d. The Ontario Fire Department indicated the addition of a 2,000-gallon pumper tender and, a BLM heavy brush truck would enable it to combat wildland fire more effectively.

6.0 NEED FOR ACTION

Wildland fires in the Vale-Ontario assessment area are common and result from many origins, both natural and human-induced. At risk are dwellings and other structures on private land near the wildland interface, and cultural and historic resources, including several buildings in Vale that are listed on the National Register of Historic Places. In addition, the close proximity of this area to Idaho attracts many recreational visitors from out-of-state, as well as local residents, making protection of the hunting areas worthwhile. Loss of crops and cattle directly by fire or indirectly through conversion of perennial grassland to annuals could have a significant impact on the economy within the assessment area.

To reduce the risks of wildfire in the assessment area, both general and specific actions are needed. In general, the residents and their local, state, and federal agencies must support activities that promote safety for dwellings and structures at risk. These agencies should coordinate efforts to achieve fuels management programs aimed at decreasing the spread of wildland fires from public lands to private lands and vice versa.

Current fire education programs in schools do not focus on wildland fire. This is a reflection of the fact that most RFDs have traditionally been structural firefighting entities, and are only now beginning to understand the special challenges presented by wildland fire, and to seriously learn the methods by which they can combat wildland fire. If children are educated about wildland fire's natural role in the ecosystem, and firewise measures around the home at an early age, this knowledge will be carried into adulthood, eventually having a significant impact on the public's knowledge base and willingness to participate in preventative measures.

Rehabilitation projects such as perennial seeding after a fire have occurred in the assessment area; however, no ongoing fuels reduction projects are in place. In interface areas where

structures, rangeland, crops or other areas of economic, cultural or historical importance exist, fuel treatment projects should be an ongoing focus.

Communications during the Jackson fire in 2000 arguably exemplified the greatest challenge facing Malheur County's ability to combat wildland fire. Communication systems are in place in the county, as is an EOC, but chains-of-command and reporting requirements are not. Similarly, communication and coordination between BLM, the EOC, and RFDs are not well-established.

Also due to the Jackson fire, many residents within this assessment area have an awareness of the great fire hazard surrounding them, and want to see precautionary measures defined and undertaken.

Malheur County has not adopted any firewise laws or ordinances. Jon Beal, the County Planner, explained this is a known problem, but no plans are currently in place to bring this to resolution.

7.0 METHODOLOGY

The assessment activities that are used to determine the proposed mitigation recommendations for the Vale-Ontario assessment area are based on information acquired from a survey of the hazard of wildland fire through field surveys, information obtained from the community meetings, and interviews with public officials. The majority of information presented in this report was gathered between November 4 and November 10, 2001. A companion report, the Final Hazard Assessment Report has been completed for the area and is available at the BLM Vale District office.

Dynamac characterized land and fuels at 35 points on public land within a 15-mile radius of Vale-Ontario, concentrating on the urban-wildland interface. As not all sections of public land were accessible, Dynamac endeavored to choose fuel survey points that were representative of surrounding sections in areas identified as having high potential for fire, areas where fires have occurred in the past, or based on types of vegetation. The rating elements included slope, aspect, elevation, fuel type, fuel density, and fuel bed depth, and were assigned to hazard rating of low, medium, or high (See Hazard Assessment Report, Table 3, and Appendix B).

At each survey point, the field crew recorded the location in UTM coordinates using a Trimble® hand-held global positioning system (GPS) unit; photographed the surrounding area in the four cardinal directions; and completed wildland fuels fire hazard assessment forms (Form 1, Hazard

Assessment Field Form) which rated characteristics of the land features and fuel sources that increased or lessened a community's risk to wildland-urban interface fire.

Dynamac staff also collected information on the flammability and defensibility of structures on private land from 299 sections located within one mile of public lands, within the assessment area. The structural hazard assessment rated the structures based on the resistance of building materials to fire, and the distance of flammable fuels to the structures located within a section. The rating elements included structure density, proximity of flammable fuels to the structures, building materials, defensible space, and types of roads, response times, and accessibility. Each element was assigned a hazard rating of low, medium, or high hazard category (See Hazard Assessment Report, Table 4, and Appendix C).

A community meeting was held on November 6, 2001, at the Vale High School Library from 6:00 to 9:00 p.m. The community was invited to attend through newspaper articles in the *Malheur Enterprise* and *Argus Observer*, announcements posted in public places such as the post office, the county seat, and on telephone poles. Flyer-invitations and surveys were mailed to area residents. While over 1,700 mailer invitations were sent out prior to the meeting, only 10 residents attended. Dynamac and BLM personnel attended the community meeting to hand out firewise brochures, obtain information from the community on hazardous fire situations and desired conditions, and to be an informational resource to those attending the meeting. A forum-like discussion was held for the full three-hour duration of the meeting. The ten residents that attended provided a significant amount of information regarding problems and ideas for solutions (See Hazard Assessment Report, Appendix D, for a meeting summary.) Residents attending the meeting were also asked to fill out a survey form regarding their perceptions and concerns about wildland fire in their communities. Self-addressed survey forms were also included with the mailed invitation to the meeting; in this way, Dynamac received several surveys from concerned residents that could not attend the meeting. (See Hazard Assessment Report, Appendix D.)

The Dynamac Community Relations Specialist conducted interviews with numerous local public officials and residents. Individuals or groups interviewed included the Malheur County Cattleman's Association, the Malheur County Sheriff and Fire Chief, the Vale Mayor and Vale City Coordinator, several rural fire department representatives, and the Malheur County Planner. (See Hazard Assessment Report, Appendix E).

A second community meeting was held on March 18, 2002, to present the draft results of the Vale-Ontario Hazard Assessment Report and Mitigation Recommendations. Over 6,000 flyers

were mailed advertising the meeting and 26 area residents attended. Comments obtained from the meeting and comments submitted by public agencies were reviewed and amended into this final report.

8.0 PROPOSED PROJECTS AND PRIORITY

The following specific action items and projects were identified and extrapolated from the list of public concerns and comments set forth by the community to reduce the hazard of wildfire in the Vale-Ontario assessment area. Each of these actions falls under the scope and intent of the Communities-At-Risk Program:

- Develop community education and outreach programs throughout the assessment area to encourage firewise practices;
- Establish a fuels reduction regimen to decrease fire risk to residential areas and the watershed; and
- Provide assistance to the rural fire departments in the assessment area in obtaining funding for additional equipment.

8.1 Community Education, Training and Outreach Recommendations

Numerous specific issues were identified by the Vale-Ontario community during interviews and the community meeting. The proposed mitigation recommendations for education and community outreach programs are separated into three sections. The first is aimed at general recommendations for the community, the second involves increasing residents' awareness of firewise landscaping and building practices, while the third provides farmers and ranchers with mitigation and fire-prevention strategies.

8.1.1 Community Education and Outreach

To reduce the risk of wildland fire spreading to residential and urban areas, residents have proposed mitigation recommendations that involve recreational user education, including forming a County Fire Council, developing a fire-safe community, and enforcing fire bans.

Recreational Use Of Public Lands: Recreational use of public lands, especially during periods when the risk of wildfires is high, has concerned many residents in the community. Private landowners are particularly concerned if they live or own land adjacent to public lands where all-

terrain vehicles (ATVs), camping, and hunting could potentially start fires through sparks from vehicles or campfires. Some residents have resorted to posting hand-made signs along roads requesting recreational visitors to be cautious. Official signs could be posted identifying BLM land, fire hazards associated with the land, and a number to call in the event of a fire. In Idaho, signs are posted along the roadway indicating #FIRE as a number to call, and this could be carried over into Oregon. In addition, BLM and Malheur County need to increase enforcement during fire season, when a fire ban is in place.

Many recreational visitors are not from the local area and do not know the risks associated with highly flammable vegetation such as the ability of a car driving or parking on dry grass to spark a fire. The use of public announcements in cities such as Ontario and Boise to advise the public of the fire hazards is needed. A message from the Governor could also have a significant impact on increasing public awareness.

County Fire Council and Fire-Safe Community: The formation of a County Fire Council composed of residents, representatives of special interest groups and government agencies, and RFDs living and working in high-risk areas would open a clear and consistent line of communication between the public and the BLM. The purpose of this Council would be to discuss problems, solutions, and progress regarding wildland fire issues, and it would provide a forum for discussion of sensitive issues such as grazing and emergency operations. In this way, the public would have an open dialogue with public agencies, enabling it to receive feedback and explanation for any concerns that are brought before the Council. It was even suggested by a BLM representative that this Council 'grade' BLM's decisions, thus providing BLM necessary feedback on its own policy decisions.

The development of a Fire-Safe Community could be one of the first goals of the County Fire Council. Advocated by Randy Simpson, the Ontario Fire Chief, the existence of such a community would serve as an example for the entire county. New housing and housing developments could follow this as an example, and existing residents could also use this community as a model for their own improvements. One such community already exists in Burns, Oregon. Communities interested in creating a Fire-Safe Community would need to organize and request advice and assistance from BLM.

8.1.2 Outreach Programs for Residents

The RFDs would be more successful at defending homes in the interface zone if the homeowners were better educated about the risk of wildfires and were encouraged to implement firewise practices. The BLM can assist with this proposed mitigation action by providing literature, organizational oversight, and by forming partnerships with local officials and volunteer organizations. The following paragraphs describe suggestions for outreach programs in Vale-Ontario assessment area.

An annual "Firewise Clean-Up Day" is one tool that could be used to encourage residents to create defensible space around their residences. In conjunction with the Firewise Clean-Up Day, specific demonstration projects should be organized to educate residents about firewise landscaping practices, such as planting less flammable vegetation, landscape design workshops, and use of firewise building materials. The clean-up day would occur in conjunction with public demonstrations, education programs in schools, and speakers on wildfire and firewise practices. Community-wide firewise-education programs should include these issues: 1) educate the public of the dangers of wildfire in the area; 2) urge residents to take responsibility in reducing the risk of wildfire and to create defensible space around their residence; and, 3) increase awareness of the natural role of fire in rangeland ecosystems, and the benefits of occasionally managing natural wildland fires to achieve ecological benefits, while maintaining firefighter and public safety as the top priority. The public education and outreach program could be co-sponsored by the BLM and the RFDs through a partnership agreement.

Targeted outreach should be conducted in Areas of Concern, identified as such on **Map 3.** During the interview process, various residents identified these areas as high fire hazards. These areas have been identified due to one or several of the following features: proximity to wildland or dense fuels, distance from a fire fighting entity, water availability and access. While a Firewise Clean-Up Day would serve the entire community well, door-to-door assessments such as the accessibility assessment suggested by Jon Beal, Malheur County Planner, would be particularly effective in these areas if combined with educational outreach. (See Section 5.1, List of Public Concerns and Comments Not Analyzed, Number 1: Adopt Firewise Ordinances.) In addition, these areas, upon further investigation, may prove to be good locations for pre-defined discing routes, mentioned below in section 8.2.

At schools, educational outreach programs should be conducted by the RFDs in conjunction with an educational outreach coordinator. These programs can raise awareness of fire safety and reduce the number of careless fires in the county. Furthermore, school children pass along their knowledge of firewise practices to parents. However, the RFDs usually have volunteer firefighters who cannot take the time from work to conduct outreach activities.

A full-time educational coordinator who can visit schools more frequently, provide up-to-date educational materials to schools and parents, and assist with outreach efforts as needed would be an effective means of reaching school-age children to educate them regarding firewise practices.

8.1.3 Outreach Programs for Farmers and Ranchers

Many of the concerns voiced at the community meeting centered on liability issues that arise when farmers and ranchers combat wildland fires on public lands that threaten private agricultural or grazing lands. Establishing pre-defined discing routes and periodic maintenance of these routes on public land would be a preventative measure in high hazard areas, which would reduce future fire hazards.

Farmers and ranchers requested that BLM allowing preventative measures to be implemented on public lands through discing and creation of brown strips or green strips (botanical breaks) in defined areas of concern. Green strips would be the preferred method, since the invasion of noxious weeds can become a potential problem with brown stripping. This would require a BLM specialist to evaluate areas for consideration by performing cultural and botanical surveys, in accordance with the National Environmental Policy Act (NEPA), and pre-define areas on public lands where discing could be performed. Discing along the drift fences or creating botanical strips, where more flame resistant vegetation is planted, would reduce the risk of wildland fires spreading onto private lands from public lands or vice versa.

8.1.4 Project Necessity

Citizen knowledge about and involvement with wildfire mitigation in and around communities is a necessary element for success in reducing the hazards posed by wildfire. Public education and outreach is an effective means of engaging the public in the process of reducing risks to a community. Such education and outreach has been shown to motivate homeowners to take measures around their individual properties, thereby contributing to the overall reduction of

wildfire hazards in a community. Furthermore, the above-described community education, training and outreach program in schools, in the community, and for those landowners who may become first responders in the event of a wildland fire, will help identify problems and solutions for both federal and private landowners, and offer opportunities for partnerships and agreements. Implementation of the program, and appropriate action by federal agencies as well as homeowners, will reduce fire risk to structures in the Vale-Ontario assessment area.

8.1.5 Project Timing

Many recommendations have no time requirements: sign postings, the establishment of a County Fire Council, defining pre-set disc lines and several specific educational outreach and training activities are limited only by the manpower and finances that will be required to accomplish them. The annual "Firewise Clean-Up Day", radio news announcements and public demonstrations would be most effective in the spring, to remind people to prepare their properties for the coming fire season.

8.2 Fuels Reduction Recommendations

Purpose of Fuels Reduction: The hazard to the community from wildfire on public lands in the Vale-Ontario assessment area is high. The large areas of public lands adjacent to the communities put residents at risk due to the surrounding grasslands, which can carry a fire rapidly over large areas, as was the case with the Jackson fire in the Ontario Heights community. Fuels reduction has been shown to be effective around communities to reduce the risk of fire in the wildland-urban interface. A good assessment of the specific hazards and threats to a community will help identify problems and solutions for both federal and private landowners, and offer opportunities for partnerships and agreements. Treatments will aid in reducing the wildfire threat and risk of loss to existing homes in the vicinity of the most hazardous fuels.

Types of Fuels Reduction and Treatment: Numerous types of fuels reduction and treatment actions were discussed at the community meeting, listed as desired conditions and carried forward as mitigation recommendations. Mitigation measures appropriate to reduce wildland fires include commercial and non-commercial mechanical fuel removal and maintenance of treated areas. The two general issues, reducing fuel loads and management of public lands, are listed as two specific actions as follows:

- Fuel breaks in the Oregon Slope area; and
- Controlled burns in Ontario Heights and along weedy roadsides.

Map 3 shows the locations of the proposed high-priority areas for fuels reduction. BLM, in addition to the specific actions herein provided by Dynamac, should take these areas under consideration and develop a more comprehensive mitigation proposal defining specific actions that will be taken to reduce fire hazards in these areas.

Fuel breaks are recommended in the Oregon Slope area. Planting herbaceous firebreaks, or greenstrips, along the interface area would reduce the spread of wildland fires into the community. Controlled burns are recommended in the Ontario Heights area to eliminate excess fuels. Controlled burns are also recommended to remove weeds along the roadside.

Project Necessity: Fuel reduction and treatment will reduce the danger of fires escalating to uncontrollable levels. This treatment will help to protect structures and agricultural/rangelands by lowering the risk fires pose, and by making fires that occur easier to suppress.

Project Timing: BLM generally times projects in the following manner: Year One is the year identification and justification of projects occurs, and treatment objectives are determined. Field surveys are conducted. In Year Two, projects that require compliance with NEPA are planned, analyzed, and designed and in Year Three, NEPA projects begin implementation. All steps are contingent on available funding. In Year Four, post-treatment monitoring begins.

8.3 Rural Assistance for Fire Departments

Purpose of Improvements: Traditionally, local area fire departments have focused on structural fire fighting. Training, equipment and experience are therefore significantly limited to structural defense capabilities. Only recently have these departments begun to understand and train for wildland firefighting. Training can be provided through a grant obtained by the Snake River Valley Fire Protection Association, and experience will come with time, but equipment is still lacking. The efficiency and effectiveness of the rural fire departments in the Vale-Ontario assessment area would be enhanced and response times shortened by the addition of the following equipment:

a. The Vale Volunteer Fire Department needs a BLM heavy, a water tender, and a portable floating pump. The current water tanker can go off-road, but it does not have necessary

all-terrain capabilities. A water tender with better off-road capabilities for fighting wildland fire. should be purchased. A floating pump is also needed so that additional water can be obtained on-site from almost any existing water supply.

b. The Ontario Fire Department requested another 2,000-gallon tender pumper truck, because the community's current 2,000-gallon capacity truck does not provide enough water. A BLM heavy brush truck, was also requested in addition to the light duty truck and one small brush truck currently used for wildland firefighting.
c. The Adrian Rural Fire Department needs to replace its 1978 water tender.
d. All fire departments need educational materials specific to wildland fire issues.

It should be noted that the Adrian and Vale Fire Departments are subscription-based services and do not benefit from the tax-based income that the Ontario Fire Department receives.

All fire departments requested additional water transportation vehicles. In order for these vehicles to be effective against interface wildland fire, they also need to have quality off-road capabilities. An NFPA-certified water truck with a minimum 3,500-gallon capacity and 4-wheel drive is needed to access rugged terrain. These trucks would be used outside city limits where there is very limited water availability. The addition of this truck will improve insurance ratings of the fire departments and decrease costs for residents.

All of the fire departments also need educational materials regarding wildland fires. Educational programs have been initiated in the past, but the materials associated with these programs do not focus on wildland fires. If materials are provided to the fire departments regarding wildland fire, this information could easily be folded into pre-existing educational efforts. It is also important to note that more than one fire department indicated they did not feel their community saw wildland fire as a risk. Additionally, approximately 50% of the residents in the Oregon Slope and Vale area elect to not subscribe to the services of their local fire departments. The failure by some individuals to perceive that the community is at risk from wildfire indicates that firewise education is necessary.

Project Necessity: Approximately 45% of the land within the Vale-Ontario assessment area is public land. Public lands surround the communities, and two of the towns, Vale and Adrian, are within one mile of public lands. The ability to respond quickly to remote areas is critical for the rural fire departments when responding to wildland fires.

Project Timing: These recommendations do not fall under any timing requirements. Project timing is contingent on obtaining funding to implement the projects. The BLM could assist fire departments in obtaining grant money as soon as time and funding permit.

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Video: Firewise Landscaping, Part 1-Overview.

Video: Firewise Landscaping, Part 2-Design and Installation.

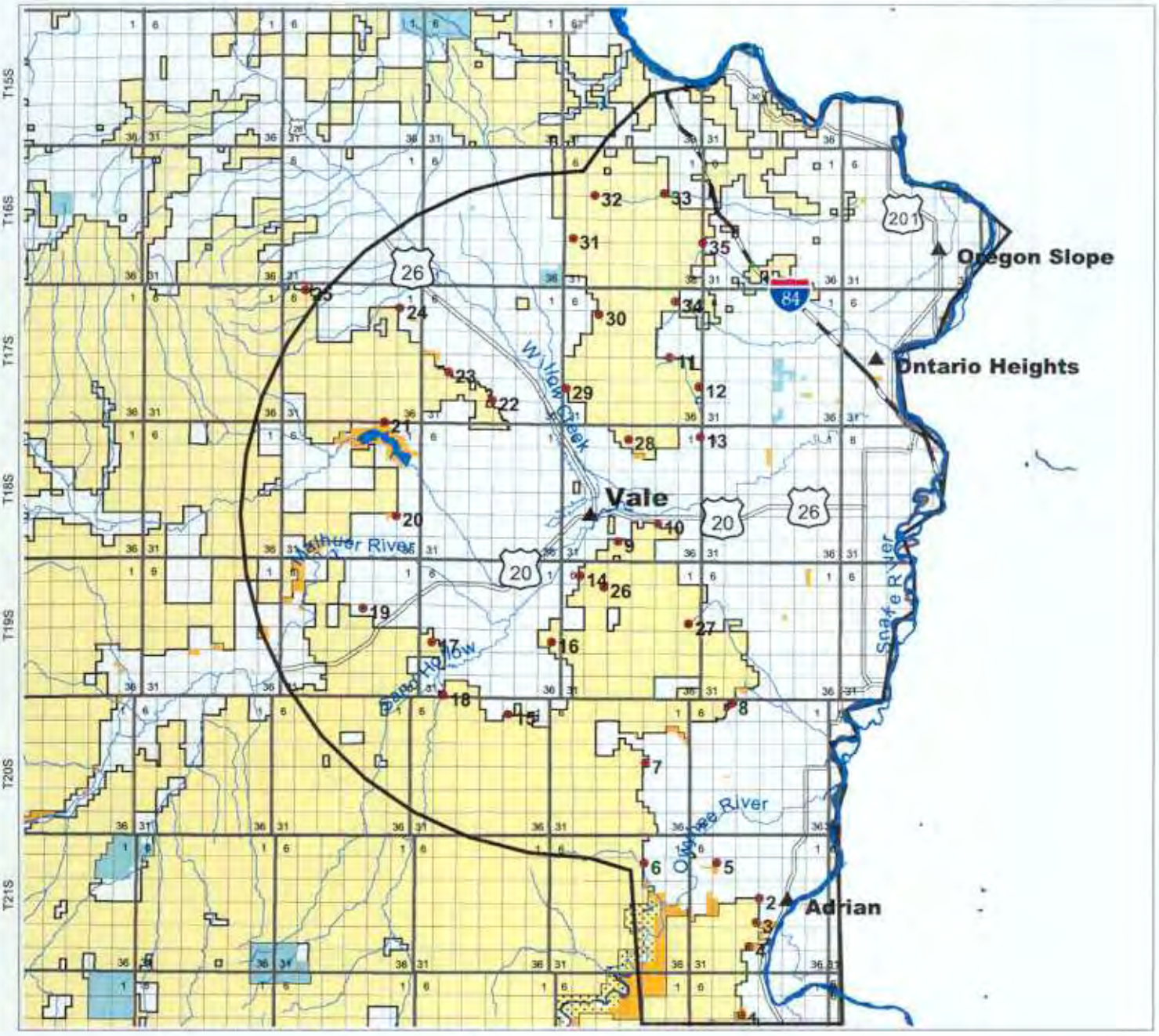
Video: Firewise Landscaping, Part 3-Maintenance.

Video: Wildfire Control--An Introduction for Rural and Volunteer Fire Departments.

Video: The Meeting: Fire Protection Planning in the Wildland/Urban Interface (1991).

Appendix: Maps

Map 1: Vale-Ontario Assessment Area and Fuel Survey Points



N

5 0 5 10 Miles

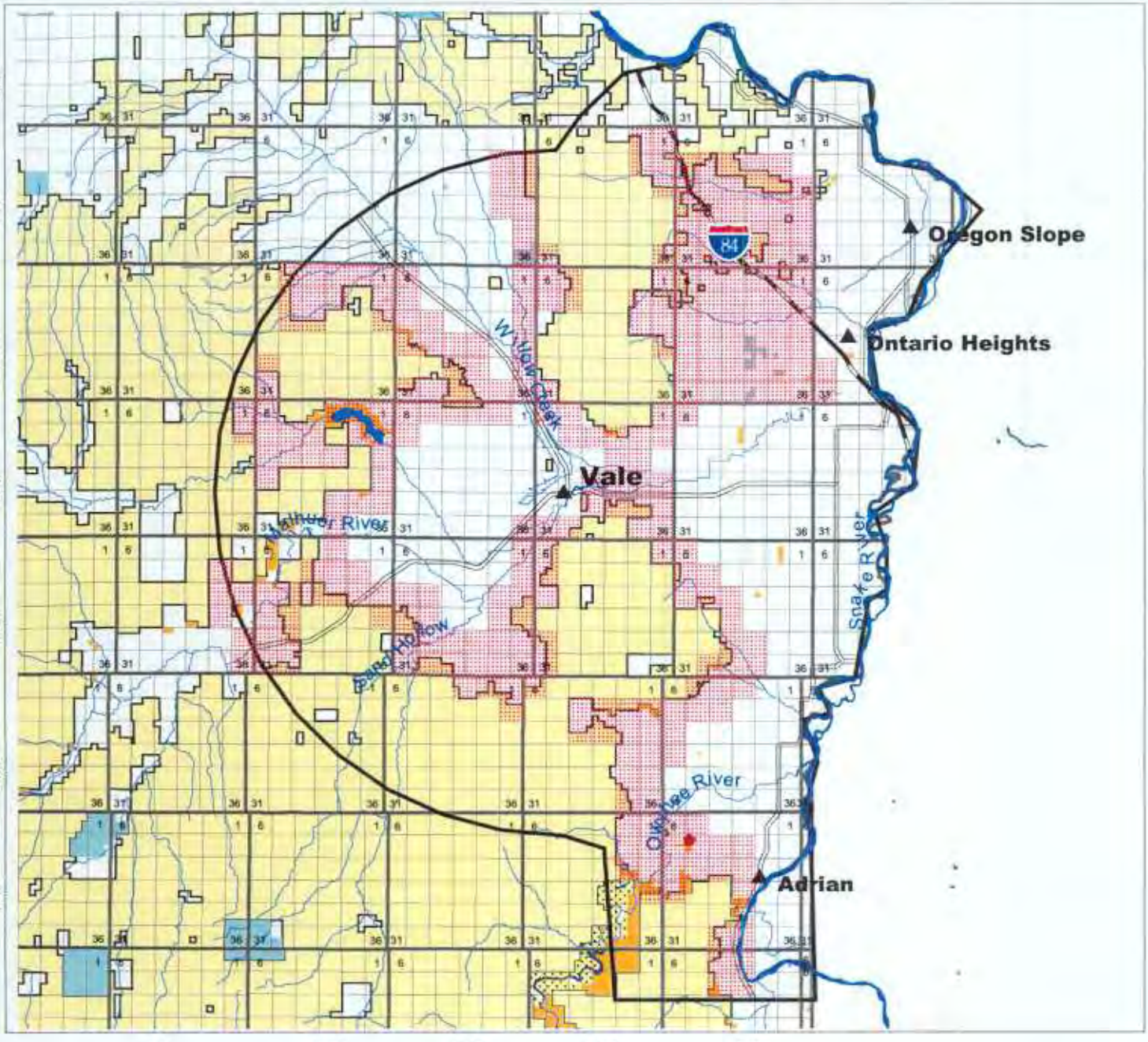
Scale 1:450,000

Ownership:

- BLM
- U.S. Forest Service
- Bureau of Indian Affairs
- U.S. Fish & Wildlife
- Bureau of Reclamation
- FERC
- Private
- State of Oregon
- Federal Aviation
- Assessment Area
- Assessment Communities
- Interstates
- Major Routes
- Major streams
- Actual Assessment Point

Map created by DYNAMAC CORPORATION Environmental Services April 2002

Map 2: Highest Risk Areas for Fuel and Fire Suppression within the Vale-Ontario Assessment Area



N

5 0 5 10 Miles

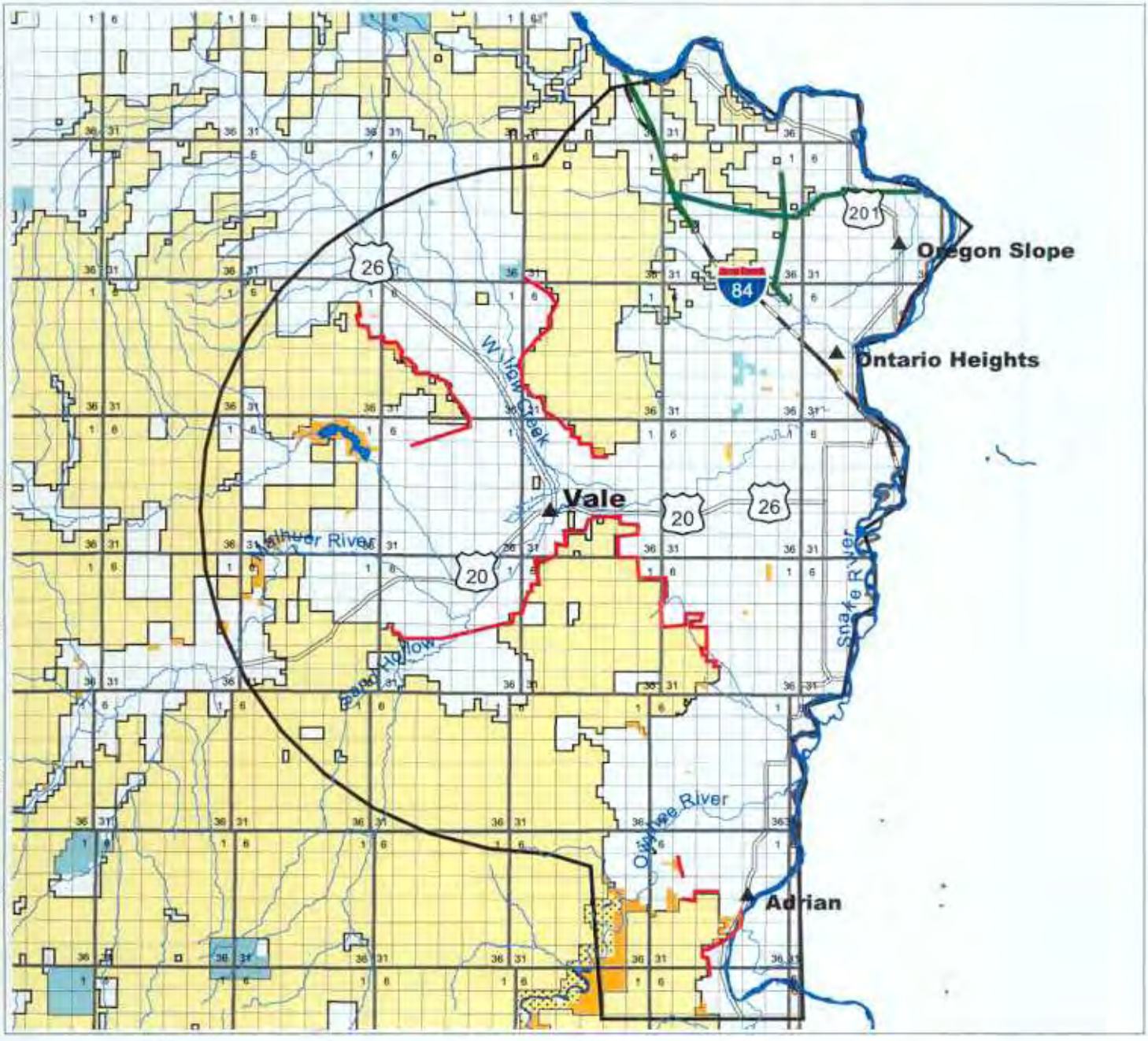
Scale 1:450,000

Ownership:
- BLM
- U.S. Forest Service
- Bureau of Indian Affairs
- U.S. Fish & Wildlife
- Bureau of Reclamation
- FERC
- Private
- State of Oregon
- Federal Aviation
- Assessment Area
- Assessment Communities
- Interstates
- Major Routes
- Major streams

- Highest Risk Fuel Areas within the Assessment Area
- Highest Risk To Fire Suppression Areas (Low Structure Density) within the Assessment Area

Map created by DYNAMAC CORPORATION Environmental Services April 2002

Map 3: Proposed Mitigation Recommendations in the Vale-Ontario Assessment Area



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5 0 5 10 Miles

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No warranty is made by the Bureau of Land management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notificati...

Ownership:
- BLM
- U.S. Forest Service
- Bureau of Indian Affairs
- U.S. Fish & Wildlife
- Bureau of Reclamation
- FERC
- Private
- State of Oregon
- Federal Aviation
- Assessment Area
- Assessment Communities
- Interstates
- Major Routes
- Major streams

Mitigation:
- Proposed Fire Breaks
- Area of Concern

Map created by DYNAMAC CORPORATION Environmental Services April 2002

City of Adrian
Jurisdiction Addendum

Addendum Overview

The City of Adrian elected to participate in the planning process for the Malheur County Multi-Jurisdictional Natural Hazards Mitigation Plan by developing a supplemental Jurisdiction Addendum ("City Addendum"). This city addendum is designed to provide any city-specific hazard risk information for where it may differ from the county's assessment.

Multihazard Requirement §201.6(a)(3): *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process.*

This addendum documents the city's participation in the process.

Multihazard Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

This addendum documents the city's risks where they vary from risks facing the planning area (the county).

Multihazard Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

This addendum documents any action items specific to the city. Note: because Adrian is a small city of under 200 residents, it does not have the staff resources to take on sole responsibility for an action item. The city does, however, wish to participate in several multi-jurisdictional action items as listed in Section 4: Goals and Action Items.

Attachments

- Hazard Mitigation City Addendum Work Session Summary
- ODOT map of Adrian
- FEMA FIRM map of Adrian *(no digital copy available; hard copy located in Natural Hazards Mitigation Plan file folder in Malheur County Planning Department)*
- Oregon Blue Book City Profile
- Meeting documentation (*no digital copy available; hard copies of agendas, minutes are located in Natural Hazards Mitigation Plan file folder in Malheur County Planning Department*)
- City-specific Action Item worksheets (N/A; the estimated population of Adrian in 2003 was 145 people. Due to its staffing limitations, the City has decided to

partner with the County on AIs that directly benefit the City. Please see Section 4 for multi-jurisdictional AIs for which Adrian is a partner city)

City of Adrian
Hazard Mitigation City Addendum Work Session
Issue Identification and Risk Assessment
May 31, 2007

Work Session Overview

On Thursday, May 31st, the City of Adrian held an issue identification work session at the Adrian Elementary School library in order to assess the jurisdiction's risks and develop community-specific action items for the city's addendum to the Malheur County Natural Hazard Mitigation Plan. This work session was facilitated by the Malheur County Hazard Mitigation Project Coordinator.

City Participants

The following individuals participated in the work session:

- Clay Webb, Mayor
- Mike Heller, City Council
- Keith Baldwin, City Council
- Linda Webb, City Council
- Adele Dockter, City Council
- Shawn Snyder, City Recorder
- Robert Webb, Fire Chief
- Dick Davis, Water & Sewer Superintendent

Hazard Analysis

In order to assess the city's risk of natural hazards, the Coordinator presented participants with a summary of the Malheur County risk assessment. The Coordinator then facilitated a discussion of each County hazard and asked participants to comment upon Adrian's risks, and whether they are greater or lesser than the County's risk to those same hazards.

Flood

The working group determined that the city's flood risk is low for both probability and vulnerability, which is lower than the county's overall high risk. Adrian is bordered on the east by the Snake River. However, participants recalled no flood events within city limits in the last 50 years, a finding that is consistent with the limited flood records available. Some minor flooding has occurred outside of city limits along the Owyhee River, but nothing that

has caused significant damage. A FEMA FIRM map of the city's floodplain areas is included in this addendum.

National Flood Insurance Program participation: according to FEMA, Adrian has 4 active flood insurance policies totaling $631,000 in value as of 2000. No single or repetitive losses have been claimed.

Because there are no National Weather Service gauges or other information-gathering resources on this section of the Snake River, records on past flood events are limited. The NWS does have a river gauge on the Snake River at Weiser, but this is approximately 43 miles downstream of Adrian.

Wildfire

The working group determined that the city's risk of wildfire is moderate for probability and low for vulnerability, which is lower than the county's high probability and moderate vulnerability. The city and its surrounding area is considered a Wildland-Urban Interface area by BLM, but fires occurring within city limits or threatening the city itself are very infrequent to nonexistent. The last time a fire came near the city was 1995, and this event caused no damage except for the burning of rangeland. There are several parcels of private and BLM land outside of the city which burn frequently, but these events generally do not significantly negatively impact the city itself. The only impact that BLM fires can have on the city is to negatively impact the activities of local ranchers, which can thus have an economic impact on the city. City officials note that the city is bordered by natural fire breaks on all sides – the Snake River to the east, agricultural lands to the south, west, and north, and a large irrigation canal to the west of town.

The County is currently developing a Community Wildfire Protection Plan, which will help further identify the city's vulnerability to wildfire.

Drought

The working group determined that the city's risk of drought is high for both probability and vulnerability, which is the same as the county's high risk. Because of the predominance of ranching, farming and other agricultural activities as a major economic force in the city, the economic impacts of drought are significant both for those individuals and for city businesses, which support and are supported by the agricultural community in the city's vicinity. The city falls within the boundaries of Owyhee Irrigation District for irrigation water.

Severe Weather

The working group determined that the city's risk of severe weather (windstorm, winter storm, thunderstorm/hail) is similar to the county's, with some exceptions:

Winter storms: probability is moderate, rather than high; vulnerability is low, rather than high. The city has had no major problems with severe winter storms in recent history. City officials did not know of any power outages, road closings, or other problems directly due to winter storms.

Windstorms: probability is moderate, rather than high; vulnerability is the same as the county's (low). Participants recalled occasional past events wherein trees were uprooted, crops damaged, and power lines blown down, but on a minor rather than a disastrous scale.

Thunderstorms: probability is high, vulnerability is low, like the county. Impacts to the city are similar to those in the rest of the county, with the greatest risk being to row crops and the economic impacts this can have.

Earthquake

The working group determined that the city's risk to earthquake is moderate in probability and low in vulnerability, which is the same as the County's risk. Like the County, the city's critical infrastructure, including local schools, public works facilities, and an outbuilding which houses the city's ambulance and fire engine, is almost exclusively un-reinforced masonry, which is especially vulnerable to seismic events. Several cracks in the walls of the local K-8 school building are believed to be from the 1984 Borah Peak earthquake in Idaho, which was felt throughout parts of Malheur County. The city is in the process of building a new K-8 school building that will be up to current building codes and thus less vulnerable to seismic activity and damages. Information on specific buildings' estimated seismic resistance, determined by DOGAMI in 2007, is available in the Earthquake Hazard Annex.

Landslide

The working group determined that the city's risk of landslide is lower than the County's, which is also low. The city has had no problems with landslides in city limits in known history and is located in a generally stable area. Land along the Owyhee River, especially Mitchell Butte, several miles west of town, experiences minor rock fall. This has historically not caused significant damages.

Volcanic Event

The working group determined that the city's risk to a volcanic event is low, which is the same as the county's risk. Were a volcanic event to occur in the Cascades region of Oregon, Adrian could be at risk for ash fall, depending on the severity of the event and the direction of the wind. Like the rest of the County, the city has an approximately 1 in 5,000 chance annually of experiencing ash fall from a volcanic event (see the County plan, Section 3: Risk Assessment, for more discussion of this event).

Issue Identification

In an effort to identify potential action items, the working group completed an issue identification exercise to identify hazard related issues related to: critical facilities & infrastructure, human population, cultural & historic resources, economic assets, and environment & land use. A summary of this exercise is included below.

Critical Facilities & Infrastructure

- Nearest health clinic, senior center, and food pantry are 12 miles away in Nyssa
- Adrian responds to emergency calls on out-of-city-limits Lytle Boulevard, which is the access road for Owyhee Dam
- The city is served by a volunteer Rural Fire District
- Elementary/Middle (K-8), and High School in city limits
- The High School auditorium serves as an emergency shelter
- LDS (Latter-Day Saints) church has an emergency shelter as well

Population

- High elderly population, most living independently, many dependent on oxygen tanks or other electronic aids, could use a list of those requiring assistance in emergency situations; no senior centers or assisted living facilities
- High number of people traveling through – most are headed to Lake Owyhee and the Owyhee river for fishing and boating opportunities.

Economy

- Locally-owned businesses are important; many are self-employed
- Business community is closely tied to the farming and ranching community
- Agriculture (farming, ranching, and agricultural processing [onion packing, etc]) dominates local economy
- Mine outside of town is a large employer (~10 employees)
- School district is a large employer (~ 47 employees)

Environment and Land Use

- Most land use in city is residential, some commercial use along the east side of Highway 201 and general use west of 201 along the railroad
- Snake River abuts the city
- Most land surrounding city is BLM land or agricultural land
- Many fishing and recreation opportunities are located on BLM land near/adjacent to the city, especially along the Owyhee River and in the Leslie Gulch and Succor Creek recreation areas.

Cultural and Historic Resources

- Historic small building where the city was founded (across the Snake River)
- Historic "City Hall," a tourist destination (it is a small wooden outhouse)
- The city is located on the historic Oregon Trail
- The local K-8 and High Schools are used for city events and festivals
- Festivals and events draw large crowds: Santa and Christmas Tree Lighting Ceremony, Strawberry Daze the first weekend in June, and the 4th of July festival, which includes the Walking Horse Race, a parade, and the Lion's Club Duck Dance and Duck Race
- The downtown business district has several historic buildings, although none are formally listed on the National Register of Historic Places

Adrian Community Profile

PO Box 226, Adrian, OR 97901
Phone 541-372-2179 • Fax 541-372-5416

City Location

map locating city location

County(ies): Malheur **Incorporated in** 1972
Location: Eastern Oregon
Nearest Major Highway and Distance: I-84 | 22 miles
Nearest Major City and Distance:
Ontario | 25 miles, Estimated Drive Time: 30 minutes
Distance to Portland: 400 miles

Source: Oregon Department of Transportation, State of Oregon Map; Oregon Blue Book

Recreational Amenities

State parks with 50 miles: Lake Owyhee State Park and Succor Creek State Recreational Park.

Planning a vacation or a tour through an area of Oregon? Visit the Oregon Tourism Commission's web site at http://www.traveloregon.com/ for more information.

Source: City Administration, local chamber of commerce, local convention and visitor bureau

Climate

Elevation: 2,180' **Measurement Location:** Ontario

Temperature:
Monthly Ave. Low: 20°F Monthly Ave. High: 91°F
Hottest Month: July Coldest Month: January
Driest Month: July Wettest Month: December
Average annual precipitation: 10.400"

Humidity (Hour 10, local time):
Average July afternoon humidity: 34%
Average January afternoon humidity: 77%

Source: Oregon Climate Service

Information in the Community Profiles was derived from many sources, including local, state and federal sources. The Oregon Economic and Community Development Department cannot accept responsibility for errors or omissions. Questions and comments may be directed to the department by telephone 503-986-0123, by fax 503-581-5115 or by email oedd.info@state.or.us.

Profile Topics
Climate

Demographics

	Population			
	1990	**2000**	**2005**	**2006**
City of Adrian	131	147	187	185
Malheur County	26,038	31,615	31,800	31,725

Sources: 1990, 2000 US Census; 2205, 2006 Center for Population Research and Census, Portland State University. 0 indicates data is unavailable.

Malheur County	9,926 sq miles	3 persons/sq mile	Sources: figures based on 2006 PSU population estimates; Oregon Bluebook county square mileage

Community Age Groups

	1970	**1980**	**1990**	**2000**
Under 5 years	0	0	5	9
5-19 years	0	0	22	88
20-44 years	0	0	33	452
45-64 years	0	0	37	117

65+ years	0	0	18	1,463
Median Age	0	0	43	38.2

Source: US Census, 0 or N/A indicates data is not available. Median value is the middle value, not an average.

Housing

Total Housing Units	**1970**	**1980**	**1990**	**2000**	**Median Value of Owner-Occupied Housing, 2000**
City of Adrian	46	64	70	70	$61,900
Malheur County	5,896	9,083	10,649	11,233	$86,900

City of Adrian 2000 Housing Breakout:

Vacancy Rate:	14.29%	**Median Owner Cost**	
Owner Occupied:	43	**(mortgaged):**	$543
Renter Occupied:	16	**Median Gross Rent:**	$415

Source: US Census. Median value is the middle value, not an average.

Also visit Housing and Community Services Web Site:
http://www.hcs.state.or.us/

Economic Development and Employment

Principal Industries of the County(ies):
Malheur County—Agriculture, livestock, food processing

Source: Oregon Employment Department, Covered Employment and Payroll Reports, 1998

Agricultural Products of the Area (Top 3 largest gross farm sales):
Malheur County—Cattle and calves, field crops, vegetable crops

Source: Oregon State University, Extension Economic Information Office

Total Number of Manufacturing Companies in the County:

Malheur County 26

Source: Oregon Employment Department, Covered Employment and Payroll Reports, 1998

Total Number of Manufacturing Companies in the City: 2

Source: City Administration

Economic Indicators

	Malheur County		Oregon		
	2001	**2002**	**2000**	**2001**	**2002**
Population	32,000	32,000	3,421,399	3,471,700	3,504,700
Labor Force	14,867	14,867	1,802,938	1,793,773	1,840,133
Total Employment			1,715,453	1,679,914	1,701,390
Unemployment	1,252	1,317	87,485	113,859	138,743
Unemployment Rate	8.4%	8.9%	4.9%	6.3%	7.5%
Non-Farm Payroll Employment	12,110	11,840	1,606,800	1,596,100	1,572,500

Total Covered Employment	13,128	12,660	1,607,944	1,596,943	1,573,083
Total Covered Payroll ($ thousands county/ $ millions state)	$304,082	$305,914	$52,701	$53,021	$52,989
Ave. Annual Payroll Per Employee	$23,163	$24,164	$32,776	$33,202	$33,684
Number of Business Units	920	913	108,432	111,353	113,097
Total Personal Income ($ millions)	$566,279	$581,883	$94,999	$98,500	$101,358
Annual Per Capita Personal Income	$	$18,608	$27,649	$28,400	28,792
Assessed Value of Property ($ millions)	$0	$1,446	$198,911	$210,435	$219,878
Residential Construction					
Building Permits	42	44	19,877	21,049	22,186
Value ($ thousands)	$6,229	$6,327	$2,533	$2,985	$3,347
Travel Expenditures ($ millions)	$0	$36,400	$6,133	$6,128	$6,208
Travel-Related Employment	0	560	89,800	91,100	90,200

Preliminary Data

Sources: Oregon Employment Department; Center for Population Research & Census, PSU; U.S. Census Bureau; Bureau of Economic Analysis; Oregon Tourism Commission; Oregon Department of Revenue; Oregon Economic and Community Development Department.

5 Largest Employers, Public and Private as of December, 2002

Employer—Product/Service	Number of Employees
Valley Packers—Onion Packing	80
Adrian School District—Education	50
Teague Mineral Products—Bentonite and Geolite Ore	11
Martin Manufacturing—Machinery	3
—	

Source: City Administration

Oregon Employment Labor Market Information

This link takes you to the Oregon Employment Department, Labor Market Analysis database. County information can be obtained here. http://olmis.emp.state.or.us/—Click on Regional Information.

Local and Regional Economic Development Organizations

City of Adrian	541-372-2179
City of Vale—http://www.ci.vale.or.us/	541-473-3133
City of Ontario	541-7684
Mahleur County Economic Development—http://www.malheurco.org/	541-881-0327

GEODC Greater Eastern Oregon Development Corporation	541-575-2786
Economic & Community Development Department Regional Development Officer—http://econ.oregon.gov/	541-575-1050

Source: City Administration, local chamber of commerce, Oregon Economic and Community Development Department

Education/Workforce

Public and Private Schools K–12

Public School District:
Adrian School District 61
305 Owyhee St
PO Box 108
Adrian, OR 97901-0108
Phone: 541-372-3744
Fax: 541-372-5380
Web site: http://www.adriansd.com/
E-mail: stupou@malesd.k12.or.us

Staff and Enrollments:
District Certified Staff: reported October 2000—23
Total District Enrollment: reported October 2001—253

Other Schools in the School District (Private, Parochial)
To see if there are private and/or parochial schools in this district please visit http://www.ode.state.or.us/pubs/directory/

Source: Oregon Department of Education

Oregon Community Colleges and Public Universities

Oregon map with higher ed institutions identified

legend for map

For a list of public and private educational institutions in Oregon visit http://www.oregon4biz.com/ed.htm.

Workforce

Oregon Economic and Community Development Department Workforce Advocate 503–986–0207, or visit http://www.oregon4biz.com/workforce.htm. Locate local workforce assistance at http://www.worksourceoregon.org/.

Financial Information

Financial Institutions

Commercial Banks: 0 **Savings and Loans:** 0 **Credit Unions:** 0

Source: City Administration

Taxes

Sales Tax Oregon has no general sales tax.

Property Tax
Property—Who pays? Owners of real and business personal property, according to the assessed value of taxable residential, commercial, farm, industrial, utility and timber property.

County assessors use permanent rates set for all taxing districts in fiscal year 1997–98, when taxes were significantly reduced with a statewide average 17 percent cut in tax levies. Certain types of levies are outside this reduction. The tax rates cannot exceed $15 per $1,000 of real market value. For 1997–98, all property was valued by county assessors at 90 percent of the July 1, 1995, levels. For subsequent years, assessed values are limited to a 3 percent annual growth rate. Construction since July 1, 1995, is valued at the average rate of similar properties in the area. Business personal property requires annual filing. One–third payment is due by November 15. If fully paid by November 15, a 3 percent discount is allowed. Special exemptions, tax relief programs and deferrals are available. For more information contact the Malheur County assessor's office at 541–473–5117.

Tax rates are representative of the largest tax code in the city. The rates are expressed as tax liability per $1,000 of assessed property value.

	Malheur County
Average Compressed Tax Rate 1997-98	$12.62
Average Compressed Tax Rate 1998-99	$12.51
Average 1999 Housing Value	$52,414
Ave Res Property Tax Paid on Ave House 1997-98	$645.47
Ave Res Property Tax Paid on Ave House 1998-99	$655.70

Average School rate 1998-99 . . . . . . $5.27

Average Non-School Rate 1998-99. . . . $4.63

Average City Rate 1998-99 . . . . . . $0

Business Taxes
Property—see above

Income—Corporations doing or authorized to do business in Oregon pay excise tax. Corporations not doing or authorized to do business, but having income from an Oregon source, pay income tax. For more information contact the Oregon Department of Revenue,

955 Center St., NE, Salem, OR 97301, 503–378–4988, http://www.oregon.gov/DOR/.

Unemployment Insurance—Employers pay this. For 2002, new employers are assigned a fixed rate of 3 percent of taxable wage base. Tax rates for existing employers are based on employers' experience and range from 1 percent to 5.4 percent of taxable wage base. Taxes are paid quarterly and are due by the end of the month following the quarter. In 2002, the tax is paid on the first $25,000 of wages paid to each employee. The rate schedule in effect depends on the balance in the Trust Fund as of August 31 each year and the amount of revenue needed to maintain the balance at a level adequate to pay benefits. For more information contact the Oregon Employment Department, 875 Union St., NE, Salem, OR 97301, 503–947–1488, web http://www.employment.oregon.gov/.

Utilities, Railroad, Weight-mile—Who pays? All railroads and investor-owned utilities operating with the state pay an annual fee. For-hire and private motor carriers operating into, within and through the state pay weight-mile taxes. Rates—limit of .25 percent of gross operating revenues of investor-owned utilities; .25 percent charged on 2002 revenues. Limit of .35 percent on gross operating revenues of railroads; .267 percent charged in 2002 revenues. Applications, plate fees and per-mile rates dependent on declared combined weight of vehicle. For more information contact the Oregon Public Utility Commission, 550 Capitol St., NE, Suite 215, Salem, OR 97301–2551, 503–378–6611, web http://www.oregon.gov/PUC/; Oregon Department of Transportation, Rail Section, 555 13th St., NE, Salem, OR 97310–1333, 503–986–4125, web http://www.oregon.gov/ODOT/RAIL/; Oregon Department of Transportation, Motor Carrier Transport Branch, 550 Capitol St., NE, Salem, OR 97301–3871, 503–378–6699, web http://www.oregon.gov/ODOT/MCT/.

Incentives
Oregon's Business Incentives.

Miscellaneous
Motor Vehicle Licensing, Driver Licensing, Fuels—Who pays? Owners and operators of motor vehicles. Oil companies importing fuels. Truckers using Oregon highways. Fees—Registration fees, driver license fees and renewals (contact the Oregon Driver & Motor Vehicle Services division 503–945–5000, web http://www.oregon.gov/ODOT/DMV/

Hunting and Fishing Licenses—contact Oregon Department of Fish and Wildlife, PO Box 59, Portland, OR 97207, general information 503–872–5268, licenses/tags/permits 503–872–5275, web http://www.dfw.state.or.us/.

Amusement Device Tax—An excise tax is imposed upon every person who operates an amusement device in Oregon. An amusement device is a video lottery game terminal. More information from the Oregon Lottery Commission, 500 Airport Rd SE, Salem, 97301, web http://www.oregonlottery.org/.

Emergency Communications (9–1–1) Tax—Telephone companies providing local exchange access services in Oregon Collect this tax from their customers. The tax, which is $0.75 per line per month, is reported and paid quarterly. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Hazardous Substance Fee—Paid by possessors of nonpetroleum hazardous substance. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Petroleum Load Fee—Paid by petroleum suppliers and importers to Oregon. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Timber Severance Tax—Paid by timber owners on harvested timber’s value. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Forest Products Harvest Tax—Paid on timber cut from any land in Oregon. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Dry Cleaning Tax—Paid by operators of dry cleaning facilities. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Alcoholic Beverages—Manufacturers and/or import wholesalers of malt beverages and wines pay a privilege tax. Manufacturers, wholesalers and retailers of distilled spirits, malt beverages and wines pay license fees. Employees who serve alcoholic beverages pay for service permits. For more information contact the Oregon Liquor Control Commission, PO Box 22297, Portland, OR 97222,

503–872–5000 or 1–800–452–6522 (in Oregon), web http://www.oregon.gov/OLCC/.

Tobacco Products—Cigarette and tobacco products distributors are required to purchase tax stamps for cigarettes or pay a percentage of the wholesale price on other tobacco products. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Transit Payroll Tax–paid by employers in the Tri-Met (Portland area) and Lane Transit District (Eugene) for mass transit systems. Administered by the Department of Revenue, web http://www.oregon.gov/DOR/.

Many local governments in Oregon collect other taxes, such as hotel-motel taxes. Contact the city or county in which you are interested for more complete information about taxes in that area.

Source: Oregon Department of Revenue, "A Summary of Taxes," January 2002; County information–County Assessor's Office

Community Services and Resources

Public Safety/Emergency Services

Fire Station(s) serving community: Adrian Rural Fire Department
Number of paid and volunteer firefighters: 13
Rating by Insurance Services Organization (ISO): 8-9*
Comments: 2000 data; *ISO rating unreported in directory
Source: Oregon State Fire Marshal, Oregon Fire Service Resource Directory 2000

Police Department: Malheur County Sheriff Office - Vale, OR
Number of paid and reserve officers: 1
Comments: The Malheur County Sheriff Office in Vale, Oregon provides all law enforcement inside the Adrian city limits.

Nearest Hospital and distance: Holy Rosary Medical Center, 25 miles to Ontario
Regional Hospital and distance: Holy Rosary Medical Center, 25 miles to Ontario
Emergency services to community: Ambulance Service & Air Life of Oregon
General Clinic(s): 0

Source: City Administration

Communications Resources

Local Newspapers: Argus Observer (Ontario), Malheur Enterprise (Vale)

Regional Newspapers: Idaho Statesman (Boise), Idaho Press Tribune (Nampa)

Radio Stations: Boise and KSRV Ontario, Oregon

TV Stations: Community receives Boise, Idaho, stations

Available Cable Television: No cable access

Telephone Service Provider(s): Malheur Bell

Local Internet Service Provider(s): Yes
Number of Internet Service Providers: Data unavailable at this time.
Source: City Administration

Library System
Nyssa Public Library, Ontario Public Library

Source: City Administration

Planning Service/Regulatory

Regulatory System	Year Acknowledged	Year Last Revised	Year of Periodic Review	Comments
Comprehensive Plan	1983			
Zoning Ordinance				
Building Permit System				
Subdivision Ordinance				
Strategic Plan				

Territory Covered by Zoning
Municipality Yes **County** Yes
Source: City Administration

Industrial Lands
Does the Community seek industrial development? Yes
Access Statewide industrial lands database—http://www.oregonprospector.com/
Source: Economic and Community Development Department

Special Districts and Associations (ports, water, sewer, etc.)
Name of Special District and the Oregon Revised Statute it was created under:
Adrian R.F.P.D.; Malheur County E.S.D.; Malheur County S.W.C.D.; Malheur District Improvement Company

Special Districts Association of Oregon—727 Center St., NE Salem, OR 97301, 503–371–8667 or 800–285–5461 http://www.sdao.com/
Source: City Administration

Infrastructure/Transportation

Water Supply

Operator: City of Adrian
District:
Source: Ground Water; 4 wells
Supply: Treated; Capacity (MGD)–0.25; Pressure (PSI)–70.00

Current Water Utilization on Meter Size (MGD): 0.20 MGD
Water Costs per thousand gallons: Base rate per/thousand =$15.00/month Summer; $15.00/month Winter
Water Costs for Total Consumption of Residential: Based on 7,000 gallons = $15.00 for 6,000 gallons, $.50 for each additional 1,000 gallons

Age of Water System: 1981

Water System Comment(s): Hook up fees/other connection fees: $550.00

Compliance Issues: None

Water debt repayment included as part of tax assessment? Data unavailable at this time.

Date of Current Master Plan:

Plans for Upgrading or Expanding: Council is currently in the process of applying for grants to upgrade and improve water quality

for the city.
Source: City Administration

Wastewater Treatment System

Operator: City of Adrian **Age of Wastewater Collection System:** 1976
District:

System Design Capacity (MGD): 0 MGD **System Utilization (MGD):** 0 MGD
Collection System Fees: $0 **Hook-up or Connection Fee:** $0
Access Fee or System Development Fee: $0

Comment(s) on Wastewater System: The city uses an evaporation system.

Compliance Issues:

Date of Last Facility Plan:

Plans for Upgrade/Expansion:

Storm Drain: Yes **Storm Water Discharge Fee:**
Fees or issues related to storm drains: No fee assessed
Source: City Administration

Utilities

Telecommunications

Is there access to broadband infrastructure? Yes	**Access**	**Monthly Fee**	**Other Fee**
	T1 Yes		
If yes, check all that apply: Fiberoptic Satellite	**DSL** Yes		
	Cable No		
Is there route diversity? Yes			

For Oregon Telecommunications information and resources, visit http://www.oregon4biz.com/inn.htm.

Natural Gas—Provider: None
Lines and Feed:

Rate Structure:

Plans for Upgrade/Expansion:

Electrical—Provider: Idaho Power Company
Lines and Feed:

Rate Structure Residential: First 300 kwh $.038623/kwh, 300 kwh + $.048279/kwh

Commercial: @12kw and 1,500kwh/month $78.00; @100kw and 30,000kwh/month $1,2878.00; @500kw and 150,000kwh/month $6,393.00

Industrial: @10,000kw and 400,000 kwh/month $13,100.00; @5,000kw and 2,500,000kwh/month $75,715.00

Plans for Upgrade/Expansion:

Solid Waste Management: Malheur County Lytle Landfill

Permit Status:

Utility Expansion Plans:

Utilities Source: City Administration; PGE information supplied by PGE. Note: We update utility rates periodically. Actual rates may change more often than that. For the most current rate for any carrier please consult the Public Utilities Commission web site at http://www.puc.state.or.us/commsion/default.htm Click on the **Statistics 200x** label (x being the most recent year).

Transportation

Highways Hwy 201 N/S route, local access **Transportation Access Fee:** $0

Community Air Service No
Air Passenger Service: No
Airport Freight Service: No
Air Service Comments:

If no local service, list closest Air Facility

Ontario Municipal Airport Boise, ID

Rail Service: No
Freight Service: No **Passenger Service:** No
If no local service, list closest Rail Service: Freight: Nyssa, Ontario, Vale Passenger: Pasco, Salt Lake City

Marine No

Transportation issues which might confront development, such as non-attainment air shed, etc.:

Public Transportation Comment:

Bus Service Available in the Community: No
Scheduled Bus Service Available: No **Buses Per Day:**
Local Charter Services: No
Distance to Nearest Bus Service: Vale or Ontario 25 miles

Trucking Service
Scheduled Freight Carrier Services: Yes EOFF, Yellow, May, Parsons
Overnight Express Parcel Service Available: Yes Fedex, Roadrunner, Airborne Express, UPS, Post Office
Overnight Express Mail Service Available: Yes
Transportation Comments:

For more information relating to transportation topics please visit the Department of Transportation web site. Airports (maps and general information) http://www.tripcheck.com/About/airport.htm; Bicycle and Pedestrian Route information http://www.tripcheck.com/About/bicycle.htm; Public Transportation, bus and rail http://www.tripcheck.com/About/busrail.htm.

Source: City Administration, local chamber of commerce (proprietary information)

R. 46 E.

TO NYSSA

AVE.

WILLOW

RD.

BEGEMAN

RD.

LN.

201

NO. 450

LAAN

KINGMAN

MENDIOLA

(NEWELL HEIGHTS RD.)

10 11 15 14

RD.

MENDIOLA

RD.

11 12 14 13

R.R.

HWY.

M.P. 11.72

CLOVER

LN.

Reservoir

RD.

HIGH ST.

ADRIAN ELEM. & MIDDLE SCHOOL

ADRIAN HIGH SCHOOL

ADRIAN

WELL

OWYHEE ST.

ST. 2ND ST. MAIN ST. ST.

HOLLY LN. OREGON ST. ST.

1ST 2ND ST. 3RD 4TH 5TH

FIRE STA.

WASHINGTON ST.

PARKER LN.

15 14 22 23

M.P. 12.23

EMERALD SLOPE RD.

OTIS

RD.

RIVER

MILE 401

D.F.N.W.R.

D.F.N.W.R.

D.F.N.W.R.

T. 21 S.

DEFFER

RD.

PACIFIC CREEK

SUCCOR

SNAKE

MILE 402

14 13 23 24

AVE.

Drain

SPUR

ROSWELL

NO. 450

RD.

PARMA

RD.

Alkali

NO. 454

BEND

HWY.

ADRIAN–

RUSSETT

ARENA

VALLEY

RD.

HWY.

CALDWELL

MILLER

PRIMROSE

NO. 453

RD.

ADRIAN–

BIG

SNIVELY

GULCH

RD.

UNION

201

Suzy Island

NATIONAL REFUGE

DEER FLAT WILDLIFE

South

22 23 27 26

23 24 26 25

TO ROSWELL (IDAHO)

TO HOMEDALE (IDAHO)

R. 46 E.

LEGEND

FUNCTIONAL CLASSIFICATION — STATE / OTHER

FOR FURTHER FUNCTIONAL CLASSIFICATION INFORMATION, CONTACT O.D.O.T. REGION OFFICE.

- INTERSTATE
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- URBAN COLLECTOR / RURAL MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD
- ORE. ROUTE – US. ROUTE – INTERSTATE ROUTE
- NATIONAL HIGHWAY SYSTEM ROUTE
- URBAN GROWTH BOUNDARY
- CITY LIMIT
- AMTRAK RAIL PASSENGER STATION
- BRIDGE

GRADE SEPARATIONS :

- STATE – OTHER FUNCTIONALLY CLASSED – LOCAL ROAD

- PUBLIC BUILDING
- COURTHOUSE
- CITY HALL
- ARMORY
- POST OFFICE
- SCHOOL
- LIBRARY
- SAFETY REST AREA
- WEIGH STATION
- PARK & RIDE LOCATION
- INTERCITY – CITY TRANSIT
- COMMERCIAL – GENERAL AVIATION
- AMTRAK STOP – PORT FACILITY
- GRAVEL PIT – QUARRY – ODOT STOCKPILE SITE

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IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

NORTH

"This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information."

SCALE

400 0 400 800 FEET

125 0 125 250 METERS

ADRIAN
Population 150 *

T. 21 S. R. 46 E. W.M.

PRELIMINARY COPY
SUBJECT TO CORRECTION

OREGON TRANSPORTATION MAP

Showing Functional Classification of Roads
City of

ADRIAN

MALHEUR COUNTY
2004

PARK & RIDE | INTERBUS | AMTRAK
AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

PORT | AIRPORT | COMM. AIR
AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

Copies available from the Oregon Department of Transportation, Map Distribution Unit, Mill Creek Office Park, 555 13th St. NE, Suite 2, Salem, Oregon 97301–4178, Telephone (503) 986–3154, http://www.odot.state.or.us/tdmappingpublic

* Based on current Oregon Population Report, College of Urban and Public Affairs, Portland State University, http://www.upa.pdx.edu/CPRC.

Harney Electric Cooperative
Hazard Mitigation Addendum

Risk Assessment and Action Items

Introduction

The Harney Electric Cooperative addendum to the Harney County Natural Hazards Mitigation Plan provides hazard information specific to the Harney Electric Cooperative as well as two action items the Electric Cooperative has submitted to mitigate against natural hazard events. The Harney Electric Cooperative has been closely involved in the process of developing the Harney County Natural Hazards Mitigation Plan and has been identified as the convener for the Mitigation Plan. This addendum is part of the multi-jurisdictional Harney County Natural Hazards Mitigation Plan which also includes addendums for the City of Burns and the City of Hines. While the Harney County Mitigation Plan provides a comprehensive range of actions for all communities in the county, action items written for the Harney Electric Cooperative are necessary to address hazards specific to the company.

Methodology

The Oregon Natural Hazards Workgroup (ONHW) gathered information from a variety of sources to identify natural hazards affecting the Electric Cooperative. The asset identification meeting held on March 28, 2007, and the Hazard Identification meeting held on March 29, 2007 provided ONHW with the primary source natural hazard information for the Electric Cooperative. In addition, conversations with Office Manager for the Harney Electric Cooperative provided important information regarding how natural hazards affect the Electric Cooperative.

The Electric Cooperative submitted two action items addressing severe weather events, which are attached at the end of this addendum.

Company Profile

The Harney County Electric Cooperative is non-profit cooperative that provides electric power to an area covering 20,000 square miles. Their service area includes most of rural Harney County and extends into Malheur and Lake counties as well as Nevada. The cooperative is headquartered in Burns and has provided power to the area since the 1950s.

Hazard Identification

Although the cooperative provides reliable service to its customers, there are issues with older infrastructure that make the company more susceptible to natural hazard events.

Severe Weather: Ice and Wind Storms

One of the recurring problems the cooperative faces are ice and wind storms that often disrupt service. Areas of concern include older power lines that have long spans between poles and which have the tendency to sag when ice accumulates on the lines. When the ice melts, the lines snap up quickly, wrapping themselves around other lines and causing a power outage. Wind storms also have the capacity to knock down power lines, causing further power outages. The areas more susceptible to ice and wind storms are hilltops where ice tends to accumulate. A winter storm that lasted from December

2003 to January 2004 caused $33,769 in damage to lines, however the Cooperative was able to obtain $172,877 in mitigation funding to put the lines that were damaged underground.

Wildfire
Conversations with the Harney Electric Cooperative indicate that wildfire also poses a significant threat to the Electric Cooperative's power lines. Many of the older wooden power poles are highly vulnerable to wildfire because they are dry timber that burns very easily. Should a wildfire pass through an area with wooden power poles, then the Electric Cooperative can sustain significant damage. A wildfire that passed through Fields in August 2006 caused approximately $150,000 in damage. In the 1980s fires caused approximately $50,000 in damage. The Electric Cooperative has mitigated for wildfires by putting some of the lines underground.

Flood
Flooding also remains a significant natural hazard that has damaged power lines owned by the cooperative. A flood in 1987 caused approximately $600,000 in damages. To mitigate against flood hazards, the Electric Cooperative has reinforced the base of powerlines to prevent future damage to them.

Mission, Goals, and Action Items

The mission and goals for the Harney Electric Cooperative Addendum are the same as the mission and goals written in the Harney County Natural Hazard Mitigation Plan. The mission for the Plan and the Electric Cooperative addendum is the following:

- To develop a disaster-resilient Harney County

The goals are the following:

- Save lives and reduce injuries.
- Minimize and prevent damage to public and private buildings and infrastructure.
- Increase cooperation and coordination among local, state, and federal agencies.
- Reduce economic loss.
- Protect natural resources.
- Protect cultural resources.

The Electric Cooperative wrote the following two action items to be included in the mitigation plan. These actions are also included in Section 3 of the Harney County Natural Hazard Mitigation Plan.

Severe Weather Action # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Replace primary electrical overhead lines to mountaintop communication services with underground lines.	• ***Minimize and prevent damage to public and private buildings and infrastructure.*** • ***Reduce economic loss.***

Rationale for Proposed Action Item:

- Overhead electrical lines are subject to high winds and winter storm damage. The risk is higher on the lines going to a mountaintop or peak. Most of the services at the top are communication sites. The communication sites are used by ODOT, State Police, county sheriff, emergency services, telephone utilities and cell phone companies. During a disaster the sites are vital for communication. During winter storm access to the line by the utility is difficult and this difficulty delays the time for restoration of power to the services. The utility company has experienced costs each year to repair and maintain the lines. Changing the lines to underground would remove the risk of damage from wind and winter storm.
- The Disaster Mitigation Act of 2000 requires communities to develop comprehensive actions to reduce the impacts of natural hazards, with an emphasis on new and existing buildings and infrastructure.[201.6(c)(3)(ii)] Replacing primary electrical overhead lines to mountaintop communication services with underground lines will reduce the impact of severe weather on power lines, and will continue power service to rural customers as well as ODOT, State Police, county sheriff, emergency services, telephone utilities, and cell phone companies.
- The two incorporated cities in Harney County –Burns and Hines- rely on the county for certain services and public facilities. Because the cities rely on the County for services, this action is considered to be a multi-jurisdictional action since it benefits both the County and all the participating cities.

Ideas for Implementation:

- **The utility company would be responsible to identify all the mountaintops and apply for grants to put the lines underground.**

Coordinating Organization:	**Harney Electric Cooperative, Inc.**

Internal Partners:	**External Partners:**
Oregon Trail Electric Cooperative	**Companies which are served by the utility and the utility company, Malheur County, Lake County**

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**n/a**
	3-4 years	

Form Submitted by:	**Fred Flippence**

Severe Weather Action # 2

Proposed Action Item:	**Alignment with Plan Goals:**
Shorten spans and anchor poles on utility lines in high wind or heavy icing areas.	• ***Minimize and prevent damage to public and private buildings and infrastructure.***

Rationale for Proposed Action Item:

- High wind storms or winter icing storms can cause damage to long spans between power poles and create power outages during storms. If poles are inserted between spans this reduces the risk of outages. Also by anchoring certain poles this can reduce the amount of line which would go down in a storm. Both items reduce the cost of repair and replacement.
- Winter storms have a significant impact on the Harney County Electric Cooperative, causing power outages when ice forms on the power lines. This is especially a problem with older power lines constructed in the 1950s that have a larger line span between poles. Placing intermediary poles between these spans cuts the span in half and reduces the likelihood of a power line breaking.
- The Disaster Mitigation Act of 2000 requires communities to develop comprehensive actions to reduce the impacts of natural hazards, with an emphasis on new and existing buildings and infrastructure.[201.6(c)(3)(ii)] Shortening the spans between long lines and anchoring poles will reduce the likelihood of lines breaking during wind and winter icing storms.
- The two incorporated cities in Harney County –Burns and Hines- rely on the county for certain services and public facilities. Because the cities rely on the County for services, this action is considered to be a multi-jurisdictional action since it benefits both the County and all the participating cities.

Ideas for Implementation:

- **The utility company would be responsible to identify high wind and icing areas from previous outages and apply for grants to strengthen the areas by pole inserts and anchoring.**

Coordinating Organization:	**Harney Electric Cooperative, Inc.**

Internal Partners:	**External Partners:**
Oregon Trail Electric	**Malheur County, Lake County**

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**N/A**
	2-4 years	

Form Submitted by:	**Fred Flippence**

City of Jordan Valley
Jurisdiction Addendum

Addendum Overview

The City of Jordan Valley elected to participate in the planning process for the Malheur County Multi-Jurisdictional Natural Hazards Mitigation Plan by developing a supplemental Jurisdiction Addendum ("City Addendum"). This city addendum is designed to provide any city-specific hazard risk information for where it may differ from the county's assessment.

Multihazard Requirement §201.6(a)(3): *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process.*

This addendum documents the city's participation in the process.

Multihazard Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

This addendum documents the city's risks where they vary from risks facing the planning area (the county).

Multihazard Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

This addendum documents any action items specific to the city. Note: because Jordan Valley is a small city of under 300 residents, it does not have the staff resources to take on sole responsibility for several action items. The city has one action item for which it is the principal responsible party. The city does, however, wish to participate in several multi-jurisdictional action items as listed in Section 4: Goals and Action Items.

Attachments

- Hazard Mitigation City Addendum Work Session Summary
- ODOT map of Jordan Valley
- FEMA FIRM map of Jordan Valley *(no digital copy available; hard copy located in Natural Hazards Mitigation Plan file folder in Malheur County Planning Department)*
- Oregon Blue Book City Profile
- Meeting documentation (*no digital copy available; hard copies of agendas, minutes are located in Natural Hazards Mitigation Plan file folder in Malheur County Planning Department*)
- City-specific Action Item worksheets (Also see Section 4 for multi-jurisdictional AIs for which Jordan Valley is a partner city)

City of Jordan Valley

Hazard Mitigation City Addendum Work Session
Issue Identification and Risk Assessment
April 25, 2007

Work Session Overview

On Wednesday, April 25th, the City of Jordan Valley held an issue identification work session at Jordan Valley City Hall in order to assess the jurisdiction's risks and develop community-specific action items for the city's addendum to the Malheur County Natural Hazard Mitigation Plan. This work session was facilitated by the Malheur County Hazard Mitigation Project Coordinator.

City Participants

The following individuals participated in the work session:

- Jake Roe, Mayor
- June Lundy, City Council
- Jim Davis, City Council
- Jim Lane, City Council
- Tom Angle, City Council
- Adele Payden, City Recorder/Treasurer
- Con Warn, Public Works

Hazard Analysis

In order to assess the city's risk of natural hazards, the Coordinator presented participants with a summary of the Malheur County risk assessment. The Coordinator then facilitated a discussion of each County hazard and asked participants to comment upon Jordan Valley's risks, and whether they are greater or lesser than the County's risk to those same hazards. Several hazard-related issues and potential mitigation actions were identified at this time.

Flood

The working group determined that the city's flood risk is low for both vulnerability and probability, which is lower than the county's high probability. Jordan Valley is bordered on the south by Jordan Creek and Baxter Creek (seasonal) runs through the east side of the city. Participants recalled only two minor flood events in 15 years, the last in 1998, both in the immediate vicinity of Jordan Creek, neither with significant impacts to residents. According to the working group, the city has not experienced a

major flood since 1952, after which the Army Corps of Engineers straightened the path of Jordan Creek to reduce flood issues.

National Flood Insurance Program participation: according to FEMA, Jordan Valley has 15 active flood insurance policies totaling $1,413,800 in value as of 2000. No single or repetitive losses have been claimed.

Because there are no National Weather Service gauges or other information-gathering resources on Jordan Creek, records on past flood events are limited. The NWS does have a river gauge on the Owyhee River at Rome, but this is approximately 33 miles upstream of Jordan Valley. Past records show that floods on the Owyhee River can affect the city, but these events are not frequent. Research through the National Weather Service reveals the following known flood events in the city (no cost estimates are available; for source information, see Section 3: Flood Hazard Summary):

Date	River/Creek	Location	Comments
1998, May	Jordan Creek	Jordan Valley	Small stream flooding; 3 homes sandbagged, portion of Highway 95 flooded.
1978, April	Owyhee River	Jordan Valley, Antelope Reservoir	Moderate flooding; roads washed out around Jordan Valley, agricultural fields flooded.
1957, February	Jordan Creek	Jordan Valley	Flooding; degree of severity unknown.
1952, March, April	Jordan Creek	Jordan Valley	Significant flooding in town; roads washed out and houses damaged.

Wildfire

The working group determined that the city's risk of wildfire is high for probability and moderate for vulnerability, which is equal to the county's risk rating. The city and its surrounding area is considered a Wildland-Urban Interface area by BLM, but fires occurring within city limits or threatening the city itself are infrequent. The major wildfire impact on the city is an economic one, as ranchers who live in Jordan Valley can have their grazing operations severely curtailed and lose cattle when fires occur on the open range.

There are several parcels of private and BLM land outside of the city which burn frequently, such as Jackie's Butte, 40 miles south of Jordan Valley, but these events generally do not significantly negatively impact the city itself. In fact, participants noted that when fire crews are at work on range fires outside of the city, firefighters provide an economic boost to local businesses. The County is currently developing a Community Wildfire Protection Plan, which will help further identify the city's vulnerability to wildfire.

Drought

The working group determined that the city's probability and vulnerability risk rating for drought is high, which is the same as the county's high risk. City residents utilize a city well, which has thus far not been impacted by past droughts.

However, because of the predominance of ranching and other agricultural activities as a major economic force in the city, the economic impacts of drought are significant both for those individuals and for city businesses, which support and are supported by the agricultural community in the city's vicinity. Countywide drought declarations listed in Section 3 of the county plan apply to Jordan Valley as well.

Severe Weather

The working group determined that the city's risk of severe weather events (windstorm, winter storm, thunderstorm/hail) is similar to the county's:

Windstorms: high probability and low vulnerability, like the county.

Thunderstorms/hail: high probability, low vulnerability, like the county.

Winter storms: moderate probability, like the county; high vulnerability, like the county. Jordan Valley experiences similar winter weather as the rest of the county, but its remoteness (83 miles to Ontario, OR; 46 miles to Marsing, ID, the nearest incorporated city) means that the impacts of severe winter weather can be worse; aid can take a much longer time to reach the city. The city experiences chronic power outages (6 events or more in any given winter season, on average, according to the working group) as a result of freezing fog downing power lines on Marsing Grade (a section of State Highway 95) north of the city. Idaho Power services the community with electricity, but because of its remoteness, there is no redundancy in the electrical system to fall back on in the event of downed lines on Marsing Grade. The city does not have sufficient generator backup power for its electric and water systems when these events occur (one gas station in city limits does have a privately owned generator for its own use only). Additionally, the city is served by Life Flight emergency helicopter services for urgent medical care, and its helicopters do not currently have a safe location to land in severe winter weather.

Earthquake

The working group determined that the city's earthquake probability is moderate, like the county; its vulnerability is also moderate, higher than the county's low risk, due to the city's proximity to Antelope Reservoir, the site of the last seismic activity in the county. Antelope Reservoir, which is located approximately 13 miles southwest of Jordan Valley, is the site of the most recent significant seismic activity in the County. A higher-magnitude seismic event emanating from underneath the reservoir could potentially destroy its earthen dam, which would have major impacts on irrigation in the area and potential flood concerns as well. Antelope Reservoir drains into Jordan Creek, which abuts the city, and then into the Owyhee River. It is regulated to hold 69,000 acre feet of water and has a capacity of 70,000 acre feet of water.

Like the County, the city's critical infrastructure, including city hall, local schools, public works facilities, and an outbuilding which houses the city's ambulance and fire

engine, is almost exclusively un-reinforced masonry, which is especially vulnerable to seismic events. Information on specific buildings' estimated seismic resistance, determined by DOGAMI in 2007, is available in the Earthquake Hazard Annex.

Landslide

The working group determined that the city's landslide probability and vulnerability risk is low, like the county. The city has had no problems with landslides in city limits in known history and is located in a generally stable area.

Volcanic Event

The steering committee determined that the city's probability and vulnerability risk of a volcanic event is low, like the county. Were a volcanic event to occur in the Cascades region of Oregon, Jordan Valley could be at risk for ash fall, depending on the severity of the event and the direction of the wind. Like the rest of the County, the city has an approximately 1 in 5,000 chance annually of experiencing ash fall from a volcanic event (see Section 3: Volcanic Hazard Summary, for more discussion of this event). Additionally, Jordan Craters, about 14 miles northwest of the city of Jordan Valley, is thought to have extruded lava as recently as 3200 years ago. According to DOGAMI, however, it is not considered a cause of concern for dangerous activity.

Issue Identification

In an effort to identify potential action items, the working groups completed an issue identification exercise to identify hazard related issues related to: critical facilities & infrastructure, human population, cultural & historic resources, economic assets, and environment & land use. A summary of this exercise is included below.

Critical Facilities & Infrastructure

- Elementary, middle, and high school in city limits, all un-reinforced masonry
- No officially designated emergency shelters; several local churches (5) could serve as shelters but are also un-reinforced masonry
- City well has no backup generator for power outages
- City sewer lift-station has limited backup power generation for power outages
- Main power transmission lines vulnerable to winter storm and fog events
- State Highway 95 is the only major access road for the rest of the County
- The State is constructing a small airport/airstrip just outside of the city; could serve as landing site for Life Flight services
- 1 health clinic, Jordan Valley Health Clinic

Population

- High elderly population, most living independently, many dependent on oxygen tanks or other electronic aids, could use a list of those requiring assistance in emergency situations; no senior centers or assisted living facilities

- High number of people traveling through – 2,300 vehicles pass through the city every day along state highway 95
- Big Loop Rodeo brings in 5,000 spectators every May for 2-3 days
- Residents of rural unincorporated areas surrounding city come in for services

Economy

- Locally-owned businesses are important
- Business community is closely tied to the farming and ranching community
- Agriculture (farming and ranching) dominates local economy
- High self-employment
- Opportunity to partner with county on business continuity planning
- Reclamation mine outside of town is a large employer (~11 employees)
- School district is a large employer (~ 25)
- Not a lot of commuting from city to other areas for work
- Many local services are geared to and dependent on business from travelers, due to high traffic on Highway 95

Environment and Land Use

- Public community park in city
- Most land use in city is residential, some commercial along Highway 95
- Jordan Creek and Baxter Creek abut the city
- Good city water well – no treatment necessary
- Most land surrounding city is private farming or ranching land

Cultural and Historic Resources

- Historic Basque pelota fronton (court)
- Rodeo grounds
- Historic cemetery
- Lions Hall – site of community events, potential shelter (log construction)
- Old Skinner Toll Road, historic site, just outside of town
- I.O.N. Heritage Museum, scheduled to open in 2007

Proposed Action Item:	**Alignment with Plan Goals:**
Acquire 35 kW generator to serve as a backup power source for the city of Jordan Valley's municipal well. [JORDAN VALLEY]	Protect Infrastructure, Safeguard Economy; Strengthen Organizational and Community Capacity; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

Jordan Valley does not have sufficient backup generator power for its city services, which include the city well and wastewater treatment plant (this facility has partial generator power for its lift stations).

Winter power outages are a chronic problem for the community due to fog freezing on power lines along Marsing Grade north of town.

The city has a high elderly population, many of whom are especially vulnerable to power outages and lack of backup sources of heat and water.

Ideas for Implementation:

Seek funding sources for the purchase of a generator.

Coordinating Organization:	City of Jordan Valley

Internal Partners:		**External Partners:**
		FEMA
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	

Form Submitted by:	**City of Jordan Valley**

Jordan Valley Community Profile

PO Box 187, Jordan Valley, OR 97910
Phone 541-586-2460 • Fax 541-586-2460
• E-Mail: cityofjv@juno.com

City Location

map locating city location

County(ies): Malheur **Incorporated in** 1911
Location: Southeast corner of state, 2 miles west of the Oregon/Idaho border
Nearest Major Highway and Distance: Hwy 95 | local
Nearest Major City and Distance:
Nampa, ID | 62 miles, Estimated Drive Time: 1 hour, 15 minutes
Distance to Portland: 428 miles

Source: Oregon Department of Transportation, State of Oregon Map; Oregon Blue Book

Recreational Amenities

2 acre city park, Lake Owyhee State Park, Succor Creek Recreation, Leslie Gulch National Park, Basque Pelota Court (historic register, built in 1915), Silver City (abandoned mining town in Idaho), Antelope Reservoir, Jordan Crater (active less than 2,500 years ago), Rome Cliffs (Rome, OR), Owyhee River white water rafting, Big Loop Rodeo-3rd weekend of May each year, Jean Baptiste Charbonneau (grave marker for the son of Sacajawea, Danner, OR).

Planning a vacation or a tour through an area of Oregon? Visit the Oregon Tourism Commission's web site at http://www.traveloregon.com/ for more information.

Source: City Administration, local chamber of commerce, local convention and visitor bureau

Climate

Elevation: 4,389' **Measurement Location:** Sheaville

Temperature:
Monthly Ave. Low: 23°F Monthly Ave. High: 94°F
Hottest Month: July Coldest Month: January
Driest Month: July Wettest Month: January
Average annual precipitation: 11.230"

Humidity (Hour 10, local time):
Average July afternoon humidity: 34%
Average January afternoon humidity: 77%

Source: Oregon Climate Service

Information in the Community Profiles was derived from many sources, including local, state and federal sources. The Oregon Economic and Community Development Department cannot accept responsibility for errors or omissions. Questions and comments may be directed to the department by telephone 503-986-0123, by fax 503-581-5115 or by email oedd.info@state.or.us.

Profile Topics

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Demographics

	Population			
	1990	**2000**	**2005**	**2006**
City of Jordan Valley	364	239	240	240
Malheur County	26,038	31,615	31,800	31,725

Sources: 1990, 2000 US Census; 2205, 2006 Center for Population Research and Census, Portland State University. 0 indicates data is unavailable.

Malheur County	9,926 sq miles	3 persons/sq mile	Sources: figures based on 2006 PSU population estimates; Oregon Bluebook county square mileage

Community Age Groups

	1970	**1980**	**1990**	**2000**
Under 5 years	0	0	32	8
5-19 years	0	0	99	50
20-44 years	0	0	151	59

45-64 years	0	0	72	73
65+ years	0	0	49	49
Median Age	0	0	32	45.4

Source: US Census, 0 or N/A indicates data is not available. Median value is the middle value, not an average.

Housing

Total Housing Units	**1970**	**1980**	**1990**	**2000**	**Median Value of Owner-Occupied Housing, 2000**
City of Jordan Valley	74	138	176	147	$49,600
Malheur County	5,896	9,083	10,649	11,233	$86,900

City of Jordan Valley 2000 Housing Breakout:

Vacancy Rate:	20.41%	**Median Owner Cost (mortgaged):**	$480
Owner Occupied:	86		
Renter Occupied:	23	**Median Gross Rent:**	$306

Also visit Housing and Community Services Web Site:
http://www.hcs.state.or.us/

Source: US Census. Median value is the middle value, not an average.

Economic Development and Employment

Principal Industries of the County(ies):
Malheur County—Agriculture, livestock, food processing

Source: Oregon Employment Department, Covered Employment and Payroll Reports, 1998

Agricultural Products of the Area (Top 3 largest gross farm sales):
Malheur County—Cattle and calves, field crops, vegetable crops

Source: Oregon State University, Extension Economic Information Office

Total Number of Manufacturing Companies in the County:

Malheur County 26

Source: Oregon Employment Department, Covered Employment and Payroll Reports, 1998

Total Number of Manufacturing Companies in the City: 0

Source: City Administration

Economic Indicators

	Malheur County		Oregon		
	2001	**2002**	**2000**	**2001**	**2002**
Population	32,000	32,000	3,421,399	3,471,700	3,504,700
Labor Force	14,867	14,867	1,802,938	1,793,773	1,840,133

Total Employment			1,715,453	1,679,914	1,701,390
Unemployment	1,252	1,317	87,485	113,859	138,743
Unemployment Rate	8.4%	8.9%	4.9%	6.3%	7.5%
Non-Farm Payroll Employment	12,110	11,840	1,606,800	1,596,100	1,572,500
Total Covered Employment	13,128	12,660	1,607,944	1,596,943	1,573,083
Total Covered Payroll ($ thousands county/ $ millions state)	$304,082	$305,914	$52,701	$53,021	$52,989
Ave. Annual Payroll Per Employee	$23,163	$24,164	$32,776	$33,202	$33,684
Number of Business Units	920	913	108,432	111,353	113,097
Total Personal Income ($ millions)	$566,279	$581,883	$94,999	$98,500	$101,358
Annual Per Capita Personal Income	$	$18,608	$27,649	$28,400	28,792
Assessed Value of Property ($ millions)	$0	$1,446	$198,911	$210,435	$219,878
Residential Construction					
Building Permits	42	44	19,877	21,049	22,186
Value ($ thousands)	$6,229	$6,327	$2,533	$2,985	$3,347
Travel Expenditures ($ millions)	$0	$36,400	$6,133	$6,128	$6,208
Travel-Related Employment	0	560	89,800	91,100	90,200

Preliminary Data

Sources: Oregon Employment Department; Center for Population Research & Census, PSU; U.S. Census Bureau; Bureau of Economic Analysis; Oregon Tourism Commission; Oregon Department of Revenue; Oregon Economic and Community Development Department.

5 Largest Employers, Public and Private as of November, 2002

Employer—Product/Service	Number of Employees
Jordan Valley School Dist. —Education	20
Texaxo—Fuel	5
JV Cafe—Food	5
City of Jordan Valley —	2
—	

Source: City Administration

Oregon Employment Labor Market Information

This link takes you to the Oregon Employment Department, Labor Market Analysis database. County information can be obtained here. http://olmis.emp.state.or.us/—Click on Regional Information.

Local and Regional Economic Development Organizations

City of Jordan Valley	541-586-2460
Malheur County Economic Development—http://www.malheurco.org/	541-881-0327
NOVA	541-881-3223

GEODC Greater Eastern Oregon Development Corporation	541-575-2786
Economic & Community Development Department Regional Development Officer—http://econ.oregon.gov/	541-575-1050

Source: City Administration, local chamber of commerce, Oregon Economic and Community Development Department

Education/Workforce

Public and Private Schools K–12

Public School District:
Jordan Valley School District 3
PO Box 99
Jordan Valley, OR 97910-0099
Phone: 541-586-2213
Fax: 541-586-2568
Web site: http://www.malesd.k12.or.us/Districts/JVSD/index.htm

Staff and Enrollments:
District Certified Staff: reported October 2000—13
Total District Enrollment: reported October 2001—84

Other Schools in the School District (Private, Parochial)
To see if there are private and/or parochial schools in this district please visit http://www.ode.state.or.us/pubs/directory/

Source: Oregon Department of Education

Oregon Community Colleges and Public Universities

Oregon map with higher ed institutions identified

legend for map

For a list of public and private educational institutions in Oregon visit http://www.oregon4biz.com/ed.htm.

Workforce

Oregon Economic and Community Development Department Workforce Advocate 503–986–0207, or visit http://www.oregon4biz.com/workforce.htm. Locate local workforce assistance at http://www.worksourceoregon.org/.

Financial Information

Financial Institutions

Commercial Banks: 0 **Savings and Loans:** 0 **Credit Unions:** 0

Source: City Administration

Taxes

Sales Tax Oregon has no general sales tax.

Property Tax
Property—Who pays? Owners of real and business personal property, according to the assessed value of taxable residential, commercial, farm, industrial, utility and timber property.

County assessors use permanent rates set for all taxing districts in fiscal year 1997–98, when taxes were significantly reduced with a statewide average 17 percent cut in tax levies. Certain types of levies are outside this reduction. The tax rates cannot exceed $15 per $1,000 of real market value. For 1997–98, all property was valued by county assessors at 90 percent of the July 1, 1995, levels. For subsequent years, assessed values are limited to a 3 percent annual growth rate. Construction since July 1, 1995, is valued at the average rate of similar properties in the area. Business personal property requires annual filing. One–third payment is due by November 15. If fully paid by November 15, a 3 percent discount is allowed. Special exemptions, tax relief programs and deferrals are available. For more information contact the Malheur County assessor's office at 541–473–5117.

Tax rates are representative of the largest tax code in the city. The rates are expressed as tax liability per $1,000 of assessed property value.

	Malheur County
Average Compressed Tax Rate 1997-98	$12.62
Average Compressed Tax Rate 1998-99	$12.51
Average 1999 Housing Value	$52,414
Ave Res Property Tax Paid on Ave House 1997-98	$645.47
Ave Res Property Tax Paid on Ave House 1998-99	$655.70
Average School rate 1998-99 . . . . . . $5.35	
Average Non-School Rate 1998-99. . . . $4.52	
Average City Rate 1998-99 . . . . . . $1.17	

Business Taxes
Property—see above

Income—Corporations doing or authorized to do business in Oregon pay excise tax. Corporations not doing or authorized to do business, but having income from an Oregon source, pay income tax. For more information contact the Oregon Department of Revenue, 955 Center St., NE, Salem, OR 97301, 503–378–4988, http://www.oregon.gov/DOR/.

Unemployment Insurance—Employers pay this. For 2002, new employers are assigned a fixed rate of 3 percent of taxable wage base. Tax rates for existing employers are based on employers' experience and range from 1 percent to 5.4 percent of taxable wage base. Taxes are paid quarterly and are due by the end of the month following the quarter. In 2002, the tax is paid on the first $25,000 of wages paid to each employee. The rate schedule in effect depends on the balance in the Trust Fund as of August 31 each year and the amount of revenue needed to maintain the balance at a level adequate to pay benefits. For more information contact the Oregon Employment Department, 875 Union St., NE, Salem, OR 97301, 503–947–1488, web http://www.employment.oregon.gov/.

Utilities, Railroad, Weight-mile—Who pays? All railroads and investor-owned utilities operating with the state pay an annual fee. For-hire and private motor carriers operating into, within and through the state pay weight-mile taxes. Rates—limit of .25 percent of gross operating revenues of investor-owned utilities; .25 percent charged on 2002 revenues. Limit of .35 percent on gross operating revenues of railroads; .267 percent charged in 2002 revenues. Applications, plate fees and per-mile rates dependent on declared combined weight of vehicle. For more information contact the Oregon Public Utility Commission, 550 Capitol St., NE, Suite 215, Salem, OR 97301–2551, 503–378–6611, web http://www.oregon.gov/PUC/; Oregon Department of Transportation, Rail Section, 555 13th St., NE, Salem, OR 97310–1333, 503–986–4125, web http://www.oregon.gov/ODOT/RAIL/; Oregon Department of Transportation, Motor Carrier Transport Branch, 550 Capitol St., NE, Salem, OR 97301–3871, 503–378–6699, web http://www.oregon.gov/ODOT/MCT/.

Incentives
Oregon's Business Incentives.

Miscellaneous
Motor Vehicle Licensing, Driver Licensing, Fuels—Who pays? Owners and operators of motor vehicles. Oil companies importing fuels. Truckers using Oregon highways. Fees—Registration fees, driver license fees and renewals (contact the Oregon Driver & Motor Vehicle Services division 503–945–5000, web http://www.oregon.gov/ODOT/DMV/

Hunting and Fishing Licenses—contact Oregon Department of Fish and Wildlife, PO Box 59, Portland, OR 97207, general information 503–872–5268, licenses/tags/permits 503–872–5275, web http://www.dfw.state.or.us/.

Amusement Device Tax—An excise tax is imposed upon every person who operates an amusement device in Oregon. An amusement device is a video lottery game terminal. More information from the Oregon Lottery Commission, 500 Airport Rd SE, Salem, 97301, web http://www.oregonlottery.org/.

Emergency Communications (9–1–1) Tax—Telephone companies providing local exchange access services in Oregon Collect this tax from their customers. The tax, which is $0.75 per line per month, is reported and paid quarterly. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Hazardous Substance Fee—Paid by possessors of nonpetroleum hazardous substance. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Petroleum Load Fee—Paid by petroleum suppliers and importers to Oregon. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Timber Severance Tax—Paid by timber owners on harvested timber’s value. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Forest Products Harvest Tax—Paid on timber cut from any land in Oregon. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Dry Cleaning Tax—Paid by operators of dry cleaning facilities. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Alcoholic Beverages—Manufacturers and/or import wholesalers of malt beverages and wines pay a privilege tax. Manufacturers, wholesalers and retailers of distilled spirits, malt beverages and wines pay license fees. Employees who serve alcoholic beverages pay for service permits. For more information contact the Oregon Liquor Control Commission, PO Box 22297, Portland, OR 97222, 503–872–5000 or 1–800–452–6522 (in Oregon), web http://www.oregon.gov/OLCC/.

Tobacco Products—Cigarette and tobacco products distributors are required to purchase tax stamps for cigarettes or pay a percentage of the wholesale price on other tobacco products. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Transit Payroll Tax–paid by employers in the Tri-Met (Portland area) and Lane Transit District (Eugene) for mass transit systems. Administered by the Department of Revenue, web http://www.oregon.gov/DOR/.

Many local governments in Oregon collect other taxes, such as hotel-motel taxes. Contact the city or county in which you are interested for more complete information about taxes in that area.

Source: Oregon Department of Revenue, "A Summary of Taxes," January 2002; County information–County Assessor's Office

Community Services and Resources

Public Safety/Emergency Services

Fire Station(s) serving community: Jordan Valley Fire Department
Number of paid and volunteer firefighters: 10*
Rating by Insurance Services Organization (ISO): 8*
Comments: 2000 data; *data unlisted in report–last reported numbers
Source: Oregon State Fire Marshal, Oregon Fire Service Resource Directory 2000

Police Department: Malheur County Sheriff's Office
Number of paid and reserve officers: 2

Nearest Hospital and distance: 62 miles in Caldwell, ID
Regional Hospital and distance: Holy Rosary Medical Center, Ontario
Emergency services to community: Ambulance Service & Air Life of Oregon
General Clinic(s): 1

Source: City Administration

Communications Resources

Local Newspapers: Malheur Enterprise, Argus-Observer

Regional Newspapers: Idaho Statesman, Idaho Press-Tribune

Radio Stations: Boise

TV Stations: Boise and Portland

Available Cable Television: Cableview (Boise-based company)

Telephone Service Provider(s): Oregon-Idaho Utilities

Local Internet Service Provider(s): Yes
Number of Internet Service Providers: Data unavailable at this time.
Source: City Administration

Library System
Nyssa Public Library, Ontario Public Library

Source: City Administration

Planning Service/Regulatory

Regulatory System	Year Acknowledged	Year Last Revised	Year of Periodic Review	Comments
Comprehensive Plan	1981		1999	
Zoning Ordinance				
Building Permit System				Inspection's Inc.
Subdivision Ordinance				
Strategic Plan				

Territory Covered by Zoning
Municipality Yes **County** Yes
Source: City Administration

Industrial Lands
Does the Community seek industrial development? Yes
Access Statewide industrial lands database—http://www.oregonprospector.com/
Source: Economic and Community Development Department

Special Districts and Associations (ports, water, sewer, etc.)
Name of Special District and the Oregon Revised Statute it was created under:
Jordan Valley Irrigation District; Malheur County E.S.D.; Malheur County S.W.C.D.; Malheur Drainage District; J.V. Cemetery District

Special Districts Association of Oregon—727 Center St., NE Salem, OR 97301, 503–371–8667 or 800–285–5461 http://www.sdao.com/
Source: City Administration

Infrastructure/Transportation

Water Supply

Operator: City of Jordan Valley
District: N/A
Source: Ground Water; City wells
Supply: Capacity (MGD)–0.15; Pressure (PSI)–65.00

Current Water Utilization on Meter Size (MGD): 0.04 MGD
Water Costs per thousand gallons: Base rate per/thousand = Res 0-7,000 gal $.50; 7,000-40,000 gal $1.65. Commercial approx $1.65
Water Costs for Total Consumption of Residential: Based on 7,000 gallons = $14.40

Age of Water System: 1975

Water System Comment(s): System Development charges $12/7,000 gal. Residential. Hook up fees $350 Residential, $575 Commercial

Compliance Issues:

Water debt repayment included as part of tax assessment? Data unavailable at this time.

Date of Current Master Plan:

Plans for Upgrading or Expanding:
Source: City Administration

Wastewater Treatment System

Operator: City of Jordan Valley **Age of Wastewater Collection System:** 1975
District: N/A

System Design Capacity (MGD): 0.01 MGD **System Utilization (MGD):** 0.01 MGD
Collection System Fees: $15.60/mo residential **Hook-up or Connection Fee:** $200
Access Fee or System Development Fee: developer assumes cost

Comment(s) on Wastewater System:

Compliance Issues:

Date of Last Facility Plan:

Plans for Upgrade/Expansion:

Storm Drain: No **Storm Water Discharge Fee:**
Fees or issues related to storm drains:
Source: City Administration

Utilities

Telecommunications

Is there access to broadband infrastructure? Yes

If yes, check all that apply:
Microwave Fiberoptic Satellite

Is there route diversity? Yes

Access	Monthly Fee	Other Fee
T1 Yes		
DSL No		
Cable No		

For Oregon Telecommunications information and resources, visit http://www.oregon4biz.com/inn.htm.

Natural Gas—Provider: None
Lines and Feed:

Rate Structure:

Plans for Upgrade/Expansion:

Electrical—Provider: Idaho Power Company
Lines and Feed: Data unavailable at this time.

Rate Structure Residential: 300kw $.038623/kwh, 300kwh+ $.058279/kwh

Commercial: @12kw and 1,500kwh/mo $78; @100kw and 30,000kwh/mo $1,287; @500kw and 150,000kwh/mo $6,393

Industrial: @1,000kw and 400,000kwh/mo $13,100; @5,000kw and 2,500,000kwh/mo $75,715

Plans for Upgrade/Expansion:

Solid Waste Management: Ontario Sanitary Service, Inc.

Permit Status:

Utility Expansion Plans:

Utilities Source: City Administration; PGE information supplied by PGE. Note: We update utility rates periodically. Actual rates may change more often than that. For the most current rate for any carrier please consult the Public Utilities Commission web site at http://www.puc.state.or.us/commsion/default.htm Click on the **Statistics 200x** label (x being the most recent year).

Transportation

Highways Hwy 95 N/S route, local **Transportation Access Fee:** $0

Community Air Service No
Air Passenger Service: No
Airport Freight Service: No
Air Service Comments:

If no local service, list closest Air Facility

Homedale, ID 54 miles

Rail Service: No
Freight Service: No **Passenger Service:** No
If no local service, list closest Rail Service: Freight: Nyssa, Ontario, Vale Passenger: Pasco, Salt Lake City

Marine No

Transportation issues which might confront development, such as non-attainment air shed, etc.:

Public Transportation Comment:

Bus Service Available in the Community: No
Scheduled Bus Service Available: No **Buses Per Day:**
Local Charter Services: No
Distance to Nearest Bus Service: 62 miles in Nampa, ID

Trucking Service
Scheduled Freight Carrier Services: Yes UPS, EOFF
Overnight Express Parcel Service Available: Yes Fedex, UPS, Post Office
Overnight Express Mail Service Available: Yes
Transportation Comments:

For more information relating to transportation topics please visit the Department of Transportation web site. Airports (maps and general information) http://www.tripcheck.com/About/airport.htm; Bicycle and Pedestrian Route information http://www.tripcheck.com/About/bicycle.htm; Public Transportation, bus and rail http://www.tripcheck.com/About/busrail.htm.

Source: City Administration, local chamber of commerce (proprietary information)

TO NYSSA

R. 46 E.

T. 29 S.

T. 30 S.

TO BURNS JCT.

I.O.N. HWY. NO. 456

95 NHS

M.P. 19.44

M.P. 21.64

LYNDE DR.

HILL RD.

PHARMACY RD.

ACKERMAN RD.

CREST DR.

VALLEY DR.

MT. VIEW CIR.

DR.

SOMERVILLE ST.

BUTTE RD.

Pharmacy

Hill

Sewage Treatment Lagoons

JORDAN VALLEY CEMETERY

MONTANA ST.

JORDAN VALLEY HEALTH CLINIC

AVE. ST.

PARK

IOWA AVE.

O.D.O.T. MAINT. STA.

JORDAN VALLEY HIGH SCHOOL

CALIFORNIA ST.

MARSHALL ST.

JORDAN VALLEY ELEM. SCHOOL

OREGON AVE.

PALMER ST.

BLACKABY ST.

BLACKABY CIR.

WROTEN ST.

BASSETT ST.

SWISHER AVE.

DINWIDDIE ST.

COMBS ST.

SUBSTATION

MAIN ST.

IDAHO ST.

SAMUEL DR.

YOUNGFIELD DR.

MALHEUR ST.

FLORENCE DR.

JORDAN ST.

DELAMAR WY.

JORDAN AVE.

YTURRI BLVD.

Creek

Baxter Creek

Ditch

Town

Jordan

Jordan Valley

Jordan Creek

DAM

Antelope Feeder Canal

34 35 3 2

35 36 2 1

3 2 10 11

2 1 11 12

LEGEND

FUNCTIONAL CLASSIFICATION (STATE / OTHER)

FOR FURTHER FUNCTIONAL CLASSIFICATION INFORMATION, CONTACT O.D.O.T. REGION OFFICE.

- INTERSTATE
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- URBAN COLLECTOR / RURAL MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD
- ORE. ROUTE – US. ROUTE – INTERSTATE ROUTE
- NATIONAL HIGHWAY SYSTEM ROUTE
- URBAN GROWTH BOUNDARY
- CITY LIMIT
- AMTRAK RAIL PASSENGER STATION
- BRIDGE
- GRADE SEPARATIONS : STATE – OTHER FUNCTIONALLY CLASSED – LOCAL ROAD

- PUBLIC BUILDING
- COURTHOUSE
- CITY HALL
- ARMORY
- POST OFFICE
- SCHOOL
- LIBRARY
- SAFETY REST AREA
- WEIGH STATION
- PARK & RIDE LOCATION
- INTERCITY – CITY TRANSIT
- COMMERCIAL – GENERAL AVIATION
- AMTRAK STOP – PORT FACILITY
- GRAVEL PIT – QUARRY – ODOT STOCKPILE SITE

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NORTH

"This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information."

SCALE

400 0 400 800 FEET

125 0 125 250 METERS

JORDAN VALLEY
Population 240 *

T. 29 - 30 S. R. 46 E.

OREGON TRANSPORTATION MAP

Showing Functional Classification of Roads
City of

JORDAN VALLEY

PRELIMINARY COPY SUBJECT TO CORRECTION

MALHEUR COUNTY
2006

PARK & RIDE | INTERBUS | AMTRAK — AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

PORT | AIRPORT | COMM. AIR — AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

Copies available from the Oregon Department of Transportation, Map Distribution Unit, Mill Creek Office Park, 555 13th St. NE, Suite 2, Salem, Oregon 97301–4178, Telephone (503) 986–3154, http://www.odot.state.or.us/tdmappingpublic

* Based on current Oregon Population Report, College of Urban and Public Affairs, Portland State University, http://www.upa.pdx.edu/CPRC.

City of Nyssa
Jurisdiction Addendum

Addendum Overview

The City of Nyssa elected to participate in the planning process for the Malheur County Multi-Jurisdictional Natural Hazards Mitigation Plan by developing a supplemental Jurisdiction Addendum ("City Addendum"). This city addendum is designed to provide any city-specific hazard risk information for where it may differ from the county's assessment.

Multihazard Requirement §201.6(a)(3): *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process.*

This addendum documents the city's participation in the process.

Multihazard Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

This addendum documents the city's risks where they vary from risks facing the planning area (the county).

Multihazard Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

This addendum documents any action items specific to the city. The city also wishes to participate in several multi-jurisdictional action items as listed in Section 4: Goals and Action Items.

Attachments

- Hazard Mitigation City Addendum Work Session Summary
- ODOT map of Nyssa
- FEMA FIRM map of Nyssa *(no digital copy available; hard copy located in Natural Hazards Mitigation Plan file folder in Malheur County Planning Department)*
- Oregon Blue Book City Profile
- Meeting documentation (*no digital copy available; hard copies of agendas, minutes are located in Natural Hazards Mitigation Plan file folder in Malheur County Planning Department*)
- City-specific Action Item worksheets (Also see Section 4 for multi-jurisdictional AIs for which Nyssa is a partner city)

City of Nyssa
Hazard Mitigation City Addendum Work Session
Issue Identification and Risk Assessment
August 8, 2007

Work Session Overview

On Wednesday, August 8th, the City of Nyssa held an issue identification work session at Nyssa City Hall in order to assess the jurisdiction's risks and develop community-specific action items for the city's addendum to the Malheur County Natural Hazards Mitigation Plan. This work session was facilitated by the Malheur County Hazard Mitigation Project Coordinator. Nyssa also participated in several Steering Committee meetings but a city staff change necessitated a work session in addition to the city's earlier participation in SC meetings.

City Participants

The following individuals participated in the work session and in earlier meetings:

- Roberta Donovan, City Manager
- Bill Ewing, former City Manager
- Duane Petty, Street Dept
- Lennie Eltering, Sheriff
- Dennis Francis, former Sheriff
- Sue Walker, Mayor
- Pat Brewer, City Councilor
- Myra Hartley, Wastewater Treatment
- Bruce Goodell, Wastewater Treatment
- Gregory Armenta, Water System Supervisor

Hazard Analysis

In order to assess the city's risk of natural hazards, the Coordinator presented participants with a summary of the Malheur County risk assessment and earlier Nyssa-specific risk information collected at SC meetings. The Coordinator then facilitated a discussion of each County hazard and asked participants to comment upon Nyssa's risks, and whether they are greater or lesser than the County's risk to those same hazards.

Flood

The working group determined that the city's flood risk is high for probability and moderate for vulnerability, which is equal to the county's high probability and higher than the county's low vulnerability due to the fact that much of the city infrastructure is located on the Snake River's floodplain. Nyssa is bordered on the east by the Snake River. Like all other county cities except for Vale, Nyssa is also within the floodway should the Owyhee Dam collapse. Work session participants noted that the city has not had significant flooding in approximately 15 years. Minor flooding (often just outside of city limits, none in the downtown core) has occurred as recently as 2006, a year when most parts of the county near waterways experienced flooding. A FEMA FIRM map of the city's floodplain areas is included in this addendum.

National Flood Insurance Program participation: according to FEMA, Nyssa had just one (1) active flood insurance policy totaling $106,400 in value as of 2000. No single or repetitive losses have been claimed.

Ice jams* are the biggest flood concern for flood events on the Snake River near Nyssa, but spring runoff flooding and flash floods are also a risk. A Union Pacific railroad trestle located just south of the city is the most frequent site of the jams, which cause water on the Snake River to back up and send overflow waters into agricultural and light industrial/commercial areas on the south side of Nyssa. Ice jam floodwaters have also historically threatened the public school buildings and blocked Main Street, State Highway 20/26, at the western edge of the city where it crosses the Snake River into Idaho.

The city's domestic water wells #s 1-5 are located near the Snake River and in flood events are at risk of inundation, posing a threat to the city's potable water supply. The city has two other municipal water wells, #s 7 and 9, but these do not have an arsenic removal system and are thus unusable for drinking water. The city is building a new wastewater treatment facility and new sewage lagoons will have berms to protect them from floodwaters.

Because there are no National Weather Service gauges or other information-gathering resources on this section of the Snake River, official records on past flood events are limited. The NWS does have a river gauge on the Snake River at Weiser, but this is approximately 30 miles downstream of Nyssa. The following two records from the National Weather Service should be taken as indicative of typical events and not as a complete flood record.

2006, January, April	Owyhee River	below Owyhee Dam, Nyssa	Moderate flooding, roads blocked by high water, agricultural fields flooded
1989	N/A	Nyssa	Flash flood, high winds, crops damaged

*For a more detailed discussion of ice jams, see the Flood Hazard Summary in Section 3 of the county plan.

Wildfire

The working group determined that the city's risk of wildfire is low for probability and low for vulnerability, which is lower than the county's high probability and moderate vulnerability. The city and its surrounding area is considered a Wildland-Urban Interface area by BLM, but fires occurring within city limits or threatening the city itself are very infrequent to nonexistent.

The last time a fire came near the city was several decades ago (the exact date is unavailable; local officials' best estimate was 1968 or 1969), when a fire near Lytle Boulevard west of city limits came within approximately 1.5 miles of the city. There are parcels of private and BLM land outside of the city which have historically burned frequently, but these events generally do not significantly negatively impact the city itself. The only impact that BLM fires can have on the city is to negatively impact the activities of local ranchers and farmers, which can thus have an economic impact on the city. City officials note that the city is bordered by natural fire breaks on all sides – the Snake River to the east and south, and agricultural lands to the south, west, and north.

The County is currently developing a Community Wildfire Protection Plan, which will help further identify the city's vulnerability to wildfire. See Section 3, Wildfire Hazard Summary, for more information on the CWPP process.

Drought

The working group determined that the city's risk of drought is high for both probability and vulnerability, which is the same as the county's high risk. Because of the predominance of ranching, farming and other agricultural activities as a major economic force in the city, the economic impacts of drought are significant both for those individuals and for city businesses, which support and are supported by the agricultural community in the city's vicinity. The city falls within the boundaries of Owyhee Irrigation District for irrigation water.

The city has had some municipal water shortages due to overuse in drought conditions, but water meters were installed in the early 1990s which allowed for more accurate usage billing and reduced overuse problems. The city would like to have wells #7 and 9, which do not have arsenic removal systems, usable in the event of future drought conditions or other emergencies.

Because drought declarations are made on a county scale, see Section 3, Drought Hazard Summary, for a record of drought history in Malheur County.

Severe Weather

The working group determined that the city's risk of severe weather (windstorm, winter storm, thunderstorm/hail) is similar to the county's, with some exceptions:

Winter storms: probability is moderate, rather than high; vulnerability is moderate, rather than high. The city has had no major problems with severe winter storms in recent history. Historically, significant winter storms have caused power outages, road closures, and infrastructure damage, even necessitating National Guard assistance, but participants recalled no significant storms in the past 10-20

years. Additionally, freezing fog has historically caused problems by damaging power lines, and water meters on the municipal water system have frozen in extreme cold. The city has one snowplow and one grader and could use an additional snowplow to aid in snow removal.

Windstorms: probability is high, like the county; vulnerability is moderate, higher than the county's low risk. Participants recalled frequent past events – group consensus was at least one windstorm each summer – wherein trees were uprooted, crops damaged, roofs and windows damaged, and power lines blown down. Windstorms have not caused disastrous local damage but are a persistent problem.

Thunderstorms/hail: probability is high, vulnerability is low, like the county. Impacts to the city are similar to those in the rest of the county, with the greatest risk being to row crops and the economic impacts this can have. Microbursts are a frequent occurrence in the area, bringing brief, heavy rainstorms that can trigger flash flood conditions as well.

Official record of past severe weather events is not kept on a city scale; for a summary of county events, see Section 3: Severe Weather Hazard Summary.

Earthquake

The working group determined that the city's risk to earthquake is moderate in probability (same as the county) and moderate in vulnerability, higher than the county's low risk. Like the county, much of the city's critical infrastructure, including public works facilities, city hall, and numerous downtown buildings on the National Historic Register, are almost exclusively un-reinforced masonry, which is especially vulnerable to seismic events. Information on specific buildings' estimated seismic resistance, determined by DOGAMI in 2007, is available in the Earthquake Hazard Annex.

Landslide

The working group determined that the city has a low probability of landslide, lower than the county's moderate probability. Nyssa has a moderate vulnerability to landslides, higher than the county's low vulnerability, due to concerns about the city's water storage tank location.

The city has had no problems with landslides in city limits in known history and is located in a generally stable area. However, Nyssa's water storage tank, which has a 3-million gallon capacity, is located on an unstable hillside that is experiencing detrimental erosion from irrigation runoff from nearby agricultural fields. There are at least two residential homes in the path of the tank and water should it ever fall, in addition to Highway 26, which is the city's Main Street and a major highway route into Idaho to the east. This is a risk which could be mitigated, and more information is available at the back of this addendum in the Action Items section.

Volcanic Event

The working group determined that the city's risk to a volcanic event is low, which is the same as the county's risk. Were a volcanic event to occur in the Cascades region of Oregon, Nyssa could be at risk for ash fall, depending on the severity of

the event and the direction of the wind. Like the rest of the County, the city has an approximately 1 in 5,000 chance annually of experiencing ash fall from a volcanic event (see the County plan, Section 3: Risk Assessment, for more discussion of this event).

Issue Identification

In an effort to identify potential action items, the working group completed an issue identification exercise to identify hazard related issues related to: critical facilities & infrastructure, human population, cultural & historic resources, economic assets, and environment & land use. A summary of this exercise is included below.

Critical Facilities & Infrastructure

- Two health clinics, one food pantry, both serve Nyssa and Adrian
- The city is served by a volunteer fire department
- Elementary/Middle (K-8), and High School in city limits; all buildings are relatively new (under 40 years old)
- The city has no officially designated emergency shelter, but school buildings are a potential location
- LDS (Latter-Day Saints) church has its own emergency shelter; they also hold an emergency preparedness open house each year for the community
- New wastewater treatment facility

Population

- The city's population is comparable to the county in terms of vulnerable populations; it has one assisted living facility
- Some passing-through tourism; visitors on their way to Owyhee Dam/Lake Owyhee and in hunting seasons

Economy

- Locally-owned businesses are important and predominate
- Business community is closely tied to the farming and ranching community
- Agriculture (farming, ranching, and agricultural processing [onion packing, etc]) dominates local economy
- School district is also a large employer (~ 170)
- Amalgamated Sugar Co. is a large employer (~50, down from 250 in 2000)

Environment and Land Use

- Most land use in city is residential, some commercial and light industrial on the south side of the city
- Snake River abuts the city to the east
- Most land surrounding the city is agricultural land

Cultural and Historic Resources

- The city is located on the historic Oregon Trail
- Festivals and events draw large crowds: Nyssa Nite Rodeo, Thunderegg Days
- The downtown business district has several buildings listed on the National Register of Historic Places:
    - Historic train depot
    - Green Lantern Saloon
    - Al Thompson's Feed And Seed Co. Building
    - Hotel Western
    - Vinsonhaler Blacksmith Shop
- Local history museum downtown

Proposed Action Item:	**Alignment with Plan Goals:**
Reinforce the hillside underneath Nyssa's water storage tank to prevent erosion and a possible landslide and tank collapse.	Protect Infrastructure, Safeguard Economy; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

The city of Nyssa has a 3-million gallon water storage tank located on a hillside near Highway 26, Main Street. The hillside on which this tank sits is unstable and subject to erosion from adjacent agricultural fields. The tank is vulnerable to a potential erosion-induced landslide or seismic activity-induced landslide. Were the tank to fall from its location it could damage several residential homes at the base of the hill and block Highway 26, in addition to leaving the city without a backup water source.

Ideas for Implementation:

- Stop erosion coming from nearby agricultural fields
- Install terracing or another reinforcement measure on the hillside

Coordinating Organization:	City of Nyssa Public Works Department

Internal Partners:	**External Partners:**
City of Nyssa	*N/A*

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	*N/A*

Form Submitted by:	

Proposed Action Item:	**Alignment with Plan Goals:**
Install arsenic removal equipment on municipal wells #7 and 9 to provide backup drinking water supply out of the floodplain.	Protect Infrastructure, Safeguard Economy; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

The city of Nyssa has 5 main municipal wells that are all located in the Snake River's floodplain. In the event of a flood event, these wells are at risk of inundation, leaving the city with no potable municipal drinking water. The city's other 2 wells, located west of town and above the floodplain, do not have arsenic removal equipment and are thus unusable. Equipping these wells for that purpose would allow for a backup water supply in the event of a flood event in the city.

Ideas for Implementation:

- Install arsenic removal equipment on municipal wells #7 and 9.

Coordinating Organization:	City of Nyssa Public Works Department

Internal Partners:	**External Partners:**
City of Nyssa	*N/A*

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	*N/A*

Form Submitted by:	

Nyssa Community Profile

14 S. 3rd Street, Nyssa, OR 97913
Phone 541-372-2264 • Fax 541-372-2377

City Location

map locating city location

County(ies): Malheur **Incorporated in** 1903
Location: Eastern Oregon, near the Oregon/Idaho border
Nearest Major Highway and Distance: I-84 | 12 miles
Nearest Major City and Distance:
Ontario | 12 miles, Estimated Drive Time: 30 minutes
Distance to Portland: 388 miles

Source: Oregon Department of Transportation, State of Oregon Map; Oregon Blue Book

Recreational Amenities

Fishing, water skiing, hunting, rafting, kayaking, rock climbing, rock-hounding, Nyssa Nite Rodeo, Catfish and Crappie Carnival, Thunderegg Days, Frontier Days Festival, Lake Owyhee State Park, Succor Creek State Recreational Area, numerous city parks totaling 12 acres, 4 golf courses nearby.

Planning a vacation or a tour through an area of Oregon? Visit the Oregon Tourism Commission's web site at http://www.traveloregon.com/ for more information.

Source: City Administration, local chamber of commerce, local convention and visitor bureau

Climate

Elevation: 2,180' **Measurement Location:** Nyssa

Temperature:
Monthly Ave. Low: 34°F Monthly Ave. High: 91°F
Hottest Month: July Coldest Month: January
Driest Month: July Wettest Month: December
Average annual precipitation: 10.400"

Humidity (Hour 10, local time):
Average July afternoon humidity: 34%
Average January afternoon humidity: 77%

Source: Oregon Climate Service

Information in the Community Profiles was derived from many sources, including local, state and federal sources. The Oregon Economic and Community Development Department cannot accept responsibility for errors or omissions. Questions and comments may be directed to the department by telephone 503-986-0123, by fax 503-581-5115 or by email oedd.info@state.or.us.

Profile Topics

Demographics

	Population			
	1990	**2000**	**2005**	**2006**
City of Nyssa	2,629	3,163	3,175	3,220
Malheur County	26,038	31,615	31,800	31,725

Sources: 1990, 2000 US Census; 2205, 2006 Center for Population Research and Census, Portland State University. 0 indicates data is unavailable.

Malheur County	9,926 sq miles	3 persons/sq mile	Sources: figures based on 2006 PSU population estimates; Oregon Bluebook county square mileage

Community Age Groups

	1970	**1980**	**1990**	**2000**
Under 5 years	244	272	273	311
5-19 years	874	844	709	922
20-44 years	630	800	784	1,012
45-64 years	568	525	440	543

65+ years	304	419	423	375
Median Age	26	27	29	28.8

Source: US Census, 0 or N/A indicates data is not available. Median value is the middle value, not an average.

Housing

Total Housing Units	1970	1980	1990	2000	Median Value of Owner-Occupied Housing, 2000
City of Nyssa	619	841	947	1,099	$61,800
Malheur County	5,896	9,083	10,649	11,233	$86,900

City of Nyssa 2000 Housing Breakout:

Vacancy Rate:	6.28%	**Median Owner Cost (mortgaged):**	$619
Owner Occupied:	77		
Renter Occupied:	38	**Median Gross Rent:**	$454

Also visit Housing and Community Services Web Site:
http://www.hcs.state.or.us/

Source: US Census. Median value is the middle value, not an average.

Economic Development and Employment

Principal Industries of the County(ies):
Malheur County—Agriculture, livestock, food processing

Source: Oregon Employment Department, Covered Employment and Payroll Reports, 1998

Agricultural Products of the Area (Top 3 largest gross farm sales):
Malheur County—Cattle and calves, field crops, vegetable crops

Source: Oregon State University, Extension Economic Information Office

Total Number of Manufacturing Companies in the County:

Malheur County 26

Source: Oregon Employment Department, Covered Employment and Payroll Reports, 1998

Total Number of Manufacturing Companies in the City: 5

Source: City Administration

Economic Indicators

	Malheur County		Oregon		
	2001	2002	2000	2001	2002
Population	32,000	32,000	3,421,399	3,471,700	3,504,700
Labor Force	14,867	14,867	1,802,938	1,793,773	1,840,133
Total Employment			1,715,453	1,679,914	1,701,390
Unemployment	1,252	1,317	87,485	113,859	138,743

Unemployment Rate	8.4%	8.9%	4.9%	6.3%	7.5%
Non-Farm Payroll Employment	12,110	11,840	1,606,800	1,596,100	1,572,500
Total Covered Employment	13,128	12,660	1,607,944	1,596,943	1,573,083
Total Covered Payroll ($ thousands county/ $ millions state)	$304,082	$305,914	$52,701	$53,021	$52,989
Ave. Annual Payroll Per Employee	$23,163	$24,164	$32,776	$33,202	$33,684
Number of Business Units	920	913	108,432	111,353	113,097
Total Personal Income ($ millions)	$566,279	$581,883	$94,999	$98,500	$101,358
Annual Per Capita Personal Income	$	$18,608	$27,649	$28,400	28,792
Assessed Value of Property ($ millions)	$0	$1,446	$198,911	$210,435	$219,878
Residential Construction					
Building Permits	42	44	19,877	21,049	22,186
Value ($ thousands)	$6,229	$6,327	$2,533	$2,985	$3,347
Travel Expenditures ($ millions)	$0	$36,400	$6,133	$6,128	$6,208
Travel-Related Employment	0	560	89,800	91,100	90,200

Preliminary Data

Sources: Oregon Employment Department; Center for Population Research & Census, PSU; U.S. Census Bureau; Bureau of Economic Analysis; Oregon Tourism Commission; Oregon Department of Revenue; Oregon Economic and Community Development Department.

5 Largest Employers, Public and Private as of September, 2000

Employer—Product/Service	Number of Employees
Amalgamated Sugar Co.—Sugar	250
Nyssa School Dist.—Education	170
Fort Boise Produce —Onion Packers	60
Snake River Onion Growers —Onion Growers/Packers	56
Fiesta Farms —Onion Growers/Packers	26

Source: City Administration

Oregon Employment Labor Market Information

This link takes you to the Oregon Employment Department, Labor Market Analysis database. County information can be obtained here. http://olmis.emp.state.or.us/—Click on Regional Information.

Local and Regional Economic Development Organizations

City of Nyssa	541-372-2264
City of Ontario	541-881-3223
Malheur County Economic Development—http://www.malheurco.org/	541-881-0327
GEODC Greater Eastern Oregon Development Corporation	541-575-2786

Economic & Community Development Department Regional Development Officer—http://econ.oregon.gov/	541-575-1050

Source: City Administration, local chamber of commerce, Oregon Economic and Community Development Department

Education/Workforce

Public and Private Schools K–12

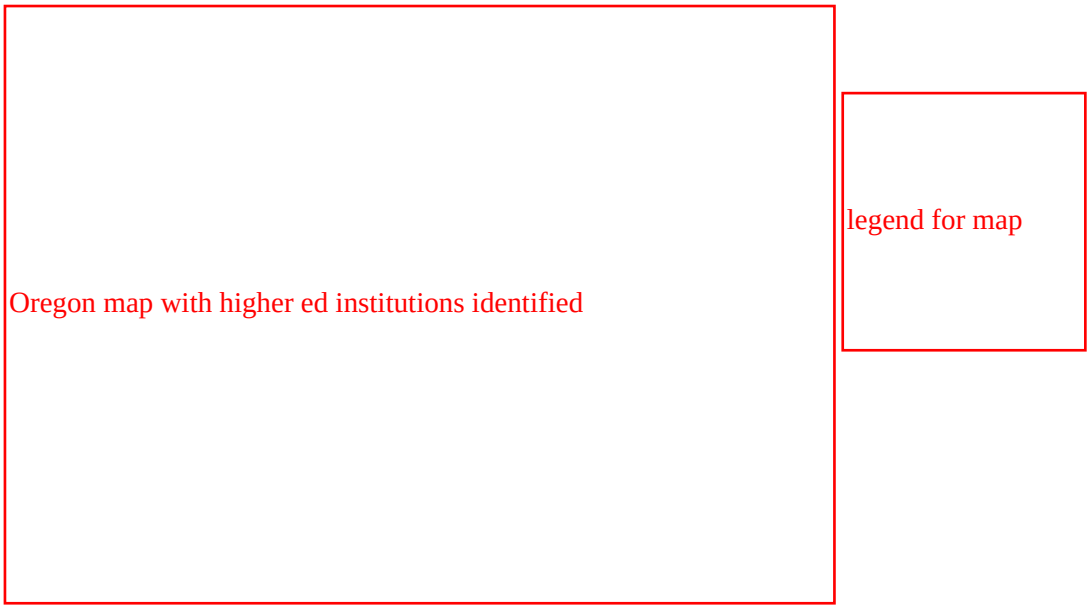
Public School District:
Nyssa School District 26
804 Adrian Blvd
Nyssa, OR 97913-3642
Phone: 541-372-2275
Fax: 541-372-2204
Web site: http://www.nyssa.k12.or.us/
E-mail: dgrotting@nyssa.k12.or.us

Staff and Enrollments:
District Certified Staff: reported October 2000—94
Total District Enrollment: reported October 2001—1,179

Other Schools in the School District (Private, Parochial)
To see if there are private and/or parochial schools in this district please visit http://www.ode.state.or.us/pubs/directory/

Source: Oregon Department of Education

Oregon Community Colleges and Public Universities



For a list of public and private educational institutions in Oregon visit http://www.oregon4biz.com/ed.htm.

Workforce

Oregon Economic and Community Development Department Workforce Advocate 503–986–0207, or visit http://www.oregon4biz.com/workforce.htm. Locate local workforce assistance at http://www.worksourceoregon.org/.

Financial Information

Financial Institutions

Commercial Banks: 2 **Savings and Loans:** 0 **Credit Unions:** 0

Source: City Administration

Taxes

Sales Tax Oregon has no general sales tax.

Property Tax
Property—Who pays? Owners of real and business personal property, according to the assessed value of taxable residential, commercial, farm, industrial, utility and timber property.

County assessors use permanent rates set for all taxing districts in fiscal year 1997–98, when taxes were significantly reduced with a statewide average 17 percent cut in tax levies. Certain types of levies are outside this reduction. The tax rates cannot exceed $15 per $1,000 of real market value. For 1997–98, all property was valued by county assessors at 90 percent of the July 1, 1995, levels. For subsequent years, assessed values are limited to a 3 percent annual growth rate. Construction since July 1, 1995, is valued at the average rate of similar properties in the area. Business personal property requires annual filing. One–third payment is due by November 15. If fully paid by November 15, a 3 percent discount is allowed. Special exemptions, tax relief programs and deferrals are available. For more information contact the Malheur County assessor's office at 541–473–5117.

Tax rates are representative of the largest tax code in the city. The rates are expressed as tax liability per $1,000 of assessed property value.

	Malheur County
Average Compressed Tax Rate 1997-98	$12.62
Average Compressed Tax Rate 1998-99	$12.51
Average 1999 Housing Value	$52,414
Ave Res Property Tax Paid on Ave House 1997-98	$645.47
Ave Res Property Tax Paid on Ave House 1998-99	$655.70

Average School rate 1998-99 . . . . . . $9.22

Average Non-School Rate 1998-99. . . . $12.31

Average City Rate 1998-99 . . . . . . $7.77

Business Taxes
Property—see above

Income—Corporations doing or authorized to do business in Oregon pay excise tax. Corporations not doing or authorized to do business, but having income from an Oregon source, pay income tax. For more information contact the Oregon Department of Revenue, 955 Center St., NE, Salem, OR 97301, 503–378–4988, http://www.oregon.gov/DOR/.

Unemployment Insurance—Employers pay this. For 2002, new employers are assigned a fixed rate of 3 percent of taxable wage base.

Tax rates for existing employers are based on employers' experience and range from 1 percent to 5.4 percent of taxable wage base. Taxes are paid quarterly and are due by the end of the month following the quarter. In 2002, the tax is paid on the first $25,000 of wages paid to each employee. The rate schedule in effect depends on the balance in the Trust Fund as of August 31 each year and the amount of revenue needed to maintain the balance at a level adequate to pay benefits. For more information contact the Oregon Employment Department, 875 Union St., NE, Salem, OR 97301, 503–947–1488, web http://www.employment.oregon.gov/.

Utilities, Railroad, Weight-mile—Who pays? All railroads and investor-owned utilities operating with the state pay an annual fee. For-hire and private motor carriers operating into, within and through the state pay weight-mile taxes. Rates—limit of .25 percent of gross operating revenues of investor-owned utilities; .25 percent charged on 2002 revenues. Limit of .35 percent on gross operating revenues of railroads; .267 percent charged in 2002 revenues. Applications, plate fees and per-mile rates dependent on declared combined weight of vehicle. For more information contact the Oregon Public Utility Commission, 550 Capitol St., NE, Suite 215, Salem, OR 97301–2551, 503–378–6611, web http://www.oregon.gov/PUC/; Oregon Department of Transportation, Rail Section, 555 13th St., NE, Salem, OR 97310–1333, 503–986–4125, web http://www.oregon.gov/ODOT/RAIL/; Oregon Department of Transportation, Motor Carrier Transport Branch, 550 Capitol St., NE, Salem, OR 97301–3871, 503–378–6699, web http://www.oregon.gov/ODOT/MCT/.

Incentives

Oregon's Business Incentives.

Other incentives: Enterprise Zone

Miscellaneous

Motor Vehicle Licensing, Driver Licensing, Fuels—Who pays? Owners and operators of motor vehicles. Oil companies importing fuels. Truckers using Oregon highways. Fees—Registration fees, driver license fees and renewals (contact the Oregon Driver & Motor Vehicle Services division 503–945–5000, web http://www.oregon.gov/ODOT/DMV/

Hunting and Fishing Licenses—contact Oregon Department of Fish and Wildlife, PO Box 59, Portland, OR 97207, general information 503–872–5268, licenses/tags/permits 503–872–5275, web http://www.dfw.state.or.us/.

Amusement Device Tax—An excise tax is imposed upon every person who operates an amusement device in Oregon. An amusement device is a video lottery game terminal. More information from the Oregon Lottery Commission, 500 Airport Rd SE, Salem, 97301, web http://www.oregonlottery.org/.

Emergency Communications (9–1–1) Tax—Telephone companies providing local exchange access services in Oregon Collect this tax from their customers. The tax, which is $0.75 per line per month, is reported and paid quarterly. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Hazardous Substance Fee—Paid by possessors of nonpetroleum hazardous substance. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Petroleum Load Fee—Paid by petroleum suppliers and importers to Oregon. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Timber Severance Tax—Paid by timber owners on harvested timber’s value. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Forest Products Harvest Tax—Paid on timber cut from any land in Oregon. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Dry Cleaning Tax—Paid by operators of dry cleaning facilities. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Alcoholic Beverages—Manufacturers and/or import wholesalers of malt beverages and wines pay a privilege tax. Manufacturers, wholesalers and retailers of distilled spirits, malt beverages and wines pay license fees. Employees who serve alcoholic beverages pay for service permits. For more information contact the Oregon Liquor Control Commission, PO Box 22297, Portland, OR 97222, 503–872–5000 or 1–800–452–6522 (in Oregon), web http://www.oregon.gov/OLCC/.

Tobacco Products—Cigarette and tobacco products distributors are required to purchase tax stamps for cigarettes or pay a percentage of the wholesale price on other tobacco products. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Transit Payroll Tax–paid by employers in the Tri-Met (Portland area) and Lane Transit District (Eugene) for mass transit systems. Administered by the Department of Revenue, web http://www.oregon.gov/DOR/.

Many local governments in Oregon collect other taxes, such as hotel-motel taxes. Contact the city or county in which you are interested for more complete information about taxes in that area.

Source: Oregon Department of Revenue, "A Summary of Taxes," January 2002; County information–County Assessor's Office

Community Services and Resources

Public Safety/Emergency Services

Fire Station(s) serving community: Nyssa Rural Fire Department, 1 station
Number of paid and volunteer firefighters: 25*
Rating by Insurance Services Organization (ISO): 8
Comments: 1998 data; *number of firefighters unreported-last reported numbers; date last graded 1995
City of Nyssa

Police Department: Nyssa Police Department
Number of paid and reserve officers: 7

Nearest Hospital and distance: Holy Rosary Medical Center, 12 miles in Ontario
Regional Hospital and distance: Holy Rosary Medical Center, 12 miles in Ontario
Emergency services to community: Ambulance Service, Life Flight Service, St. Al Hospital Boise, ID
General Clinic(s): 2

Source: City Administration

Communications Resources

Local Newspapers: Ontario Argus-Observer (daily)

Regional Newspapers: Idaho Statesman, Idaho Press-Tribune, Oregonian

Radio Stations: 1 FM, 1 AM stations

TV Stations: City receives Boise, Idaho, area stations

Available Cable Television: Cable One

Telephone Service Provider(s): Malheur Bell

Local Internet Service Provider(s): Yes
Number of Internet Service Providers: Data unavailable at this time.
Source: City Administration

Library System
Nyssa Public Library

Source: City Administration

Planning Service/Regulatory

Regulatory System	Year Acknowledged	Year Last Revised	Year of Periodic Review	Comments
Comprehensive Plan	1985		2002	
Zoning Ordinance		1985		
Building Permit System		1985		
Subdivision Ordinance		1985		
Strategic Plan		2002		New

Territory Covered by Zoning
Municipality Yes **County** Yes
Source: City Administration

Industrial Lands
Does the Community seek industrial development? Yes
Access Statewide industrial lands database—http://www.oregonprospector.com/
Source: Economic and Community Development Department

Special Districts and Associations (ports, water, sewer, etc.)
Name of Special District and the Oregon Revised Statute it was created under:
Malheur County E.S.D.; Malheur County S.W.C.D.; Malheur Memorial Hospital District; Nyssa Road Assessment District #2; Nyssa Rural Fire District; Nyssa-Arcadia Drainage District

Special Districts Association of Oregon—727 Center St., NE Salem, OR 97301, 503–371–8667 or 800–285–5461 http://www.sdao.com/
Source: City Administration

Infrastructure/Transportation

Water Supply

Operator: City of Nyssa
District: N/A
Source: Ground Water; Wells
Supply: Capacity (MGD)–1.00; Pressure (PSI)–50.00

Current Water Utilization on Meter Size (MGD): 0.60 MGD
Water Costs per thousand gallons: Base rate per/thousand = $1.30
Water Costs for Total Consumption of Residential: Based on 7,000 gallons = $9.10

Age of Water System: 1995

Water System Comment(s): Hook up fees: new $1,250. System received a $3.4 million upgrade in 1996.

Compliance Issues:

Water debt repayment included as part of tax assessment? No

Date of Current Master Plan: 1996

Plans for Upgrading or Expanding:
Source: City Administration

Wastewater Treatment System

Operator: City of Nyssa **Age of Wastewater Collection System:**
District: N/A

System Design Capacity (MGD): 0.80 MGD **System Utilization (MGD):** 0.40 MGD
Collection System Fees: $3.70/1,000 gal water used **Hook-up or Connection Fee:** $250.00
Access Fee or System Development Fee: $25 per ERU/ea ERU = 6,800 Includes commercial and industrial

Comment(s) on Wastewater System: $800,000.00 connection system upgrade in 1970. Wastewater plant received $1.6 million upgrade in 1998.

Compliance Issues: Yes

Date of Last Facility Plan: 1998

Plans for Upgrade/Expansion: Currently updating facilities plan. Will do preliminary engineering in 2003 with construction 2004 to meet DEQ requirements.

Storm Drain: No **Storm Water Discharge Fee:**
Fees or issues related to storm drains: No fee assessed. City has a “French Drain” system.
Source: City Administration

Utilities

Telecommunications

Is there access to broadband infrastructure? Yes	**Access**	**Monthly Fee**	**Other Fee**
	T1 Yes		
If yes, check all that apply: Microwave Fiberoptic	**DSL** Yes		
	Cable Yes		
Is there route diversity? Yes			

For Oregon Telecommunications information and resources, visit http://www.oregon4biz.com/inn.htm.

Natural Gas—Provider: Cascade Natural Gas
Lines and Feed:

Rate Structure: Cost per therm: Residential: $.61337, minimum $3.00 Commercial: $.50916, minimum $3.00 Industrial: $.467440, minimum $12.00

Plans for Upgrade/Expansion:

Electrical—Provider: Idaho Power Company
Lines and Feed:

Rate Structure Residential: First 300 kwh $.038623/kwh, 300 kwh+ $.058279/kwh
Commercial: @ 12kw and 1,500kwh/month $78.00; @ 100kw and 30,000kwh/month $1,287.00; @ 400kw and 150,000kwh/month $6,393.00
Industrial: @ 1,000kw and 400,000kwh/month $13,100.00; @5,000kw and 2,500,000kwh/month $75,716.00

Plans for Upgrade/Expansion:

Solid Waste Management: S & S Disposal

Permit Status: Current

Utility Expansion Plans: None

Utilities Source: City Administration; PGE information supplied by PGE. Note: We update utility rates periodically. Actual rates may change more often than that. For the most current rate for any carrier please consult the Public Utilities Commission web site at http://www.puc.state.or.us/commsion/default.htm Click on the **Statistics 200x** label (x being the most recent year).

Transportation

Highways Hwy 201 N/S route, local access **Transportation Access Fee:** $0

Community Air Service No	**If no local service, list closest Air Facility**
Air Passenger Service: No	
Airport Freight Service: No	Boise, ID Airport, 50 miles
Air Service Comments:	

Rail Service: Yes Union Pacific
Freight Service: Yes **Passenger Service:** No
If no local service, list closest Rail Service: Pasenger: Pasco, Salt Lake City

Marine No

Transportation issues which might confront development, such as non-attainment air shed, etc.:

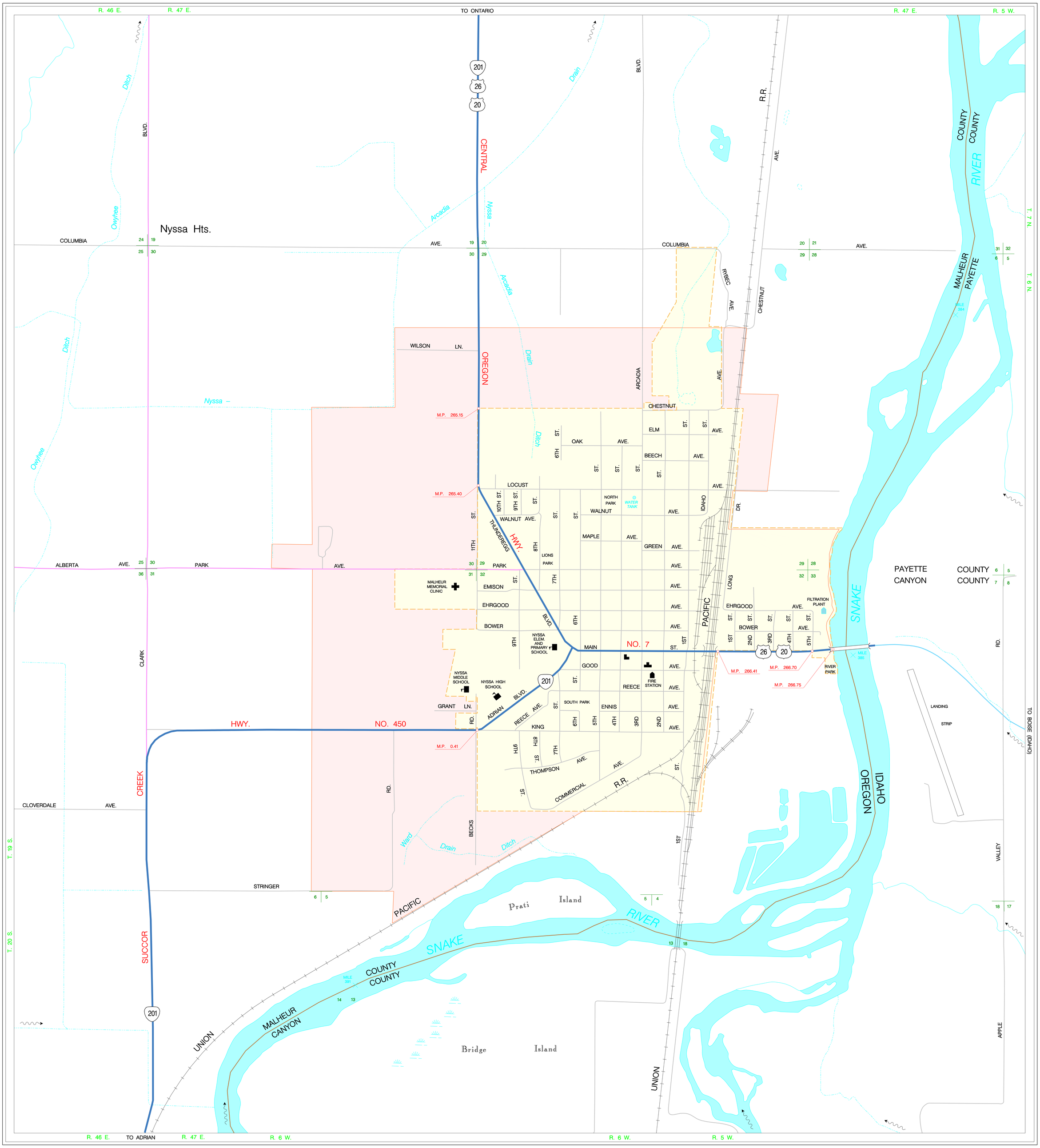
Public Transportation Comment:

Bus Service Available in the Community: No
Scheduled Bus Service Available: No **Buses Per Day:**
Local Charter Services: No
Distance to Nearest Bus Service: 30 miles in Nampa, ID

Trucking Service
Scheduled Freight Carrier Services: Yes EOFF, Yellow, May, Parsons
Overnight Express Parcel Service Available: Yes Fedex, Roadrunner, Airborne Express, UPS, Post Office
Overnight Express Mail Service Available: Yes
Transportation Comments:

For more information relating to transportation topics please visit the Department of Transportation web site. Airports (maps and general information) http://www.tripcheck.com/About/airport.htm; Bicycle and Pedestrian Route information http://www.tripcheck.com/About/bicycle.htm; Public Transportation, bus and rail http://www.tripcheck.com/About/busrail.htm.

Source: City Administration, local chamber of commerce (proprietary information)



LEGEND

FUNCTIONAL CLASSIFICATION — STATE / OTHER

FOR FURTHER FUNCTIONAL CLASSIFICATION INFORMATION, CONTACT O.D.O.T. REGION OFFICE.

- INTERSTATE
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- URBAN COLLECTOR / RURAL MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD
- ORE. ROUTE – US. ROUTE – INTERSTATE ROUTE
- NATIONAL HIGHWAY SYSTEM ROUTE
- URBAN GROWTH BOUNDARY
- CITY LIMIT
- AMTRAK RAIL PASSENGER STATION
- BRIDGE
- GRADE SEPARATIONS : STATE – OTHER FUNCTIONALLY CLASSED – LOCAL ROAD
- PUBLIC BUILDING
- COURTHOUSE
- CITY HALL
- ARMORY
- POST OFFICE
- SCHOOL
- LIBRARY
- SAFETY REST AREA
- WEIGH STATION
- PARK & RIDE LOCATION
- INTERCITY – CITY TRANSIT
- COMMERCIAL – GENERAL AVIATION
- AMTRAK STOP – PORT FACILITY
- GRAVEL PIT – QUARRY – ODOT STOCKPILE SITE

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FEDERAL HIGHWAY ADMINISTRATION

NORTH

"This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information."

SCALE

500 0 500 1000 FEET

150 0 150 300 METERS

NYSSA
Population 3,170

T. 19-20 S. R. 46-47 E.

PRELIMINARY COPY
SUBJECT TO CORRECTION

OREGON TRANSPORTATION MAP

Showing Functional Classification of Roads
City of

NYSSA

MALHEUR COUNTY
2004

PARK & RIDE | INTERBUS | AMTRAK
AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

PORT | AIRPORT | COMM. AIR
AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

Copies available from the Oregon Department of Transportation, Map Distribution Unit, Mill Creek Office Park, 555 13th St. NE, Suite 2, Salem, Oregon 97301–4178, Telephone (503) 986–3154, http://www.odot.state.or.us/tdmappingpublic
* Based on current Oregon Population Report, College of Urban and Public Affairs, Portland State University, http://www.upa.pdx.edu/CPRC.

City of Ontario
Jurisdiction Addendum

Addendum Overview

The City of Ontario elected to participate in the planning process for the Malheur County Multi-Jurisdictional Natural Hazards Mitigation Plan by developing a supplemental Jurisdiction Addendum ("City Addendum"). This city addendum is designed to provide any city-specific hazard risk information for where it may differ from the county's assessment.

Multihazard Requirement §201.6(a)(3): *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process.*

This addendum documents the city's participation in the process.

Multihazard Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

This addendum documents the city's risks where they vary from risks facing the planning area (the county).

Multihazard Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

This addendum documents any action items specific to the city. The city also wishes to participate in several multi-jurisdictional action items as listed in Section 4: Goals and Action Items.

Attachments

- Hazard Mitigation City Addendum Work Session Summary
- ODOT map of Ontario
- FEMA FIRM map of Ontario *(no digital copy available; hard copy located in Natural Hazards Mitigation Plan file folder in Malheur County Planning Department)*
- Oregon Blue Book City Profile
- Meeting documentation (*no digital copy available; hard copies of agendas, minutes are located in Natural Hazards Mitigation Plan file folder in Malheur County Planning Department*)
- City-specific Action Item worksheets (Also see Section 4 for multi-jurisdictional AIs for which Ontario is a partner city)

City of Ontario

Hazard Mitigation City Addendum Work Session

Issue Identification and Risk Assessment

May 30, 2007

Work Session Overview

On Wednesday, May 30th, the City of Ontario held an issue identification work session at Ontario City Hall in order to assess the jurisdiction's risks and develop community-specific action items for the city's addendum to the Malheur County Natural Hazard Mitigation Plan (NHMP). This work session was facilitated by the Malheur County Hazard Mitigation Project Coordinator.

City Participants

The following city of Ontario stakeholders participated in the work session.

In addition, the Coordinator met with several Ontario city officials individually to further assess the jurisdiction's risks and develop community-specific action items. These individuals are designated with a star (*).

- Scott Trainor, City Manager*
- Mike Kee, Police Chief
- Steve Gaschler, Public Works Director*
- Kathy Daly, Parks and Recreation Director*
- Terry Mairs, Fire Chief*
- Rachel Hopper, Finance Director
- Tori Barnett, City Recorder

Hazard Analysis

In order to assess the city's risk of natural hazards, the Coordinator presented participants with a summary of the Malheur County risk assessment and preliminary Ontario risk information as gathered from the Steering Committee and earlier interviews. The Coordinator then facilitated a discussion of each County hazard and asked participants to comment upon Ontario's risks, and whether they are greater or lesser than the County's risk to those same hazards. The analysis below has been combined with information from other city and county stakeholders to provide a city-specific hazard analysis for the City of Ontario's addendum to the NHMP.

Flood

The working group determined that the city's flood risk is high for both probability and vulnerability, which is equal to the county's probability ranking and higher than the county's vulnerability ranking. The city's higher vulnerability ranking is due to the fact that Ontario is adjacent to both the Snake and Malheur Rivers and vulnerable to flooding from both of these sources, especially from spring runoff and ice jams.

National Flood Insurance Program participation: according to FEMA, Ontario has 42 active flood insurance policies totaling $3,396,100 in value as of 2000. Two single-event losses have been claimed, totaling $39,762. No repetitive losses have been claimed. A FIRM map of the city's floodplain areas is included in this addendum. No local records have been compiled on how many specific structures are located within the city floodplain areas; this project is one that could likely be undertaken once the FEMA floodplain maps are digitized (see Action Item FLOOD#10 for more information).

Because there are no National Weather Service gauges on the Snake or Malheur River in Ontario city limits, measurements for past flood events must be taken from the Malheur gauge just downstream of Vale (approximately 10 miles upstream) or from the Snake gauge at Weiser (approximately 18 miles downstream). Flood events measured at these gauges often have an effect on Ontario as well.

River Gauge	***Flood State***	***Years Measured***	***# of Floods***	***Frequency***
Malheur at Vale	11 ft	1926-2006	5	Once every 16.2 years
Snake at Weiser	12 ft	1924-2006	9	Once every 9.1 years

The following hazard history was taken from the county Flood Hazard Summary in Section 3 and provides the best available record of flooding in Ontario. See the Section 3 Flood Hazard Summary for source information

Year	***River***	***Location***	***Cost***	***Description***
2006, January	Malheur	Vale, Ontario area	N/A	Moderate flooding, roads blocked by high water, agricultural fields flooded
1993, March	Malheur, Owyhee	Vale, Ontario	$550,000	Moderate flooding; damage to county roads, Highway 20 under water, erosion, 4 houses evacuated, 36th St bridge outside of Ontario damaged
1985	Snake		N/A	Ice jam flooding
1952, March, April	Malheur	Vale, Ontario	N/A	Severe flooding; bridges and railroads under water, 6 families evacuated.
1910	Malheur		N/A	Severe flooding
1904	Malheur		N/A	Severe flooding

Wildfire

The working group determined that the city's vulnerability and probability risk rankings for wildfire are the same as the county's: high probability and moderate vulnerability. The city experiences the effects of wildfire frequently, but events threatening the city on a major scale are rare. Agricultural fields and irrigation canals surrounding the city act as natural fire breaks, and city officials said they feel that WUI areas near Ontario (Oregon Slope and Ontario Heights, both just out of city limits) are adequately protected.

The county is currently developing a Community Wildfire Protection Plan, which will include information on incorporated cities and help further identify Ontario's vulnerability to wildfire.

Drought

The working group determined that the city's vulnerability and probability risk rankings for drought are high, which is the same as the county's high risk. Because of the predominance of ranching, farming and other agricultural activities as a major economic force in the city, the economic impacts of drought are significant both for those individuals and for city businesses, which support and are supported by the agricultural community in the city's vicinity. Countywide drought declarations listed in Section 3 of the county plan apply to Ontario as well.

Severe Weather

The working group determined that the city's risk of severe weather events (windstorm, winter storm, thunderstorm/hail) is similar to the county's, but with differences noted below:

Winter storms: moderate probability, like the county; moderate vulnerability, lower than the county's high vulnerability. The city of Ontario sits at the lowest elevation point in the county, and while major winter storms can and have occurred, they typically do not cause significant damage to the community. However, road closures on I-84 within an hour's drive of the city due to winter weather are a frequent occurrence and can interrupt commuter traffic. They also bring a large influx of stranded motorists and into the city, which can provide an economic boost to local motels and restaurants. City Finance Director Rachel Hopper noted that the city budgets funds for seasonal winter storm needs, such as clearing roads.

Windstorms: high probability, like the county; moderate vulnerability, higher than the county's low vulnerability. The city ranked their vulnerability to windstorms higher than the county's vulnerability due to the concentration of infrastructure in the city and the resulting greater potential losses. Most National Weather Service records of windstorm activity in the county come from the Ontario area (including Cairo Junction, which is an unincorporated community 2 miles outside of city limits).

Below is a table of recorded windstorms in the Ontario vicinity, with any known damages recorded (for source information on this table, which was compiled from local newspapers and stakeholder information, see Section 3: Severe Weather Hazard Summary):

Date	*Location*	*Damage*	*Comments*
August 10, 2006	Treasure Valley area – Ontario and western Idaho	N/A	Power lines and trees downed; debris; several wildfires started or exacerbated by the storm.
July 11, 2004	Ontario area	N/A	Numerous trees across town on public and private property uprooted; debris.
Summer 2003	Ontario area, Cairo Junction	$1,375	Roof of Ontario golf course clubhouse damaged; debris.
February 8, 1999	Cairo Junction	$5,000	Roof of Cairo Elementary gym damaged.

*damages not adjusted for inflation.

Thunderstorms/hail: high probability, like the county; moderate vulnerability, higher than the county's low vulnerability. . The city ranked their vulnerability to thunderstorms and hail higher than the county's vulnerability due to the concentration of infrastructure in the city and the resulting greater potential losses. In addition to the damage that severe thunderstorms and hail can inflict on agricultural fields and irrigation systems and the resulting economic impacts, Ontario is home to most of the car dealerships in the county, all of which are vulnerable to inventory damage from hail.

Records on these events are unfortunately not available on the city level; see Section 3 of the county plan for past thunderstorm and hail events in the county.

Earthquake

The working group determined that the city's probability for earthquakes is moderate, which is the same as the County's risk, but that its vulnerability is high (the county's is low). The city has a higher vulnerability because of the concentration of residents and infrastructure within Ontario city limits is greater than anywhere else in the county.

Like the county, much of the city's critical infrastructure, including city hall, several local schools, public works facilities, and hospital, are almost exclusively un-reinforced masonry, which is especially vulnerable to seismic events. Information on specific buildings' estimated seismic resistance, determined by DOGAMI in 2007, is available in the Earthquake Hazard Annex.

Landslide

The working group determined that the city's risk of landslide is low, like the county's. The city has had no problems with landslides in city limits in known history and is located in a generally stable area. A few neighborhoods on the northwest edge of the city and immediately outside of city limits (Ontario Heights) are located on steep hillsides surrounding the town but have not experienced problems in the past.

Volcanic Event

The steering committee determined that the city's risk to a volcanic event is low, which is the same as the county's risk. Were a volcanic event to occur in the Cascades region of Oregon, Ontario could be at risk for ash fall, depending on the severity of the

event and the direction of the wind. Like the rest of the County, the city has an approximately 1 in 5,000 chance annually of experiencing ash fall from a volcanic event (see the County plan, Section 3: Risk Assessment, for more discussion of this event).

Issue Identification

In an effort to identify potential action items, the working group completed an issue identification exercise to identify potential hazard related issues related to: critical facilities & infrastructure, human population, cultural & historic resources, economic assets, and environment & land use. A summary of this exercise is included below.

Critical Facilities & Infrastructure

- The opening underneath the 36th street bridge is too narrow to let floodwaters and debris pass, thus acting as a bottleneck when the Malheur River is at flood stage. According to the Army Corps of Engineers, the bridge remains structurally sound. This bridge is located just outside of city limits.
- Ontario has its own water treatment and wastewater facilities; these are located on the Malheur River floodplain. They have generators and power outage alarms, in addition to multiple lift stations, all with their own generators. Sewage lagoons have high berms designed to withstand potential flooding from the Malheur River.
- City stormwater system is mostly fine but has several issues that would benefit from mitigation, including upgrading pipes and removing silt build-up to reduce flood risks.
- Municipal airport at western edge of town.
- MOUs for emergency shelter: county fairgrounds, local churches, public schools.
- New armory is being built as of 2007 – will be bigger, will have good facilities for community shelter.
- Holy Rosary Medical Center is located in Ontario and serves the entire county.

Population

- Highest population in the county (pop. 11,245).
- Four assisted living facilities.
- The LDS (Mormon) church has an extensive emergency preparedness network among its members.
- Daytime population in Ontario is significantly higher than its residential population – from about 32,000 up to 40-70,000, some from elsewhere in the county and some from Idaho; most drive personal vehicles in for working and commerce.
- Daytime population in Ontario also includes high number of transitory individuals – e.g. motorists and commercial truck drivers – due to its location on I-84 and Highway 20. If I-84 closes due to severe weather, every motel in the region fills up, in addition to the one major freight truck stop. The county/Ontario is not equipped to house significant numbers of stranded motorists.

- Southeast Oregon Regional Food Bank, based in Ontario, serves every city in the county in addition to some unincorporated areas with 1 warehouse, 4 food pantries, and 2 affiliated meal sites. Sites stock some emergency-use food (FEMA boxes, canned goods) but not in significant quantities.
- High sex offender population (3% in Ontario) – potential disaster safety risk, as it would be a challenge to keep track of them in the event of an evacuation or in shelters to ensure child safety.

Economy

- Heavily agriculture/ranching-based economy with many interconnected parts: small businesses support agriculture and ranching – seeds, supplies, machinery repair and supply, veterinary services, local banks and credit unions, etc. If farmers have a bad year, the whole system has a bad year – ex. If there is a drought or other industry-wide issue, profits go down across the entire ag community. Most farmers and ranchers are self-employed.
- North Ontario – new interstate interchange is under construction and will spur development – truck stop, big box stores, residential, etc. Much of this area is in the 100-year floodplain of the Snake River.
- Lots of businesses are on/near the freeway and depend on that traffic.
- Railroad – the Union Pacific line through Ontario is a major commercial freight line. It can have problems in the event of fire or winter storms.
- ~8000 total jobs in Ontario area, many are part-time or seasonal
- City, county, and state government is a significant employer.

Environment and Land Use

- Malheur Butte is a local landmark
- Four major rivers: Snake, Malheur, Owyhee, Payette
- Natural Resources Conservation Service and Soil and Water Conservation District both have county offices in Ontario.
- Ontario State Park, located along shoreline of the Snake River
- Economic activity and development is concentrated in the Ontario area, partially as a result of rapid growth throughout the greater Treasure Valley, which stretches westward 57 miles from Boise, ID to Ontario.

Cultural and Historic Resources

- Several buildings on the National Register of Historic Places:
    - Downtown train depot
    - Blackaby House
- Aquatic center
- Four Rivers Cultural Center and its museum
- Boulevard Grange organization
- Treasure Valley Community College
- Oregon State University Agricultural Experiment Station
- Historic downtown business district

- County fairgrounds in Ontario; Malheur County Fair & Rodeo
- Seasonal community festivals and events

Proposed Action Item:	Alignment with Plan Goals:
Implement stormwater improvement measures as identified in the 2003 City of Ontario Stormwater Master Plan. [ONTARIO]	Protect Infrastructure, Safeguard Economy

Rationale for Proposed Action Item:

Ontario's Stormwater Master Plan (SMP), adopted in 2003, identifies several infrastructure improvements that would mitigate flood risks for the city in addition to improving the overall stormwater system.

SMP Recommendations:

- Adopt a city policy to limit post-development stormwater runoff to pre-development conditions. (Reduces surcharge and flood risk)
- Establish an annual pipeline replacement program and eventually replace all pipelines with at least 12-inch diameter pipelines. (better outflow, reduced risk of surcharges)
- Review and update interagency agreements between the City and irrigation districts to outline each entity's responsibilities in regards to water quality, stormwater runoff, and maintenance of jointly used facilities. (improve efficiency)
- Kmart Drainage Basin – several pipe upsizings and a cleanout. (Reduce surcharges during storm events)
- Heinz Frozen Foods Basin – correct an adverse pipeline grade. (Reduce surcharge during storm events)
- Park Boulevard Drainage Basin – combine this basin with the Double Trunk Line and Downtown Ontario Drainage Basin; upsize, connect, redirect, and limit inflow of several lines; add desiltation basins. (All of these measures would be to reduce surcharges during storm events)
- Verde Road Basin – fix a collapsing 30-inch pipe
- SW 4th Ave Drainage Basin – construct a desiltation basin for agricultural runoff
- Construct retention basins for several drainage areas. (Reduced flood risk, water filtration)
- Preserve land identified in Fig 21 (see Flood Hazard Annex) for future water quality treatment needs.

(A copy of the full text of these recommendations is attached to the Ontario city addendum.)

Ideas for Implementation:

- Coordinate efforts with the Ontario Public Works Department to implement storm water improvement measures.
- Work with FEMA to identify funding sources.

Coordinating Organization:	City of Ontario Public Works

Internal Partners:	External Partners:
City of Ontario	FEMA

Timeline:		If available, estimated cost:
Short Term (0-2 years)	Long Term (2-4 or more years)	N/A
	X	

Form Submitted by:	

Proposed Action Item:	Alignment with Plan Goals:
Identify flood-prone riverfront property for potential acquisition as part of the ongoing greenbelt space project. [ONTARIO]	Reduce the Threat to Life Safety; Protect Natural and Cultural Resources

Rationale for Proposed Action Item:

As of 2007, the city of Ontario is creating a greenbelt (public access, with walking trails) along the Malheur and Snake Rivers around the border of the city. As part of this process, the city will identify parcels of riverfront land (flood prone; located on the rivers' floodplains) that can serve a dual purpose for greenbelt use and flood mitigation (if purchased and set into a conservation easement, this greenbelt land would not be developed but could be used for greenbelt recreation purposes).

There is currently one parcel of land on the first phase of the greenbelt (the "Malheur River Loop") that is not under city ownership.

The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Acquiring flood-prone riverfront property for potential acquisition will not only reduce the vulnerability of floods, but help in the development of the greenbelt space project.

Goal 7 of Oregon's Statewide Planning Goals and Guidelines states that local governments "adopt or amend, as necessary, based on the evaluation of risk, plan policies and implementing measures …[to avoid] development in hazard areas where the risk to people and property cannot be mitigated." Acquiring flood-prone riverfront property for acquisition in the greenbelt space project will avoid future development in the flood-prone properties, fulfilling Goal 7's requirements.

Ideas for Implementation:

- For the one parcel of non-city owned land on the Malheur River Loop, initiate contact with the landowner to discuss usage and possible sale options.
- Work with city planning department to identify parcels on the proposed greenbelt route not owned by the city; initiate contact with landowners.
- Research potential ownership and easement options for greenbelt/flood mitigation parcels not owned by the city.

Coordinating Organization:	City of Ontario Parks & Recreation Department

Internal Partners:	External Partners:
City of Ontario Planning Department	Oregon Department of Parks & Recreation, FEMA

Timeline:		If available, estimated cost:
Short Term (0-2 years)	Long Term (2-4+ years)	N/A
X		

Form Submitted by:	

Proposed Action Item:	Alignment with Plan Goals:
Conduct a Base Flood Elevation study on the area immediately surrounding the new I-84 overpass in Ontario. [ONTARIO]	Protect Infrastructure, Safeguard Economy; Reduce the Threat to Life Safety

Rationale for Proposed Action Item:

The City of Ontario is experiencing significant growth on the north end of town in the immediate vicinity of a new interstate overpass which is estimated to be complete by 2008. This area is also located in the floodplain of the Snake River and may be more vulnerable to flood damage when fully built out. Current permits are being issued with Base Flood Elevations designed around a floodplain without any pre-existing development.

The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Conducting a base-flood elevation study around the I-84 overpass will make new development in that area less vulnerable to flooding events and protect future buildings in that neighborhood.

Ideas for Implementation:

- Review current floodplain maps to determine area in need of new BFE.
- Coordinate efforts with FEMA to conduct a base flood elevation study and to seek funding sources, potentially through FEMA's Map Modernization program.
- Note: This area may be photographed with LIDAR aerial photography in late 2007, which would aid in providing FEMA with sufficient information to revise the BFE.

Coordinating Organization:	City of Ontario Planning Dept

Internal Partners:	External Partners:
Malheur County Planning Dept	FEMA

Timeline:		If available, estimated cost:
Short Term (0-2 years)	Long Term (2-4 or more years)	N/A
X		

Form Submitted by:	

Ontario Community Profile

444 SW 4th Street, Ontario, OR 97914
Phone 541-889-7684 • Fax 541-889-7121
Web Page http://www.ontariooregon.org

City Location

map locating city location

County(ies): Malheur **Incorporated in** 1899
Location: Eastern Oregon, adjacent to the Snake River on the Oregon/Idaho border. City resides in the Mountain Time Zone.
Nearest Major Highway and Distance: I-84 | Local
Nearest Major City and Distance:
Boise, ID | 57 miles, Estimated Drive Time: 1 hour
Distance to Portland: 370 miles

Source: Oregon Department of Transportation, State of Oregon Map; Oregon Blue Book

Recreational Amenities

Lake Owyhee State Park, Succor Creek State Recreational Area, Snake River @ Farewell Bend, Bogus Basin Ski Resort, Brundage Mt. Ski Resort, Anthony Lakes Ski Resort, Sumpter, Unity Phillips Reservoir, 5 city parks and one golf course, indoor swimming pool, tennis courts, skate park.

Planning a vacation or a tour through an area of Oregon? Visit the Oregon Tourism Commission's web site at http://www.traveloregon.com/ for more information.

Source: City Administration, local chamber of commerce, local convention and visitor bureau

Climate

Elevation: 2,150' **Measurement Location:** Ontario

Temperature:
Monthly Ave. Low: 19°F Monthly Ave. High: 96°F
Hottest Month: July Coldest Month: January
Driest Month: July Wettest Month: December
Average annual precipitation: 9.680"

Humidity (Hour 10, local time):
Average July afternoon humidity: 34%
Average January afternoon humidity: 77%

Source: Oregon Climate Service

Information in the Community Profiles was derived from many sources, including local, state and federal sources. The Oregon Economic and Community Development Department cannot accept responsibility for errors or omissions. Questions and comments may be directed to the department by telephone 503-986-0123, by fax 503-581-5115 or by email oedd.info@state.or.us.

Profile Topics

Demographics

	Population			
	1990	**2000**	**2005**	**2006**
City of Ontario	9,394	10,985	11,245	11,325
Malheur County	26,038	31,615	31,800	31,725

Sources: 1990, 2000 US Census; 2205, 2006 Center for Population Research and Census, Portland State University. 0 indicates data is unavailable.

Malheur County	9,926 sq miles	3 persons/sq mile	Sources: figures based on 2006 PSU population estimates; Oregon Bluebook county square mileage

Community Age Groups

	1970	**1980**	**1990**	**2000**
Under 5 years	527	0	865	1,041
5-19 years	2,039	0	2,261	2,720
20-44 years	1,850	0	3,086	3,486

45-64 years	1,353	0	1,578	2,043
65+ years	754	0	1,435	1,695
Median Age	28	0	35	30.9

Source: US Census, 0 or N/A indicates data is not available. Median value is the middle value, not an average.

Housing

Total Housing Units	1970	1980	1990	2000	Median Value of Owner-Occupied Housing, 2000
City of Ontario	1,931	3,275	3,819	4,445	$85,900
Malheur County	5,896	9,083	10,649	11,233	$86,900

City of Ontario 2000 Housing Breakout:

Vacancy Rate:	8.12%	**Median Owner Cost**	
Owner Occupied:	1,134	**(mortgaged):**	$800
Renter Occupied:	612	**Median Gross Rent:**	$453

Also visit Housing and Community Services Web Site:
http://www.hcs.state.or.us/

Source: US Census. Median value is the middle value, not an average.

Economic Development and Employment

Principal Industries of the County(ies):
Malheur County—Agriculture, livestock, food processing

Source: Oregon Employment Department, Covered Employment and Payroll Reports, 1998

Agricultural Products of the Area (Top 3 largest gross farm sales):
Malheur County—Cattle and calves, field crops, vegetable crops

Source: Oregon State University, Extension Economic Information Office

Total Number of Manufacturing Companies in the County:

Malheur County 26

Source: Oregon Employment Department, Covered Employment and Payroll Reports, 1998

Total Number of Manufacturing Companies in the City: 17

Source: City Administration

Economic Indicators

	Malheur County		Oregon		
	2001	2002	2000	2001	2002
Population	32,000	32,000	3,421,399	3,471,700	3,504,700
Labor Force	14,867	14,867	1,802,938	1,793,773	1,840,133

Total Employment			1,715,453	1,679,914	1,701,390
Unemployment	1,252	1,317	87,485	113,859	138,743
Unemployment Rate	8.4%	8.9%	4.9%	6.3%	7.5%
Non-Farm Payroll Employment	12,110	11,840	1,606,800	1,596,100	1,572,500
Total Covered Employment	13,128	12,660	1,607,944	1,596,943	1,573,083
Total Covered Payroll ($ thousands county/ $ millions state)	$304,082	$305,914	$52,701	$53,021	$52,989
Ave. Annual Payroll Per Employee	$23,163	$24,164	$32,776	$33,202	$33,684
Number of Business Units	920	913	108,432	111,353	113,097
Total Personal Income ($ millions)	$566,279	$581,883	$94,999	$98,500	$101,358
Annual Per Capita Personal Income	$	$18,608	$27,649	$28,400	28,792
Assessed Value of Property ($ millions)	$0	$1,446	$198,911	$210,435	$219,878
Residential Construction					
Building Permits	42	44	19,877	21,049	22,186
Value ($ thousands)	$6,229	$6,327	$2,533	$2,985	$3,347
Travel Expenditures ($ millions)	$0	$36,400	$6,133	$6,128	$6,208
Travel-Related Employment	0	560	89,800	91,100	90,200

Preliminary Data

Sources: Oregon Employment Department; Center for Population Research & Census, PSU; U.S. Census Bureau; Bureau of Economic Analysis; Oregon Tourism Commission; Oregon Department of Revenue; Oregon Economic and Community Development Department.

5 Largest Employers, Public and Private as of November, 2002

Employer—Product/Service	Number of Employees
Heinz Frozen Foods—Frozen Potato Products	1,100
Treasure Valley Community College —Education	260
SRCI—Correctional Institution	1,000
School District 8-C—Education	380
Holy Rosary Medical Center —Health Care	480

Source: City Administration

Oregon Employment Labor Market Information

This link takes you to the Oregon Employment Department, Labor Market Analysis database. County information can be obtained here. http://olmis.emp.state.or.us/—Click on Regional Information.

Local and Regional Economic Development Organizations

City of Ontario—http://www.ontariooregon.org	541-881-3210
Malheur County Economic Development—http://www.malheurco.org/	541-881-0327
Ontario Development Corporation	541-889-8012

Ontario Chamber of Commerce —http://www.ontariochamber.com/	541-889-8012
Ontario Visitors & Convention Bureau—http://www.ontariochamber.com/	541-889-8012
GEODC Greater Eastern Oregon Development Corporation	541-575-2786
Economic & Community Development Department Regional Development Officer—http://econ.oregon.gov/	541-575-1050

Source: City Administration, local chamber of commerce, Oregon Economic and Community Development Department

Education/Workforce

Public and Private Schools K–12

Public School District:
Ontario School District 8C
195 SW 3rd Ave
Ontario, OR 97914-2768
Phone: 541-889-5374
Fax: 541-889-8553
Web site: http://www.ontario.k12.or.us/

Staff and Enrollments:
District Certified Staff: reported October 2000—189
Total District Enrollment: reported October 2001—2,838

Other Schools in the School District (Private, Parochial)
To see if there are private and/or parochial schools in this district please visit http://www.ode.state.or.us/pubs/directory/

Source: Oregon Department of Education

Oregon Community Colleges and Public Universities

legend for map

Boise State University located in Boise, Idaho–55 miles away; Albertson's College located in Caldwell, Idaho–30 miles away.

For a list of public and private educational institutions in Oregon visit http://www.oregon4biz.com/ed.htm.

Workforce

Oregon Economic and Community Development Department Workforce Advocate 503–986–0207, or visit http://www.oregon4biz.com/workforce.htm. Locate local workforce assistance at http://www.worksourceoregon.org/.
Industrial Training Center; Training and Employment Consortium

Financial Information

Financial Institutions

Commercial Banks: 6 **Savings and Loans:** 1 **Credit Unions:** 1
7 mortgage brokers, 2 financial companies
Source: City Administration

Taxes

Sales Tax Oregon has no general sales tax.

Property Tax
Property—Who pays? Owners of real and business personal property, according to the assessed value of taxable residential, commercial, farm, industrial, utility and timber property.

County assessors use permanent rates set for all taxing districts in fiscal year 1997–98, when taxes were significantly reduced with a statewide average 17 percent cut in tax levies. Certain types of levies are outside this reduction. The tax rates cannot exceed $15 per $1,000 of real market value. For 1997–98, all property was valued by county assessors at 90 percent of the July 1, 1995, levels. For subsequent years, assessed values are limited to a 3 percent annual growth rate. Construction since July 1, 1995, is valued at the average rate of similar properties in the area. Business personal property requires annual filing. One–third payment is due by November 15. If fully paid by November 15, a 3 percent discount is allowed. Special exemptions, tax relief programs and deferrals are available. For more information contact the Malheur County assessor's office at 541–473–5117.

Tax rates are representative of the largest tax code in the city. The rates are expressed as tax liability per $1,000 of assessed

property value.

	Malheur County
Average Compressed Tax Rate 1997-98	$12.62
Average Compressed Tax Rate 1998-99	$12.51
Average 1999 Housing Value	$52,414
Ave Res Property Tax Paid on Ave House 1997-98	$645.47
Ave Res Property Tax Paid on Ave House 1998-99	$655.70

Average School rate 1998-99 . . . . . . $5.66

Average Non-School Rate 1998-99. . . . $8.52

Average City Rate 1998-99 . . . . . . $5.54

Business Taxes
Property—see above

Income—Corporations doing or authorized to do business in Oregon pay excise tax. Corporations not doing or authorized to do business, but having income from an Oregon source, pay income tax. For more information contact the Oregon Department of Revenue, 955 Center St., NE, Salem, OR 97301, 503–378–4988, http://www.oregon.gov/DOR/.

Unemployment Insurance—Employers pay this. For 2002, new employers are assigned a fixed rate of 3 percent of taxable wage base. Tax rates for existing employers are based on employers' experience and range from 1 percent to 5.4 percent of taxable wage base. Taxes are paid quarterly and are due by the end of the month following the quarter. In 2002, the tax is paid on the first $25,000 of wages paid to each employee. The rate schedule in effect depends on the balance in the Trust Fund as of August 31 each year and the amount of revenue needed to maintain the balance at a level adequate to pay benefits. For more information contact the Oregon Employment Department, 875 Union St., NE, Salem, OR 97301, 503–947–1488, web http://www.employment.oregon.gov/.

Utilities, Railroad, Weight-mile—Who pays? All railroads and investor-owned utilities operating with the state pay an annual fee. For-hire and private motor carriers operating into, within and through the state pay weight-mile taxes. Rates—limit of .25 percent of gross operating revenues of investor-owned utilities; .25 percent charged on 2002 revenues. Limit of .35 percent on gross operating revenues of railroads; .267 percent charged in 2002 revenues. Applications, plate fees and per-mile rates dependent on declared combined weight of vehicle. For more information contact the Oregon Public Utility Commission, 550 Capitol St., NE, Suite 215, Salem, OR 97301–2551, 503–378–6611, web http://www.oregon.gov/PUC/; Oregon Department of Transportation, Rail Section, 555 13th St., NE, Salem, OR 97310–1333, 503–986–4125, web http://www.oregon.gov/ODOT/RAIL/; Oregon Department of Transportation, Motor Carrier Transport Branch, 550 Capitol St., NE, Salem, OR 97301–3871, 503–378–6699, web http://www.oregon.gov/ODOT/MCT/.

Incentives
Oregon's Business Incentives.

Other incentives: Enterprise Zone

Miscellaneous
Motor Vehicle Licensing, Driver Licensing, Fuels—Who pays? Owners and operators of motor vehicles. Oil companies importing fuels. Truckers using Oregon highways. Fees—Registration fees, driver license fees and renewals (contact the Oregon Driver & Motor Vehicle Services division 503–945–5000, web http://www.oregon.gov/ODOT/DMV/

Hunting and Fishing Licenses—contact Oregon Department of Fish and Wildlife, PO Box 59, Portland, OR 97207, general information 503–872–5268, licenses/tags/permits 503–872–5275, web http://www.dfw.state.or.us/.

Amusement Device Tax—An excise tax is imposed upon every person who operates an amusement device in Oregon. An amusement device is a video lottery game terminal. More information from the Oregon Lottery Commission, 500 Airport Rd SE, Salem, 97301,

web http://www.oregonlottery.org/.

Emergency Communications (9–1–1) Tax—Telephone companies providing local exchange access services in Oregon Collect this tax from their customers. The tax, which is $0.75 per line per month, is reported and paid quarterly. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Hazardous Substance Fee—Paid by possessors of nonpetroleum hazardous substance. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Petroleum Load Fee—Paid by petroleum suppliers and importers to Oregon. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Timber Severance Tax—Paid by timber owners on harvested timber's value. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Forest Products Harvest Tax—Paid on timber cut from any land in Oregon. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Dry Cleaning Tax—Paid by operators of dry cleaning facilities. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Alcoholic Beverages—Manufacturers and/or import wholesalers of malt beverages and wines pay a privilege tax. Manufacturers, wholesalers and retailers of distilled spirits, malt beverages and wines pay license fees. Employees who serve alcoholic beverages pay for service permits. For more information contact the Oregon Liquor Control Commission, PO Box 22297, Portland, OR 97222, 503–872–5000 or 1–800–452–6522 (in Oregon), web http://www.oregon.gov/OLCC/.

Tobacco Products—Cigarette and tobacco products distributors are required to purchase tax stamps for cigarettes or pay a percentage of the wholesale price on other tobacco products. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Transit Payroll Tax–paid by employers in the Tri-Met (Portland area) and Lane Transit District (Eugene) for mass transit systems. Administered by the Department of Revenue, web http://www.oregon.gov/DOR/.

Many local governments in Oregon collect other taxes, such as hotel-motel taxes. Contact the city or county in which you are interested for more complete information about taxes in that area.

Source: Oregon Department of Revenue, "A Summary of Taxes," January 2002; County information–County Assessor's Office

Community Services and Resources

Public Safety/Emergency Services

Fire Station(s) serving community: Ontario Fire Department, 1 station
Number of paid and volunteer firefighters: 41
Rating by Insurance Services Organization (ISO): 3-8*
Comments: Last reported in 1996; *number of firefighters from City web site; ISO rating is last reported rating in directory.
Source: Oregon State Fire Marshal, Oregon Fire Service Resource Directory 2000

Police Department: Ontario Police Department
Number of paid and reserve officers: 32

Nearest Hospital and distance: Holy Rosary Medical Center
Regional Hospital and distance: Holy Rosary Medical Center
Emergency services to community: Ambulance Service & Life Flight
General Clinic(s): 3

Source: City Administration

Communications Resources

Local Newspapers: The Argus Observer

Regional Newspapers: The Oregonian, The Idaho Statesman

Radio Stations: KCID, KSRV AM stations, KSRV FM

TV Stations: City receives Boise, ID, area stations

Available Cable Television: Cable One, Snake River Communications

Telephone Service Provider(s): Malheur Bell

Local Internet Service Provider(s): Yes
Number of Internet Service Providers: 7
Source: City Administration

Library System
Ontario Public Library

Source: City Administration

Planning Service/Regulatory

Regulatory System	Year Acknowledged	Year Last Revised	Year of Periodic Review	Comments
Comprehensive Plan	1985	1999	2007	
Zoning Ordinance		2001		
Building Permit System		1999		
Subdivision Ordinance		2001		
Strategic Plan		1999		

Territory Covered by Zoning
Municipality Yes **County** Yes
Source: City Administration

Industrial Lands
Does the Community seek industrial development? Yes
Access Statewide industrial lands database—http://www.oregonprospector.com/
Source: Economic and Community Development Department

Special Districts and Associations (ports, water, sewer, etc.)
Name of Special District and the Oregon Revised Statute it was created under:
Malheur County E.S.D.; Malheur County S.W.C.D.

Special Districts Association of Oregon—727 Center St., NE Salem, OR 97301, 503–371–8667 or 800–285–5461 http://www.sdao.com/
Source: City Administration

Infrastructure/Transportation

Water Supply

Operator: City of Ontario
District: N/A
Source: Ground Water Surface Water; Snake River, 8 wells
Supply: Treated; Capacity (MGD)–11.00; Pressure (PSI)–75.00

Current Water Utilization on Meter Size (MGD): 4.40-9.70 MGD
Water Costs per thousand gallons: Base rate per/thousand = $6.58 0-4,000 gallons
Water Costs for Total Consumption of Residential: Based on 7,000 gallons = $9.24

Age of Water System: 1910

Water System Comment(s): Hook up Fee: actual cost of material + labor + 15% administration costs.

Compliance Issues: Yes

Water debt repayment included as part of tax assessment? No

Date of Current Master Plan: 2002

Plans for Upgrading or Expanding: City is currently working on designing a 4MGD water treatment plant expansion, as well as construction of a major supply line upgrade to the west side of town.
Source: City Administration

Wastewater Treatment System

Operator: City of Ontario **Age of Wastewater Collection System:** 1958
District: N/A

System Design Capacity (MGD): 3.06 MGD **System Utilization (MGD):** 1.90 MGD
Collection System Fees: $35.29 (1 ERU) at 7,700 gal/mo. **Hook-up or Connection Fee:** *
Access Fee or System Development Fee: Resolution of intent adopted 1997.

Comment(s) on Wastewater System: *material + labor + 15% + $10.00 inspection fee. Major system improvement project completed in 1995 and 1999.

Compliance Issues: None

Date of Last Facility Plan: 1997

Plans for Upgrade/Expansion:

Storm Drain: Yes **Storm Water Discharge Fee:**
Fees or issues related to storm drains: Residential: $1.16/month; Business: $6.41/month (sq. ft. impervious area divided by 2,500 times $1.10 = monthly fee)
Source: City Administration

Utilities

Telecommunications

Is there access to broadband infrastructure? Yes	**Access**	**Monthly Fee**	**Other Fee**
If yes, check all that apply: Microwave Fiberoptic	**T1** Yes		
	DSL Yes		
Is there route diversity? Yes	**Cable** Yes		

For Oregon Telecommunications information and resources, visit http://www.oregon4biz.com/inn.htm.

Natural Gas—Provider: Cascade Natural Gas Corp.
Lines and Feed:

Rate Structure: Cost per therm: Residential: $.91034, minimum $3.00 Commercial: $.81773, minimum $3.00 Industrial: $.7796900, minimum $12.00

Plans for Upgrade/Expansion:

Electrical—Provider: Idaho Power Company
Lines and Feed:

Rate Structure Residential: First 300 kwh $.038766/kwh, 300 kwh+ $.048164/kwh Customer Charge per meter per month $4.00
Commercial: $5 per meter per month single phase; $10 per meter month 3 phase
$3.81/kw and .031986/kwh
Industrial: $10 per meter per month
$3.81/kw and .0311234/kwh

Plans for Upgrade/Expansion:

Solid Waste Management: Ontario Sanitary Service

Permit Status:

Utility Expansion Plans:

Utilities Source: City Administration; PGE information supplied by PGE. Note: We update utility rates periodically. Actual rates may change more often than that. For the most current rate for any carrier please consult the Public Utilities Commission web site at http://www.puc.state.or.us/commsion/default.htm Click on the **Statistics 200x** label (x being the most recent year).

Transportation

Highways I-84 N/w/SE route, local; Hwy 20 W route, local; Hwy 26 W route, local; Hwy 201 N/S route, local **Transportation Access Fee:** $0

Community Air Service Yes	Ontario Municipal Airport	**If no local service, list closest Air Facility**
Air Passenger Service: No		
Airport Freight Service: Yes	FedEx, UPS	Boise, ID

Air Service Comments: Navigation Aids: NDB; Runway Dimensions: 14/32: 4,531' x 100'; Runway surface: asphalt, fair condition; Operations: 17,000 flights/yr.

Rail Service: Yes Union Pacific
Freight Service: Yes **Passenger Service:** No
If no local service, list closest Rail Service: Passenger: Pasco, Salt Lake City

Marine No

Transportation issues which might confront development, such as non-attainment air shed, etc.:

Public Transportation Comment:

Bus Service Available in the Community: Yes Greyhound, City of Ontario bus
Scheduled Bus Service Available: Yes **Buses Per Day:** 4
Local Charter Services: No
Distance to Nearest Bus Service:

Trucking Service
Scheduled Freight Carrier Services: Yes Eastern Oregon Fast Freight and UPS
Overnight Express Parcel Service Available: Yes Fedex, Roadrunner, Airborne Express, UPS, Post Office
Overnight Express Mail Service Available: Yes
Transportation Comments:

For more information relating to transportation topics please visit the Department of Transportation web site. Airports (maps and general information) http://www.tripcheck.com/About/airport.htm; Bicycle and Pedestrian Route information http://www.tripcheck.com/About/bicycle.htm; Public Transportation, bus and rail http://www.tripcheck.com/About/busrail.htm.

Source: City Administration, local chamber of commerce (proprietary information)

TO BAKER CITY R. 47 E. | TO HUNTINGTON | R. 5 W.

TO PAYETTE (IDAHO)

T. 17 S. | T. 18 S. | T. 9 N. | T. 8 N.

TO VALE R. 47 E. | TO CALDWELL R. 5 W.

LEGEND

FUNCTIONAL CLASSIFICATION — STATE / OTHER

FOR FURTHER FUNCTIONAL CLASSIFICATION INFORMATION, CONTACT O.D.O.T. REGION OFFICE.

- INTERSTATE
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- URBAN COLLECTOR / RURAL MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD
- ORE. ROUTE – US. ROUTE – INTERSTATE ROUTE
- NATIONAL HIGHWAY SYSTEM ROUTE
- URBAN GROWTH BOUNDARY
- CITY LIMIT
- AMTRAK RAIL PASSENGER STATION
- BRIDGE
- GRADE SEPARATIONS : STATE – OTHER FUNCTIONALLY CLASSED – LOCAL ROAD

- PUBLIC BUILDING
- COURTHOUSE
- CITY HALL
- ARMORY
- POST OFFICE
- SCHOOL
- LIBRARY
- SAFETY REST AREA
- WEIGH STATION
- PARK & RIDE LOCATION
- INTERCITY – CITY TRANSIT
- COMMERCIAL – GENERAL AVIATION
- AMTRAK STOP – PORT FACILITY
- GRAVEL PIT – QUARRY – ODOT STOCKPILE SITE

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GEOGRAPHIC INFORMATION SERVICES — OREGON DEPARTMENT OF TRANSPORTATION

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NORTH

"This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information."

SCALE

750 0 750 1500 FEET

225 0 225 450 METERS

ONTARIO
Population 11,200 *

T. 17-18 S. R. 47 E. W.M.

OREGON TRANSPORTATION MAP

Showing Functional Classification of Roads
City of

ONTARIO

PRELIMINARY COPY SUBJECT TO CORRECTION

MALHEUR COUNTY
2004

PARK & RIDE | INTERBUS | AMTRAK — AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

PORT | AIRPORT | COMM. AIR — AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

Copies available from the Oregon Department of Transportation, Map Distribution Unit, Mill Creek Office Park, 555 13th St. NE, Suite 2, Salem, Oregon 97301–4178, Telephone (503) 986–3154, http://www.odot.state.or.us/tdmappingpublic

* Based on current Oregon Population Report, College of Urban and Public Affairs, Portland State University, http://www.upa.pdx.edu/CPRC.

ONTARIO - MALHEUR COUNTY

City of Vale
Jurisdiction Addendum

Addendum Overview

The City of Vale elected to participate in the planning process for the Malheur County Multi-Jurisdictional Natural Hazards Mitigation Plan by developing a supplemental Jurisdiction Addendum ("City Addendum"). This city addendum is designed to provide any city-specific hazard risk information for where it may differ from the county's assessment.

Multihazard Requirement §201.6(a)(3): *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process.*

This addendum documents the city's participation in the process.

Multihazard Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

This addendum documents the city's risks where they vary from risks facing the planning area (the county).

Multihazard Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

This addendum documents any action items specific to the city. The city also wishes to participate in several multi-jurisdictional action items as listed in Section 4: Goals and Action Items.

Attachments

- Hazard Mitigation City Addendum Work Session Summary
- ODOT map of Vale
- FEMA FIRM map of Vale *(no digital copy available; hard copy located in Natural Hazards Mitigation Plan file folder in Malheur County Planning Department)*
- Oregon Blue Book City Profile
- Meeting documentation (*no digital copy available; hard copies of agendas, minutes are located in Natural Hazards Mitigation Plan file folder in Malheur County Planning Department*)
- City-specific Action Item worksheets (Also see Section 4 for multi-jurisdictional AIs for which Vale is a partner city)

Information Overview

The city of Vale opted to participate in the county planning process meetings rather than schedule a separate city work session. Vale thus had city representation at each Steering Committee meeting; the Malheur County Hazard Mitigation Project Coordinator collected Vale-specific hazard and asset information from these meetings for the city's addendum.

In addition, the Coordinator met with several Vale city officials individually to further assess the jurisdiction's risks and develop community-specific action items. This information is collected and summarized below in a format similar to that of cities which scheduled a city work session.

City Participants

The following individuals with professional experience in Vale participated in the development of the Vale city addendum through Steering Committee meetings, other community meetings, or in individual interviews with the Coordinator:

- Brent Barton, City Manager
- Ted Hesse, Fire Chief
- Bill Lawrence, Mayor
- Mick Pressly, Public Works Director
- Craig Smith, Malheur Co Emergency Services Cmdr

Hazard Analysis

When assessing the county's hazard risks, the Coordinator engaged with Vale representatives to compare Vale's risks to the county's overall risk assessment. The following information is a summary of the information collected from this process.

Flood

The working group determined that the city's flood risk is high for probability and moderate for vulnerability, which is equal to the county's high probability and higher than the county's low probability due to the fact that the city is adjacent to the Malheur River and has a history of flooding. Mild to moderate flooding has historically been a frequent occurrence, but severe floods have not occurred as often. A FEMA FIRM map of the city's floodplain areas is included in this addendum.

National Flood Insurance Program participation: according to FEMA, Vale has 6 active flood insurance policies totaling $1,057,500 in value as of 2000. Seven single losses have been claimed, totaling $13,036; no repetitive loss claims have been filed.

Spring runoff flooding on the Malheur River is the biggest flood concern for flood events in Vale, but the city itself has not experienced severe flooding since 1957. After that flood the Army Corps of Engineers installed dikes to manage the river and prevent another disastrous flood event. Dikes on the Malheur River get inspected annually for safety and soundness by the Army Corps of Engineers; so far there have been no problems. More recent historic floods have caused road blockages and minor problems with the city's stormwater system. The city would like to replace a faulty storm valve that has led to flood concerns in the vicinity of the school district's bus shed.

The Malheur River is the major flood source in the city. Its flow can be affected several miles upstream of Vale by Bully Creek, which has its own dam and an irrigation reservoir and ultimately flows into the Malheur. Flooding has not occurred on Bully Creek for nearly 30 years.

There is a National Weather Service gauge on the Malheur River downstream of Vale, which provides an approximation of the frequency of flood events on the river; however, official city records on past flood events are limited. The NWS would like to have another gauge on the river, several miles upstream from Vale, for better flood measurements and for more advance warning for residents – since the current gauge is downstream of the city, it does not help local officials be warned of potential flood conditions quickly enough.

River	***Flood State***	***Years Measured***	***# of Floods***	***Frequency***
Malheur at Vale	11 ft	1926-2006	5	Once every 16.2 years

Source: National Weather Service

The following hazard history was taken from the county Flood Hazard Summary in Section 3 and provides the best available record of flooding in Vale. See the Flood Hazard Summary for source information.

2006, January, April	Malheur	Vale	N/A	Moderate flooding, roads blocked by high water, agricultural fields flooded
1993, March	Malheur	Vale	$550,000	Moderate flooding in cities and unincorporated areas; Highway 20 under water, erosion
1983, March	Malheur	Vale	N/A	Mild flooding; one house surrounded by water
1982, February	Malheur	Vale	N/A	Moderate flooding; one bridge damaged, 4 homes flooded,

				agricultural fields flooded
1978, April	Malheur, Bully Creek	Vale, Bully Creek Res.	$46,000	Moderate flooding
1971, January	Malheur	Vale area	N/A	Moderate flooding
1963, February	Malheur	Vale area	$1,527.78	Winter weather, flooding
1957, February	Malheur,	Vale	N/A	Severe flooding; Vale business district inundated, agricultural fields flooded, irrigation canals destroyed, cattle drowned, 2 bridges washed out, 40 homes inundated.
1952, March, April	Malheur,	Vale	N/A	Severe flooding; bridges and railroads under water, 6 families evacuated.
1910	Malheur	Vale	N/A	Severe "Flood of Record"
1904	Malheur	Vale	N/A	Severe flooding

Wildfire

The working group determined that the city's risk of wildfire is high for probability and low for vulnerability, which is the same as the county's high probability and lower than its moderate vulnerability. The city and its surrounding area is considered a Wildland-Urban Interface area by BLM, but fires occurring within city limits or threatening the city itself are infrequent.

The city does have a high probability ranking because fires on rangeland hills outside of city limits occur frequently. These events do not generally threaten the city itself, but they can be a risk for citizens living within 3-5 miles outside of city limits, many of whom work or do business in Vale.

The city has a volunteer fire department which can be stretched thin because Vale also assists several surrounding rural unincorporated communities through Mutual Aid Agreements, including Harper, Brogan, and Ironside.

The County is currently developing a Community Wildfire Protection Plan, which will help further identify the city's vulnerability to wildfire. See Section 3, Wildfire Hazard Summary, for more information on the CWPP process.

Drought

The working group determined that the city's risk of drought is high for both probability and vulnerability, which is the same as the county's high risk. Because of the predominance of ranching, farming and other agricultural activities as a major economic force in the city, the economic impacts of drought are significant both for those individuals and for city businesses, which support and are supported by the agricultural community in the city's vicinity. The city falls within the

boundaries of Warm Springs and Vale Irrigation Districts for irrigation water, but most agricultural activity takes place just outside of city limits. Several Warm Springs irrigation canals pass through the city. Because drought declarations are made on a county scale, see Section 3, Drought Hazard Summary, for a record of drought history in Malheur County.

Severe Weather

The working group determined that the city's risk of severe weather (windstorm, winter storm, thunderstorm/hail) is similar to the county's, with some exceptions:

Winter storms: probability is moderate, like the county; vulnerability is moderate, rather than high. The city has had no major problems with severe winter storms in recent history. Historically, significant winter storms have caused power outages, road closures, and infrastructure damage, but these severe events are infrequent.

Because of the infrequent nature of severe winter storms in Vale, the city does not maintain sufficient equipment to clear and maintain roads made impassable by snow or ice. This can have an impact on local businesses and schools, in addition to truck and passenger vehicle traffic on Highway 20

Windstorms: probability is moderate, lower than the county's high ranking; vulnerability is low, the same as the county. Windstorms are a rare event in Vale, but they can and have occurred. Damage in the city has not extended beyond downed trees and debris.

Thunderstorms/Hail: probability is high, vulnerability is low, like the county. Impacts to the city are similar to those in the rest of the county, with the greatest risk being to row crops and the economic impacts this can have on farmers who live in Vale. Participants recalled no thunderstorm-induced flash floods in the city.

Official record of past severe weather events is not kept on a city-specific scale; for a summary of county events, see Section 3: Severe Weather Hazard Summary.

Earthquake

The working group determined that the city's risk to earthquake is moderate in probability (same as the county) and moderate in vulnerability, higher than the county's low risk. Like the county, much of the city's critical infrastructure, including public works facilities, city hall, and numerous downtown buildings (some on the National Historic Register), are almost exclusively un-reinforced masonry, which is especially vulnerable to seismic events. Information on specific buildings' estimated seismic resistance, determined by DOGAMI in 2007, is available in the Earthquake Hazard Annex.

The original, oldest wing of Vale Elementary School, a 3-story structure, was damaged by the 1984 Borah Peak earthquake in Idaho (see Section 3: Earthquake Hazard Summary for more information on this event). This part of the structure, while still standing after the earthquake, had to be vacated and ultimately demolished due to damages and safety concerns.

Landslide

The working group determined that the city has a low probability of landslide, lower than the county's moderate probability. Vale has a low vulnerability to landslides, the same ranking as the county. The city has had no problems with landslides in city limits in known history and is located in a generally stable area.

Volcanic Event

The working group determined that the city's probability of and vulnerability to a volcanic event is low, which is the same as the county's risk. Were a volcanic event to occur in the Cascades region of Oregon, Vale could be at risk for ash fall, depending on the severity of the event and the direction of the wind. The city experienced minor ash fall in 1980 after the eruption of Mt. St. Helens. Like the rest of the County, the city has an approximately 1 in 5,000 chance annually of experiencing ash fall from a volcanic event (see the County plan, Section 3: Risk Assessment, for more on this event).

Issue Identification

In an effort to identify potential action items, Vale participants in the planning process completed an issue identification exercise to identify hazard related issues related to: critical facilities & infrastructure, human population, cultural & historic resources, economic assets, and environment & land use. A summary of this exercise is included below.

Critical Facilities & Infrastructure

- One health clinic and one food pantry.
- The city has a volunteer fire department that also responds to calls from surrounding unincorporated communities.
- Elementary, Middle, and High School in city limits.
- The county courthouse (located downtown) serves as the main emergency shelter for the city; several local churches are also informal shelters.
- Water treatment facility is located by the river but has high-bermed lagoons to prevent flooding.

Population

- The city's population is comparable to the county in terms of vulnerable populations; it has one assisted living facility.
- Some tourism; visitors come through for hunting season and to see the Oregon Trail mural series downtown.

Economy

- Locally-owned businesses are important and predominate.
- Business community is closely tied to the farming and ranching community.

- Agriculture (farming, ranching), light industrial (agricultural processing, diatomaceous earth processing), local government (county and city), federal government (BLM) and education (school district) are the major local employers.

Environment and Land Use

- Most land use in city is residential, in addition to a downtown commercial district and some light industrial use along the railroad line on the north side of the city.
- Malheur River borders city to the south and east.
- Most land surrounding the city is agricultural land and BLM land.

Cultural and Historic Resources

- The city is located on the historic Oregon Trail.
- Festivals and events draw large crowds: Vale 4th of July Rodeo, Annual Fire & Ambulance Steak & Crab Community Feed.
- The downtown business district has several buildings listed on the National Register of Historic Places:
    - First Bank of Vale
    - Oregon Trail Historic District
    - Vale Drug Store
    - Vale Hotel and Opera House
    - Rinehart Old Stone House (serves as a history museum)
- Aquatic Center

Proposed Action Item:	**Alignment with Plan Goals:**
Replace faulty flapper valve and head gate valve in storm drain near the city school bus shed. [VALE]	Protect Infrastructure, Safeguard Economy

Rationale for Proposed Action Item:

Vale Public Works Director reported a flood hazard in the city due to a faulty flapper valve and head gate valve on a storm drain on the south side of the city near the aquatic center and the school district bus shed.

In flood events, these valves do not work properly and allow water to back up through the storm drain, where it can flow out into the bus shed. This has happened during most flood events in the past 20 years. Thus far the water has not risen enough to force the school district to move the buses, but it is a concern for the district and for the public works department.

The city is currently only able to employ stopgap measures (plywood and gravel laid over the drain) until the valves can be replaced.

Ideas for Implementation:

- Replace faulty flapper valve and head gate valve to allow proper storm water drainage into the Malheur River.

Coordinating Organization:	*Vale Department of Public Works*

Internal Partners:		**External Partners:**
City of Vale		
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	*N/A*

Form Submitted by:	

Vale Community Profile

252 B Street, West, Vale, OR 97918
Phone 541-473-3133 • Fax 541-473-3895
Web Page http://www.ci.vale.or.us/

City Location

map locating city location

County(ies): Malheur **Incorporated in** 1889
Location: Northeastern Oregon, 12 miles west of the Oregon/Idaho border
Nearest Major Highway and Distance: I-84 | 17 miles
Nearest Major City and Distance:
Ontario | 16 miles, Estimated Drive Time: 20 minutes
Distance to Portland: 400 miles

Source: Oregon Department of Transportation, State of Oregon Map; Oregon Blue Book

Recreational Amenities

Vale Municipal Pool, Vale 4th of July Rodeo, Malheur Gun Club, 18 expertly painted murals depicting Oregon Trail Life, the Emma Humphrey Memorial Library, Bully Creek County Park, playground, rodeo grounds, group picnic facilities, Historic Downtown, museum, baseball and softball, soccer, horseshoe pits, trap shooting, hunting, fishing.

Planning a vacation or a tour through an area of Oregon? Visit the Oregon Tourism Commission's web site at http://www.traveloregon.com/ for more information.

Source: City Administration, local chamber of commerce, local convention and visitor bureau

Climate

Elevation: 2,244' **Measurement Location:** Vale

Temperature:
Monthly Ave. Low: 18°F Monthly Ave. High: 94°F
Hottest Month: July Coldest Month: January
Driest Month: July Wettest Month: December
Average annual precipitation: 9.770"

Humidity (Hour 10, local time):
Average July afternoon humidity: 34%
Average January afternoon humidity: 77%

Source: Oregon Climate Service

Information in the Community Profiles was derived from many sources, including local, state and federal sources. The Oregon Economic and Community Development Department cannot accept responsibility for errors or omissions. Questions and comments may be directed to the department by telephone 503-986-0123, by fax 503-581-5115 or by email oedd.info@state.or.us.

Profile Topics

Profiles Home Page

Login to update my profile

Demographics

	Population			
	1990	**2000**	**2005**	**2006**
City of Vale	1,491	1,976	1,990	2,050
Malheur County	26,038	31,615	31,800	31,725

Sources: 1990, 2000 US Census; 2205, 2006 Center for Population Research and Census, Portland State University. 0 indicates data is unavailable.

Malheur County	9,926 sq miles	3 persons/sq mile	Sources: figures based on 2006 PSU population estimates; Oregon Bluebook county square mileage

Community Age Groups

	1970	**1980**	**1990**	**2000**
Under 5 years	0	115	122	161
5-19 years	0	330	300	517
20-44 years	0	330	438	658

45-64 years	0	788	266	359
65+ years	0	325	326	281
Median Age	31	0	35	32.3

Source: US Census, 0 or N/A indicates data is not available. Median value is the middle value, not an average.

Housing

Total Housing Units	**1970**	**1980**	**1990**	**2000**	**Median Value of Owner-Occupied Housing, 2000**
City of Vale	390	550	630	730	$67,300
Malheur County	5,896	9,083	10,649	11,233	$86,900

City of Vale 2000 Housing Breakout:

Vacancy Rate:	9.73%	**Median Owner Cost**	
Owner Occupied:	1,059	**(mortgaged):**	$665
Renter Occupied:	562	**Median Gross Rent:**	$411

Source: US Census. Median value is the middle value, not an average.

Also visit Housing and Community Services Web Site:
http://www.hcs.state.or.us/

Economic Development and Employment

Principal Industries of the County(ies):
Malheur County—Agriculture, livestock, food processing

Source: Oregon Employment Department, Covered Employment and Payroll Reports, 1998

Agricultural Products of the Area (Top 3 largest gross farm sales):
Malheur County—Cattle and calves, field crops, vegetable crops

Source: Oregon State University, Extension Economic Information Office

Total Number of Manufacturing Companies in the County:

Malheur County 26

Source: Oregon Employment Department, Covered Employment and Payroll Reports, 1998

Total Number of Manufacturing Companies in the City: 5

Source: City Administration

Economic Indicators

	Malheur County		Oregon		
	2001	**2002**	**2000**	**2001**	**2002**
Population	32,000	32,000	3,421,399	3,471,700	3,504,700
Labor Force	14,867	14,867	1,802,938	1,793,773	1,840,133
Total Employment			1,715,453	1,679,914	1,701,390

Unemployment	1,252	1,317	87,485	113,859	138,743
Unemployment Rate	8.4%	8.9%	4.9%	6.3%	7.5%
Non-Farm Payroll Employment	12,110	11,840	1,606,800	1,596,100	1,572,500
Total Covered Employment	13,128	12,660	1,607,944	1,596,943	1,573,083
Total Covered Payroll ($ thousands county/ $ millions state)	$304,082	$305,914	$52,701	$53,021	$52,989
Ave. Annual Payroll Per Employee	$23,163	$24,164	$32,776	$33,202	$33,684
Number of Business Units	920	913	108,432	111,353	113,097
Total Personal Income ($ millions)	$566,279	$581,883	$94,999	$98,500	$101,358
Annual Per Capita Personal Income	$	$18,608	$27,649	$28,400	28,792
Assessed Value of Property ($ millions)	$0	$1,446	$198,911	$210,435	$219,878
Residential Construction					
Building Permits	42	44	19,877	21,049	22,186
Value ($ thousands)	$6,229	$6,327	$2,533	$2,985	$3,347
Travel Expenditures ($ millions)	$0	$36,400	$6,133	$6,128	$6,208
Travel-Related Employment	0	560	89,800	91,100	90,200

Preliminary Data

Sources: Oregon Employment Department; Center for Population Research & Census, PSU; U.S. Census Bureau; Bureau of Economic Analysis; Oregon Tourism Commission; Oregon Department of Revenue; Oregon Economic and Community Development Department.

5 Largest Employers, Public and Private as of December, 2002

Employer—Product/Service	Number of Employees
Oregon Trail Mushrooms—Mushrooms	155
Malheur County—Government	130
Eagle-Picher Minerals, Inc.—Diatamaceous Earth	68
George's Shop & Rock—Trucking and Sand & Gravel	28
—	

Source: City Administration

Oregon Employment Labor Market Information

This link takes you to the Oregon Employment Department, Labor Market Analysis database. County information can be obtained here. http://olmis.emp.state.or.us/—Click on Regional Information.

Local and Regional Economic Development Organizations

City of Vale—http://www.ci.vale.or.us/	541-473-3133
Malheur County Economic Development—http://www.malheurco.org/	541-881-0327
GEODC Greater Eastern Oregon Development Corporation	541-575-2786

Economic & Community Development Department Regional Development Officer—http://econ.oregon.gov/ 541-575-1050

Source: City Administration, local chamber of commerce, Oregon Economic and Community Development Department

Education/Workforce

Public and Private Schools K–12

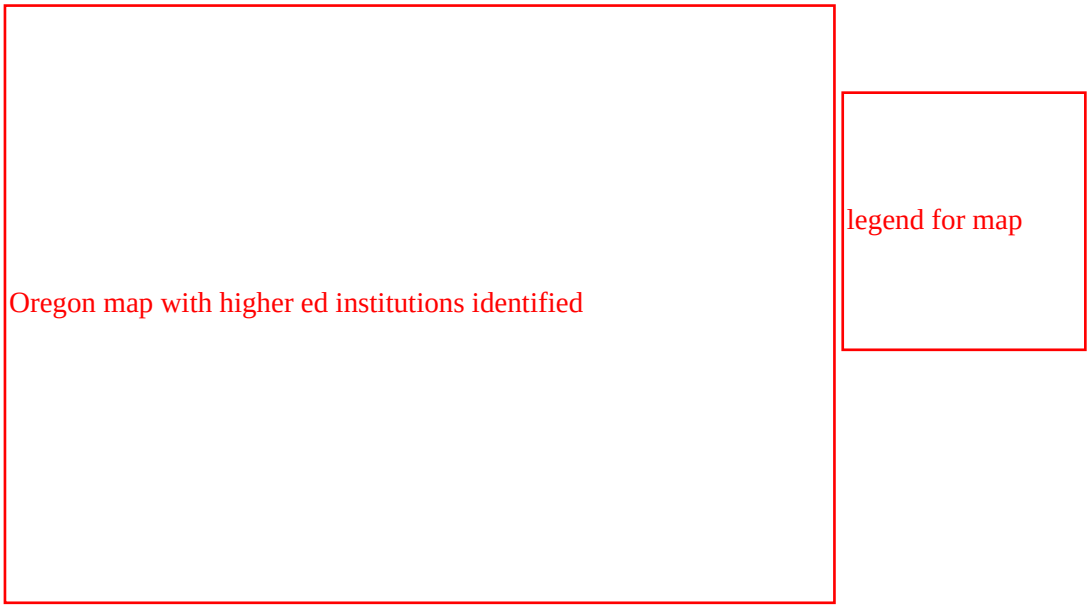
Public School District:
Vale School District 84
403 “E” St W
Vale, OR 97918-1599
Phone: 541-473-3291
Fax: 541-473-3294
Web site: http://www.vale.k12.or.us/

Staff and Enrollments:
District Certified Staff: reported October 2000—68
Total District Enrollment: reported October 2001—1,055

Other Schools in the School District (Private, Parochial)
To see if there are private and/or parochial schools in this district please visit http://www.ode.state.or.us/pubs/directory/

Source: Oregon Department of Education

Oregon Community Colleges and Public Universities



For a list of public and private educational institutions in Oregon visit http://www.oregon4biz.com/ed.htm.

Workforce

Oregon Economic and Community Development Department Workforce Advocate 503–986–0207, or visit http://www.oregon4biz.com/

workforce.htm. Locate local workforce assistance at http://www.worksourceoregon.org/.

Financial Information

Financial Institutions

Commercial Banks: 2 **Savings and Loans:** 0 **Credit Unions:** 1

Source: City Administration

Taxes

Sales Tax Oregon has no general sales tax.

Property Tax
Property—Who pays? Owners of real and business personal property, according to the assessed value of taxable residential, commercial, farm, industrial, utility and timber property.

County assessors use permanent rates set for all taxing districts in fiscal year 1997–98, when taxes were significantly reduced with a statewide average 17 percent cut in tax levies. Certain types of levies are outside this reduction. The tax rates cannot exceed $15 per $1,000 of real market value. For 1997–98, all property was valued by county assessors at 90 percent of the July 1, 1995, levels. For subsequent years, assessed values are limited to a 3 percent annual growth rate. Construction since July 1, 1995, is valued at the average rate of similar properties in the area. Business personal property requires annual filing. One–third payment is due by November 15. If fully paid by November 15, a 3 percent discount is allowed. Special exemptions, tax relief programs and deferrals are available. For more information contact the Malheur County assessor's office at 541–473–5117.

Tax rates are representative of the largest tax code in the city. The rates are expressed as tax liability per $1,000 of assessed property value.

	Malheur County
Average Compressed Tax Rate 1997-98	$12.62
Average Compressed Tax Rate 1998-99	$12.51
Average 1999 Housing Value	$52,414
Ave Res Property Tax Paid on Ave House 1997-98	$645.47
Ave Res Property Tax Paid on Ave House 1998-99	$655.70

Average School rate 1998-99 . . . . . . $6.73

Average Non-School Rate 1998-99. . . . $11.32

Average City Rate 1998-99 . . . . . . $7.68

Business Taxes
Property—see above

Income—Corporations doing or authorized to do business in Oregon pay excise tax. Corporations not doing or authorized to do business, but having income from an Oregon source, pay income tax. For more information contact the Oregon Department of Revenue, 955 Center St., NE, Salem, OR 97301, 503–378–4988, http://www.oregon.gov/DOR/.

Unemployment Insurance—Employers pay this. For 2002, new employers are assigned a fixed rate of 3 percent of taxable wage base. Tax rates for existing employers are based on employers' experience and range from 1 percent to 5.4 percent of taxable wage base. Taxes are paid quarterly and are due by the end of the month following the quarter. In 2002, the tax is paid on the first $25,000 of wages paid to each employee. The rate schedule in effect depends on the balance in the Trust Fund as of August 31 each year and the

amount of revenue needed to maintain the balance at a level adequate to pay benefits. For more information contact the Oregon Employment Department, 875 Union St., NE, Salem, OR 97301, 503–947–1488, web http://www.employment.oregon.gov/.

Utilities, Railroad, Weight-mile—Who pays? All railroads and investor-owned utilities operating with the state pay an annual fee. For-hire and private motor carriers operating into, within and through the state pay weight-mile taxes. Rates—limit of .25 percent of gross operating revenues of investor-owned utilities; .25 percent charged on 2002 revenues. Limit of .35 percent on gross operating revenues of railroads; .267 percent charged in 2002 revenues. Applications, plate fees and per-mile rates dependent on declared combined weight of vehicle. For more information contact the Oregon Public Utility Commission, 550 Capitol St., NE, Suite 215, Salem, OR 97301–2551, 503–378–6611, web http://www.oregon.gov/PUC/; Oregon Department of Transportation, Rail Section, 555 13th St., NE, Salem, OR 97310–1333, 503–986–4125, web http://www.oregon.gov/ODOT/RAIL/; Oregon Department of Transportation, Motor Carrier Transport Branch, 550 Capitol St., NE, Salem, OR 97301–3871, 503–378–6699, web http://www.oregon.gov/ODOT/MCT/.

Incentives
Oregon's Business Incentives.

Other incentives: Enterprise Zone

Miscellaneous
Motor Vehicle Licensing, Driver Licensing, Fuels—Who pays? Owners and operators of motor vehicles. Oil companies importing fuels. Truckers using Oregon highways. Fees—Registration fees, driver license fees and renewals (contact the Oregon Driver & Motor Vehicle Services division 503–945–5000, web http://www.oregon.gov/ODOT/DMV/

Hunting and Fishing Licenses—contact Oregon Department of Fish and Wildlife, PO Box 59, Portland, OR 97207, general information 503–872–5268, licenses/tags/permits 503–872–5275, web http://www.dfw.state.or.us/.

Amusement Device Tax—An excise tax is imposed upon every person who operates an amusement device in Oregon. An amusement device is a video lottery game terminal. More information from the Oregon Lottery Commission, 500 Airport Rd SE, Salem, 97301, web http://www.oregonlottery.org/.

Emergency Communications (9–1–1) Tax—Telephone companies providing local exchange access services in Oregon Collect this tax from their customers. The tax, which is $0.75 per line per month, is reported and paid quarterly. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Hazardous Substance Fee—Paid by possessors of nonpetroleum hazardous substance. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Petroleum Load Fee—Paid by petroleum suppliers and importers to Oregon. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Timber Severance Tax—Paid by timber owners on harvested timber’s value. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Forest Products Harvest Tax—Paid on timber cut from any land in Oregon. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Dry Cleaning Tax—Paid by operators of dry cleaning facilities. More information from the Oregon Department of Revenue, web http://www.oregon.gov/DOR/.

Alcoholic Beverages—Manufacturers and/or import wholesalers of malt beverages and wines pay a privilege tax. Manufacturers, wholesalers and retailers of distilled spirits, malt beverages and wines pay license fees. Employees who serve alcoholic beverages pay for service permits. For more information contact the Oregon Liquor Control Commission, PO Box 22297, Portland, OR 97222, 503–872–5000 or 1–800–452–6522 (in Oregon), web http://www.oregon.gov/OLCC/.

Tobacco Products—Cigarette and tobacco products distributors are required to purchase tax stamps for cigarettes or pay a percentage of the wholesale price on other tobacco products. More information from the Oregon Department of Revenue, web http://www.oregon.gov/

DOR/.

Transit Payroll Tax–paid by employers in the Tri-Met (Portland area) and Lane Transit District (Eugene) for mass transit systems. Administered by the Department of Revenue, web http://www.oregon.gov/DOR/.

Many local governments in Oregon collect other taxes, such as hotel-motel taxes. Contact the city or county in which you are interested for more complete information about taxes in that area.

Source: Oregon Department of Revenue, "A Summary of Taxes," January 2002; County information–County Assessor's Office

Community Services and Resources

Public Safety/Emergency Services

Fire Station(s) serving community: Vale FD, Vale Rural Fire Inc
Number of paid and volunteer firefighters: 15*
Rating by Insurance Services Organization (ISO): 6-0-0*
Comments: *Unreported since 1996; last reported numbers from the city.
Source: Oregon State Fire Marshal, Oregon Fire Service Resource Directory 2000

Police Department: Vale Police Department
Number of paid and reserve officers: 5

Nearest Hospital and distance: Holy Rosary Medical Center, 14 miles in Ontario
Regional Hospital and distance: Holy Rosary Medical Center, 14 miles in Ontario
Emergency services to community: Ambulance Service & Air Life of Oregon
General Clinic(s): 1

Source: City Administration

Communications Resources

Local Newspapers: Malheur Enterprise

Regional Newspapers: Argus Observer, The Oregonian, The Idaho Statesman

Radio Stations: City receives Ontario and Boise, ID, stations

TV Stations: City receives Boise, ID, stations

Available Cable Television: Cable One

Telephone Service Provider(s): Malheur Bell (Ontario)

Local Internet Service Provider(s): Yes
Number of Internet Service Providers: 2
Source: City Administration

Library System
Nyssa Public Library, Ontario Public Library

Source: City Administration

Planning Service/Regulatory

Regulatory System	Year Acknowledged	Year Last Revised	Year of Periodic Review	Comments
Comprehensive Plan	1985	1998	2004	
Zoning Ordinance		1985		
Building Permit System				State of Oregon Uniform Bldg Codes
Subdivision Ordinance		1985		
Strategic Plan				

Territory Covered by Zoning
Municipality Yes **County** Yes
Source: City Administration

Industrial Lands
Does the Community seek industrial development? Yes
Access Statewide industrial lands database—http://www.oregonprospector.com/
Source: Economic and Community Development Department

Special Districts and Associations (ports, water, sewer, etc.)
Name of Special District and the Oregon Revised Statute it was created under:
Pioneer Nursing Home Health District, ORS; Valley View Cemetery District; Warmsprings Irrigation District; Vale Irrigation District, Vale School District

Special Districts Association of Oregon—727 Center St., NE Salem, OR 97301, 503–371–8667 or 800–285–5461 http://www.sdao.com/
Source: City Administration

Infrastructure/Transportation

Water Supply

Operator: City of Vale
District: N/A
Source: Ground Water; Wells
Supply: Capacity (MGD)–1.10; Pressure (PSI)–50.00

Current Water Utilization on Meter Size (MGD): 0.70 MGD
Water Costs per thousand gallons: Base rate per/thousand = $28.22 base + $1.00/usage over 3,000 gallons
Water Costs for Total Consumption of Residential: Based on 7,000 gallons =

Age of Water System: 1932

Water System Comment(s): No System Development charges; Hook up fees for actual time and materials. City plans to drill more wells in order to meet expected increased demand by 2017.

Compliance Issues: None

Water debt repayment included as part of tax assessment? No

Date of Current Master Plan:

Plans for Upgrading or Expanding:
Source: City Administration

Wastewater Treatment System

Operator: City of Vale **Age of Wastewater Collection System:** 1954
District: N/A

System Design Capacity (MGD): 26.10 MGD **System Utilization (MGD):** 14.10 MGD
Collection System Fees: $25.20/mo singe fam* **Hook-up or Connection Fee:** based on actual time & materials
Access Fee or System Development Fee: None

Comment(s) on Wastewater System: Lagoon system comprised of two cells only one of which has ever been used. Designed to handle population of 3,900.

Compliance Issues: Under MAO with Oregon DEQ for lagoon rehabilitation Scheduled reconstruction 2004

Date of Last Facility Plan:

Plans for Upgrade/Expansion:

Storm Drain: Yes **Storm Water Discharge Fee:**
Fees or issues related to storm drains: No fee assessed.
Source: City Administration

Utilities

Telecommunications

	Access	Monthly Fee	Other Fee
Is there access to broadband infrastructure? Yes			
	T1 Yes		
If yes, check all that apply: Microwave Fiberoptic	**DSL** No		
	Cable No		
Is there route diversity? Yes			

For Oregon Telecommunications information and resources, visit http://www.oregon4biz.com/inn.htm.

Natural Gas—Provider: Cascade Natural Gas
Lines and Feed:

Rate Structure: Cost per therm: Residential: $.677060, minimum $3.00 Commercial: $.576860, minimum $3.00 Industrial: $.537050, minimum $12.00

Plans for Upgrade/Expansion:

Electrical—Provider: Idaho Power
Lines and Feed:

Rate Structure Residential: First 300kwh $.038623/kwh, 300kwh + $.058279/kwh

Commercial: @12kw and 1,500kwh/month $78.00; @100kw and 30,000kwh/month $1,287; @ 500kw and 150,000kwh/month $6,393

Industrial: @1,000kw and 400,000kwh/month $13,100; @ 5,000kw and 2,500,000kwh/month $75,715

Plans for Upgrade/Expansion:

Solid Waste Management: City of Vale Sanitation Department

Permit Status:

Utility Expansion Plans: Yes

Utilities Source: City Administration; PGE information supplied by PGE. Note: We update utility rates periodically. Actual rates may change more often than that. For the most current rate for any carrier please consult the Public Utilities Commission web site at http://www.puc.state.or.us/commsion/default.htm Click on the **Statistics 200x** label (x being the most recent year).

Transportation

Highways Hwy 26 NW/E route, local access; Hwy 20 E/W route, local access **Transportation Access Fee:** $0

Community Air Service Yes	Miller Memorial Airport	**If no local service, list closest Air Facility**
Air Passenger Service: No		
Airport Freight Service: No		Boise, ID 76 miles

Air Service Comments: Navigation Aids: NDB; Runway Dimensions: 10/28: 2,200' x 40' (gravel, good condition); 17/35: 3,872' x 65' (gravel, good condition); local charter service available

Rail Service: Yes Oregon-Eastern Railroad
Freight Service: Yes **Passenger Service:** No
If no local service, list closest Rail Service: Passenger Service: Pasco, Salt Lake City

Marine No

Transportation issues which might confront development, such as non-attainment air shed, etc.:

Public Transportation Comment:

Bus Service Available in the Community: No Amtrack Bus Service
Scheduled Bus Service Available: Yes **Buses Per Day:**
Local Charter Services: No
Distance to Nearest Bus Service: Ontario, 16 miles

Trucking Service
Scheduled Freight Carrier Services: Yes EOFF, Yellow, May, Parsons
Overnight Express Parcel Service Available: Yes Fedex, Roadrunner, Airborne Express, UPS, Post Office
Overnight Express Mail Service Available: Yes
Transportation Comments:

For more information relating to transportation topics please visit the Department of Transportation web site. Airports (maps and general information) http://www.tripcheck.com/About/airport.htm; Bicycle and Pedestrian Route information http://www.tripcheck.com/About/bicycle.htm; Public Transportation, bus and rail http://www.tripcheck.com/About/busrail.htm.

Source: City Administration, local chamber of commerce (proprietary information)

OREGON TRANSPORTATION MAP

Showing Functional Classification of Roads

City of

VALE

MALHEUR COUNTY

2004

PRELIMINARY COPY
SUBJECT TO CORRECTION

VALE
Population 1,990 *

T. 18 S. R. 45 E. W.M.

LEGEND

FUNCTIONAL CLASSIFICATION (STATE / OTHER)

FOR FURTHER FUNCTIONAL CLASSIFICATION INFORMATION, CONTACT O.D.O.T. REGION OFFICE.

- INTERSTATE
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- URBAN COLLECTOR / RURAL MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD
- ORE. ROUTE – US. ROUTE – INTERSTATE ROUTE
- NATIONAL HIGHWAY SYSTEM ROUTE
- URBAN GROWTH BOUNDARY
- CITY LIMIT
- AMTRAK RAIL PASSENGER STATION
- BRIDGE
- GRADE SEPARATIONS : STATE – OTHER FUNCTIONALLY CLASSED – LOCAL ROAD

- PUBLIC BUILDING
- COURTHOUSE
- CITY HALL
- ARMORY
- POST OFFICE
- SCHOOL
- LIBRARY
- SAFETY REST AREA
- WEIGH STATION
- PARK & RIDE LOCATION
- INTERCITY – CITY TRANSIT
- COMMERCIAL – GENERAL AVIATION
- AMTRAK STOP – PORT FACILITY
- GRAVEL PIT – QUARRY – ODOT STOCKPILE SITE

PUBLISHED BY

GEOGRAPHIC INFORMATION SERVICES — OREGON DEPARTMENT OF TRANSPORTATION

PREPARED DIGITALLY BY THE
OREGON DEPARTMENT OF TRANSPORTATION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

NORTH

"This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information."

SCALE

400 0 400 800 FEET

125 0 125 250 METERS

PARK & RIDE · INTERBUS · AMTRAK
AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

PORT · AIRPORT · COMM. AIR
AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

Copies available from the Oregon Department of Transportation, Map Distribution Unit, Mill Creek Office Park, 555 13th St. NE, Suite 2, Salem, Oregon 97301–4178, Telephone (503) 986–3154, http://www.odot.state.or.us/tdmappingpublic

* Based on current Oregon Population Report, College of Urban and Public Affairs, Portland State University, http://www.upa.pdx.edu/CPRC.

VALE - MALHEUR COUNTY

FOLD HERE — VALE - MALHEUR COUNTY

FOLD HERE

REV

Appendix A
Planning and Public Process in Malheur County

The following appendix summarizes the public involvement process used in developing this plan for Malheur County. Each event or meeting is documented in summary form. Full text notes, agendas, and other materials are located at the end of the appendix.

Public Process

The Disaster Mitigation Act of 2000 requires:

> • **Multihazard Requirement §201.6(b):** An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:
>
> *(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
> *(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
> *(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*
>
> • **Multihazard Requirement §201.6(c)(1):** [The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

The Coordinator developed a Public Outreach and Involvement Plan in conjunction with the Steering Committee and ONHW designed to fulfill the above requirements and to maximize opportunities for stakeholders and the general public to be involved in the planning process and offer feedback on the plan in development. Documentation of public process in this appendix loosely follows the structure of the original Public Outreach and Involvement Plan. The original memorandum is located at the back of this appendix.

How was the Plan Developed?

See Volume I, Section 1 for a complete description of the overall planning process. In summary: in Fall 2005, the Oregon Natural Hazards Workgroup (ONHW) at the University of Oregon's Community Service Center partnered with the Department of Geology and Mineral Industries (DOGAMI) and the Southeast Oregon Region (Harney and Malheur as well as Jefferson and Lake) counties to develop a Pre-Disaster Mitigation Planning Grant proposal. Each county joined the Partnership for Disaster Resistance and Resilience (The Partnership) by signing (through their County Commissions) a Memorandum of Understanding for this project.

Each community was responsible for facilitating and coordinating the mitigation planning process locally, utilizing the resources provided by ONHW, DOGAMI and other state partners. The community reviewed the resources provided by the various organizations and applied local knowledge, information and data about community characteristics, assets and resources in order to identify potential mitigation actions aimed at reducing the community's overall risk. To aid in these actions, the County worked with the University of Oregon's Community Service Center to hire a full-time RARE (Resource Assistance for Rural Environments) participant to coordinate the planning process. This Coordinator was thus responsible for utilizing local and ONHW resources and facilitating all Plan-related meetings and workshops, in addition to primary drafting of the local elements of the Plan.

How was the Public Involved?

The initial Public Outreach and Involvement Plan was loosely divided into phases, like the overall planning process (See Vol.1, Sec.1): Phases I-IV corresponded with specific quarterly progress goals, and some outreach actions were ongoing. Note: some activities occurred slightly out of their planned phase; this was due to scheduling changes and did not cause any overall disruptions in the process. For each activity described below, documentation materials (where available) follow at the end of the appendix and are labeled by phase and event.

Ongoing Activities

- *Stakeholder Interviews*
  - The Coordinator utilized local resources (interviews, meetings, existing documents, membership lists from local organizations, etc) to compile a list of local stakeholders. The Coordinator then worked with the county Planning Director (Jon Beal) and Emergency Services Commander (Craig Smith) to use the initial stakeholder list to identify individuals with significant local expertise for a Steering Committee (SC). Members were sought from diverse backgrounds and with relevant professional experience. The Coordinator used telephone, email, and in-person communication to solicit participation. Only one of the invited stakeholder organizations (Malheur County Health Department) declined to participate in the SC. (A list of Steering Committee members is available in Vol.1, Sec.1)
  - Based on the original list of identified stakeholders and growing as more were identified through the process, the Coordinator conducted interviews with local stakeholders in government, nonprofit, and private sectors ("Stakeholder Interviews"). These individuals provided additional local expertise and information on hazards and community resilience and vulnerability factors. See the Stakeholder Interview documentation in this appendix for interview summaries and an explanation of the methodology and questions used.

- *Information Dissemination*
  - The Coordinator disseminated relevant hazard preparation and mitigation information to stakeholders, to participants in meetings, and to the public throughout the process. Some materials came from organizations such as BLM; others were developed specifically for the Malheur County plan.

- *The Project Webpage*
  - The County's page on the Partners for Disaster Resistance and Resilience website (www.OregonShowcase.org) served as an outreach tool to the community. The webpage was used to provide local contact information and updates on the planning process. The final adopted and approved plan will be posted on the Partnership website via the University of Oregon Libraries' Scholar's Bank Digital Archive.

- *Household Preparedness Survey*
  - As part of the regional PDM grant, ONHW implemented a region-wide household preparedness survey. The survey gauged household knowledge of mitigation tools and techniques and assessed household disaster preparedness. The survey results improve public/private coordination of mitigation and preparedness for natural hazards by obtaining more accurate information on household understanding and needs. Results of the survey are documented in an independent report in Volume IV, Appendix E.

Phase I Activities (October – December 2006)

- *Steering Committee Meeting #1*
  - Agenda attached.

- *Stakeholder Interviews*
  - Ongoing

- *Press Release/News Story to announce the project.*
  - The Coordinator worked with the county newspaper, The Argus Observer, to publish a story discussing the planning process. (attached)

- *Introductory presentations for organizations that will play a large role in the planning process.*
  - Emergency Management Team
  - Regional Fire Chiefs
  - County Court

- *Project Coordinator attendance at various committee meetings to introduce the project and gather contacts and support.*
  - Owyhee Watershed Council Assessment Committee
  - Rail Lands Committee
  - GIS Committee
  - Planning Commission

Phase II Activities (January – March 2007)

- *Steering Committee Meeting #2*
  - Agenda attached.

- *Stakeholder Interviews*
  - Ongoing

- *Presentations in outlying county cities*
  - The Coordinator met with representatives from each incorporated city in the county to provide information about the planning process and encourage their voluntary participation. Each city decided to complete a plan addendum that includes jurisdiction-specific risk assessment and community resilience information. These addendums, as well as more detailed information on the city planning process, are available in Volume III.
  - Jordan Valley – April 10, 2007
  - Adrian – March 29, 2007
  - Nyssa – February 8, 2007
  - Vale – N/A (had SC participation)
  - Ontario – N/A (had SC participation)

- *Project Coordinator attendance and presentation at civic service groups:*
  - Ontario Kiwanis Club
  - Ontario Chamber of Commerce
  - Four Rivers Hunger Awareness Coalition

- *Project Coordinator attendance at various committee meetings to introduce the project and gather contacts and support.*
  - Owyhee Watershed Council Assessment Committee
  - Rail Lands Committee
  - GIS Development Committee
  - Planning Commission

- *Oregon Emergency Management HAZARD ANALYSIS WORKSHOP*
  - This workshop, conducted with the Malheur County Steering Committee according to OEM methodology, served as a supplemental meeting with a dual purpose: to update Malheur County's Hazard Risk Ratings for OEM and to provide additional hazard risk information for the NHMP.

Phase III Activities (April – June 2007)

- *Steering Committee Meetings #3 and #4*
  - Agendas attached.

- *Stakeholder Interviews*
  - Ongoing

- *Press Release/News Story to update the community on planning progress.* (digital copy unavailable; hard copy on file in Planning Dept)

- *Project Coordinator attendance at various committee meetings to introduce the project and gather contacts and support.*
  - Malheur Community Services Committee
  - Four Rivers Trails & Greenbelt Committee

- *Project Coordinator attendance and presentation at civic service groups:*
  - Ontario Lions Club
  - United Methodist Women
  - Four Rivers Healthy Community

Phase IV Activities (July – August 2007)

- *Steering Committee Meeting #5*
  - Agenda attached.

- *Stakeholder Interviews*
  - Ongoing

- *Distribute the plan to stakeholders and the general public.*
  - Will be completed when the plan reaches final approval stage.

- *Develop long-term communication strategy for keeping the public involved in the action item implementation stages.*
  - Stakeholders interviewed during the planning process will be invited to attend plan update/review meetings.
  - A copy of the plan will be available online and on file at the Malheur County Library and the Malheur County Planning Department.

- *Project Coordinator attendance at various committee meetings to discuss the plan and targeted Action Items.*
  - Malheur Watershed Council

Stakeholder Interviews – Overview and Documentation

The Stakeholder Interview Process

The Coordinator utilized local resources (interviews, meetings, existing documents, membership lists from local organizations, etc) to compile a list of local stakeholders. Based on the original list of identified stakeholders and growing as more were identified through the process, the Coordinator conducted interviews with local stakeholders in government, nonprofit, and private sectors ("Stakeholder Interviews"). These individuals provided additional local expertise and information on hazards and community resilience and vulnerability factors. Transcribed notes from these interviews are available

Stakeholder Interview Questions

A base set of interview questions was developed. This served as a starting point for each interview, with variations, subtractions, and additions made as necessary.

Questions to Ask Everyone

1. Thinking about the kind of work that [your organization] does, what natural hazards do you see as the biggest risks in the county? Why?
2. Can you recall [your organization] being impacted by any natural hazards in recent memory [last 50 years]?
3. Does [your organization] maintain information or data on the impact of previous disasters? [Like lost profits, increased need for services, etc]
4. Do you know of any people or organizations who you think should be involved in this project [or involved in risk reduction in the community in general]?
5. Has [your organization] done any work on its own behalf to reduce its vulnerability to disasters? [If so, what? If not, do you have plans to do so?]
6. Do you feel that you have adequate information about the risk of natural hazards in this area [to protect your business, family, organization, etc]

Questions to Ask Natural Resources People

7. What and where are the significant environmental resources in your area [or under your jurisdiction]?
8. Are there any environmental assets that, if lost or damaged, could have significant long-term economic impacts?
9. What other kinds of impacts besides economic ones might a natural hazard have upon these assets?
10. Who are the other stakeholders on the [natural assets] at risk?

Questions to Ask Human Services People

11. How would you gauge the community's current awareness level of natural hazards in the county? Their preparedness?
12. Are there certain populations within the community that might be at greater risk in the event of a natural disaster?
13. What methods do you use in the community to raise awareness [i.e. Do you have any tips for engaging the community on natural hazard issues]?
14. Are there local cultural or historic resources that are important to different populations in the community? Might they be affected by natural hazards?
15. What key organizations aside from yours would provide aid in the event of a natural disaster?
16. What role would [your organization] have in the event of a natural disaster?

Questions to ask Economic Development People

17. Which businesses would be significantly impacted by the temporary loss of utilities?
18. Which businesses or organizations are dependent on their location and which are capable of relocating?
19. What critical facilities and infrastructure does your community rely on to function?
20. Have they taken necessary precautions against natural disasters? (planning ahead, retrofitting, etc)
21. Are there existing developments in high hazard zones?
22. What are current and future development trends and how might those be affected by natural disasters? (building in floodplains, etc)

Questions to ask County/City Government People

23. How prepared is the [government] to maintain its services after a disaster?
24. Are there any services that could be compromised post-disaster?

Questions to ask Economic Development People

25. Does natural hazard planning/consideration play into economic development in the county?

Stakeholders Interviewed, Phase I-IV

Transcribed notes, some with summaries, are attached.

- Brent Barton, City of Vale, City Manager
- Jay Breidenbach, National Weather Service (Boise), Hydrologist
- Jay Chamberlain, Owyhee Irrigation District, Director
- Norm Collins, Oregon Department of Transportation
- Kathy Daly, City of Ontario Parks & Recreation Department, Director
- Roberta Donovan, City of Nyssa, City Manager
- Ray Dunten, Farm Services Agency, Director
- Paul Flatt, National Weather Service (Boise), Warning Coordination Meteorologist
- Ken Freese, Malheur County Road Department, Director
- Steve Gaschler, City of Ontario Public Works, Director
- Frank Horton, Snake River Correctional Institute, Special Operations Captain
- Jim Jensen, Malheur County Economic Development Dept, Director
- Michelle Kooch, Malheur County, GIS Specialist
- Peter Lawson, Southeast Oregon Regional Food Bank, Program Director
- Jodie Marshall, American Red Cross of Greater Idaho, Emergency Services Director
- Jennifer Martin, Owyhee Watershed Council, Project Coordinator
- Adele Payden, City of Jordan Valley, Recorder
- Lance Philips, Malheur County Soil and Water Conservation District, Director
- Kelly Poe, Commission on Children & Families, Director
- Mick Pressly, City of Vale Public Works, Director
- Jason Simmons, Vale BLM, Fire & Fuels Management Specialist
- Shawn Snyder, City of Adrian, Recorder
- Scott Trainor, City of Ontario, City Manager
- Kelly Weideman, Malheur Watershed Council, Project Coordinator
- Linda White, Holy Rosary Medical Center, Emergency Services
- Brian Wickert, Malheur County Environmental Health, Director

Pre-Disaster Mitigation Plan Steering Committee
Quarterly Meeting #1
December 11, 2006
3:00 PM, Vale Public Library, Vale, OR
Facilitator: Sarah Hackney, Hazard Mitigation Project Coordinator

1. Introductions
2. Briefly Discuss/Define Mitigation
3. Broader Context – County, State, Federal Partners
4. Describe Scope and Timeline of the Planning Process
5. Discuss Current Regional Hazard Profile (ONHW)
6. Create a Mission Statement
7. Briefly Discuss Plan Goals
8. Discuss a Public Involvement Strategy
9. Identify Roles and Responsibilities of the Committee

Agenda

Malheur County Pre-Disaster Mitigation Plan Steering Committee
February 27, 2007, Meeting #2
2:00 PM
City of Ontario Council Chambers, Ontario, OR

1. Introduction [5 min]

2. Quarterly Progress Update: Phase II [15 min]
    a. Mission Statement
    b. Stakeholder Interviews
    c. Regional Profile
    d. Hazard Annexes
    e. Community Resilience Factors
    f. Yearly Progress
        i. Phase II

3. Pre-Exercise Risk Assessment Discussion [15 min]
    a. Disaster Cycle
    b. Understanding Risk

[BREAK]

4. Asset Mapping Exercise [120 min]
    a. Community Asset Identification
    b. Asset Mapping – cities and county

5. Where do we go from here? [20 min]
    a. Materials for Phase II/III
        i. Action Item Worksheets
        ii. Community Resilience Factors table
        iii. Hazard Annex summary (ready in Mid-March)
    b. Feedback
    c. Questions?

Pre-Disaster Mitigation Plan Steering Committee
Quarterly Meeting #3 – OEM Hazard Exercise
April 17, 2007
2:00 PM, Nyssa City Hall, Nyssa, OR

1. **Introductions** (5 minutes)

2. **Planning Process Update**
   (Sarah; 10 minutes)

   a. Risk assessment
   b. Next step: action items

3. **Oregon Emergency Mgmt. Hazard Ranking Exercise**
   (Craig and Sarah; 90 minutes)

   a. Hazard Worksheets
   b. Hazard Prioritization
   c. Questions?

4. **Closing** (10 minutes)

   a. Schedule next meeting
   b. Set risk assessment review timeline
   c. Questions?

Agenda

Malheur County Pre-Disaster Mitigation Plan Steering Committee
May 15, 2007, Meeting #4
2:00 PM
Vale City Hall, Vale, OR

1. Introductions [5 min]

2. Progress Update: Phase III/IV [5 min]
    a. Risk Assessment
    b. Stakeholder Interviews
    c. Action Items

3. Goals for the Mitigation Plan [15 min]
    a. Discuss/review draft goals [handout]
    b. Revise/choose goals

4. Discussion: The Ins and Outs of Action Items [10 min]
    a. What is an action item?
    b. Details of why/how/quantity/type/etc
    c. Explanation of the ONHW/FEMA Action Item Form [handout]

5. Review Draft Action Items [80 min]
    a. Review list of AIs submitted by stakeholders [handout]
    b. Review list of potential secondary AIs [handout]
    c. Review any new AIs brought up in discussion

6. Where do we go from here? [5 min]
    a. Homework
    b. Questions
    c. Feedback
    d. Set next meeting

Pre-Disaster Mitigation Plan Steering Committee
Quarterly Meeting #5 – Plan Implementation
July 17, 2007
2:00 PM, Ontario City Hall, Ontario, OR

1. **Introductions** (5 minutes)

2. **Implementing the Plan** (20 minutes) *(handout)*

    a. Plan adoption process PART 1
        i. July – August 2007
    b. Plan adoption process PART 2
        i. September – December 2007
    c. Final approval and adoption
        i. Winter 2007-8
    d. Moving forward after adoption
        i. 2008 - ?

3. **Action Items** (20 minutes) *(handout)*

    a. How do we move an action item forward?
    b. Project prioritization
    c. Existing plans and policies
    d. Funding sources
    e. Review final list, open discussion

4. **Post-Adoption Plan Maintenance** (20 minutes) *(handout)*

    a. FEMA's maintenance requirements
        i. Updates
        ii. Meetings
        iii. Public Involvement
        iv. Success Reporting
    b. Local responsibilities

5. **Closing** (5 minutes)

    a. Last questions, comments
    b. Anything else?

Stakeholder Interview transcribed notes and summaries

Stakeholder Interview

Date: February 8, 2007
Name: Brent Barton
Title: City Manager
Organization: City of Vale

Summary

Vale has a history of significant flooding from the Malheur River, but this has become less of a concern after the installation of Army Corps of Engineers dikes in 1958 after the major flood of 1957. The city has some minor drainage and flooding concerns that could easily become action items.

Hazard Resources Available:

- Floodplain maps (FEMA)
- Floodplain ordinance
- Building codes (contracted through Inspections, Inc.)

Hazard Areas of Concern:

- New sewage lagoons – located near river, could be at risk in high water events, need to check into this.
- Drainage/flood issues near the school district bus shed in high water events.
- Inadequate volunteer fire/ambulance response personnel.
- Response is also stretched thin because Vale assists rural unincorporated areas – Harper, Brogan, Ironside, Juntura.

General Notes

Brent Barton is the city manager for the city of Vale. He met with Sarah Hackney to discuss Vale's participation in the county Plan and known hazard vulnerabilities within city limits. Barton attended Steering Committee meetings in February and May as Vale's official representative and will be the main liason in the development of a city addendum for Vale.

Stakeholder Interview

Date: June 28, 2007
Name: Kathy Daly
Title: Director
Organization: City of Ontario Parks & Recreation Department

Summary

The city of Ontario's Parks & Recreation Department is currently working on developing a greenbelt around the city of Ontario that will encompass almost the entirety of the city's

interface areas with the Snake and Malheur rivers. The project is currently in its initial development phase, with progress projected to last several years. The current first piece of the greenbelt is located on the north side of town along the Malheur River. Most of that land is already owned by the city, but there is one small parcel which will need to be purchased or arranged through an easement. The first section of the greenbelt will technically be open by September 2007 but the parcel mentioned above does not need to be purchased before that time. As subsequent sections of the greenbelt come into development (paths, amenities, etc), the department may identify flood-prone riverfront parcels that would be ideal for the greenbelt location.

Hazard Areas of Concern:

- The proposed city greenbelt is for the most part located along the Malheur and Snake rivers, on flood-prone riverfront parcels. A greenbelt would serve a dual purpose as a valuable recreation site and flood mitigation service.

General Notes

Kathy Daly is the Parks & Recreation Department Director for the city of Ontario and oversees the city's parks and recreation facilities in addition to working on new initiatives such as the city greenbelt. She met with Sarah Hackney to discuss the city's greenbelt plans and how these might also serve as flood mitigation for the city. Further development of the city greenbelt in flood-prone riverfront areas will be included as an Action Item in the NHMP.

Stakeholder Interview

Date: January 30, 2007
Name: Paul Flatt, Jay Breidenbach
Title: Warning Coordination Meteorologist, Hydrologist
Organization: National Weather Service, Boise, ID

Summary

The National Weather Service branch in Boise, ID serves as the regional weather service for the entirety of Malheur County, in addition to Harney and Baker counties in Oregon and all of Southwestern Idaho. NWS gathers extensive data on weather events in the region (winter storms, thunderstorms, lightning, drought, etc) and on flood events. In addition to collecting and archiving this data, NWS issues severe weather hazard warnings via EAS to local media outlets and police dispatches.

Hazard Information Available:

- Extensive archives on all weather and flood events in Malheur County
- Access to other hazard data (volcanic, seismic)
- Communication resource

Hazard areas of concern:

- NWS would like to see another river gauge installed on the Malheur River, as the only one is located downstream of Vale. Another gauge would allow for more information and great lead time in the event of an evacuation due to flooding.
- NWS has minor concerns re: Owyhee Dam, given the implications of dam failure.

General Notes

NWS will be a valuable resource – they are helpful and willing to assist the Coordinator in gathering necessary data from their archives. They may also be a source of further action item suggestions.

Stakeholder Interview

Date: June 18, 2007
Name: Steve Gaschler
Title: Director
Organization: City of Ontario Public Works Department

Summary

In general the city of Ontario's Public Works systems are in good working order and not especially vulnerable to natural hazards. Flooding is the director's biggest concern, as floods in and around Ontario have the potential to overload the city's stormwater system and wastewater plant. However, the city wastewater treatment facility has not been threatened by floodwaters in over 20 years (1975-1985 is the last known time a flood event threatened the facility) and the city's other systems have not sustained any past impacts. The Public works department is also looking to update its development ordinances to limit post-development stormwater runoff to pre-development conditions.

For future mitigation and general infrastructural improvements, the city intends to use the recommendations in its Stormwater Master Plan (SMP) as a guide. This list is included in the Malheur County NHMP.

Hazard Areas of Concern:

- The 2003 SMP lists prioritized recommendations for system improvements based in part on flood concerns. These recommendations include increasing pipe sizes, installing desiltation basins, and maintaining wetland and open space buffers around key water management areas.

General Notes

Steve Gaschler is the Public Works Director for the city of Ontario and oversees the city's stormwater, drinking water, and waste water facilities, in addition to the city's streets, building codes, and planning departments. He met with Sarah Hackney to discuss the city's Stormwater Master Plan (SMP) and overall vulnerability to natural hazards. The Public Works department does have some mitigation projects identified in its SMP and these are also identified as Action Items in the Malheur County NHMP.

Stakeholder Interview

Date: January 22, 2007
Name: Frank Horton
Title: Special Operations Captain

Organization: Snake River Correctional Institute, Ontario, OR

Transcribed Notes (Summary Unavailable)

Their perimeter blocks fire – have roads and gravel.
5-6 years ago they had a fire and only had a little outbuilding damage. That's the only fire since the facility was built (~ 1995).

3,000 beds. 2970 today, usually almost full.

Newest parts of the building came online in 2002, up to date re: hazard safety. Parts of it have been open since 95. 2 generators, good for several days. Water comes from the city.

Biggest issues: pandemic, toxic spill or anything else requiring EVACUATION. Evac would be very tough. Have MOUs for buses from schools, plus Nat'l Guard.

No MOUs with city/county, though.

Above the floodplain
Feels like they have good hazard info, but would always be happy to have more communication, more information.
Have bank of batteries for critical structures if generators go out. And do have good network of backup generators.
Frank is the only emergency mgmt guy but all staff has basic training.
Doesn't know anything about quake retrofits – as far as he knows they are up to code.

6 sets of emergency plans on site – for each command center. Extensive planning re: incident command structure, communication, incident reporting, etc etc.

Have great Emergency Plan. Also have emergency checklists so than anyone can pick one up and make sure things are getting done right.

Randy Geer in Salem is their state contact. Makes sure they are in line with all other state prisons, they also have cooperative agreements with other prisons re: resources/staff/transportation etc.

Have callout system for employees.
Have had inmates make sandbags for flooding in the county (not on site)

Informal agreement that SRCI staff can still utilize I-84 to get to work even if it's closed due to weather. That can happen 1-2 x/yr.

Snowstorm hazards – has stopped vehicles before with big drifts. They have their own plows, though. Have food on stock for a week, plus MREs if necessary.

Water is only utility tie to the city, really.
Whole staff has emergency ops training. 1,000 staff.
They are ok for special populations – have facilities for handicapped, mentally ill, etc. if injured, first go to infirmary there, then to holy rosary in Ontario.

Have inmate fire crews – both to manage anything that might come up on site and also they contract out with ODF. Have equipment too.
Generally Frank thinks they're pretty well set. The one he could use more info on is a medical outbreak.

Stakeholder Interview

Date: January 10, 2007
Name: Michelle Kooch
Title: GIS Specialist
Organization: Malheur County

Summary

Malheur County's GIS data is a system very much in progress. The county does not currently have any comprehensive hazard mapping, but some of the data from which to develop hazard maps are available – natural resources, roads, dams, etc.

Hazard Resources Available:

- Natural resource data sets
- Some county infrastructure data sets (dams, roads)
- Base maps and tax lot data
- Some historical fire data is available from BLM and may be digitized
- County, City, and BLM data can be combined

Hazard Areas of Concern:

- Floodplain maps not yet available in digital form
- Smaller cities in the county (Nyssa, Adrian, Jordan Valley) without GIS staff are lacking even basic GIS mapping.
- County does not have maps of most utility infrastructures (power lines, irrigation pipes, etc)

General Notes

Michelle Kooch is the county's GIS specialist. She met with Sarah Hackney to discuss the county's GIS resources, especially regarding natural resources and hazards. She will attend the January Oregon Natural Hazards Workgroup Training and is willing to help with mapping county natural hazards as needed (as long as the information is available, given the county's in-progress state of GIS data). For the scope of this project, advanced GIS mapping of natural hazards will likely not be possible. However, should the desire arise in the community for more sophisticated hazard mapping, it should be written into the plan as an action item. The coordinator will discuss this option with the Steering Committee in February.

Stakeholder Interview

Date: January 26, 2007
Name: Peter Lawson
Title: Project Developer

Organization: Southeast Oregon Regional Food Bank, Ontario, OR

Transcribed Notes (summary unavailable)

The SE OR branch of OFB has only been around in its current form for 2 years.
Originally food bank/food pantry stuff was run by the Malheur County Council o nAging – not too effective, had internal problems, OFB tried to help, still had issues, bad communication. They decided to just start their own warehouse and invest in the infrastructure out here.
Ontario pantry is adjacent to Episcopal church, close to warehouse. Warehouse not set up for indiv handouts, mostly caselots which go out to pantries

They take anything and everything – get all kinds of product.

500,000 lbs first yr
700,000 lbs this yr
Want to make it to 1,000,000 lbs in the next few yrs
2,500 ppl served monthly

Fresh Alliance Program – local Albertson's used to toss out its near-expiration fresh foods but now they get some of it. Started in Sept, have already done 10,000 lbs product.
Distribute product to the local food pantries (4) and other orgs like project DOVE (6).

Only have stats for food given to pantries due to USDA methods.

Aren't currently doing anything with state agencies re: disasters. Informally known that they will help out if they can.

Have 3 pallets of FEMA boxes – which have 1-2 days worth of food for one person.

Have folks from DHS, SRCI, etc on the board.
Nothing with local Red Cross yet, but other parts of state have worked w/ Red Cross
Good ties to Ontario police.
Predecessor had done a little disaster aid but he doesn't know details.
Malheur County is a very food insecure county, very vulnerable.
Lots of folks depend on access to pantries for food.

When sugar beet plant in Nyssa closed, had big spike in pantry use.

How do folks find pantries? Word of mouth, some newspaper ads, some news articles – argus will run stories anytime. Radio ads, too. And social service providers give info too.

Great state infrastructure – high communication levels compared to other states.
Not much presence in the very rural areas – though many of the churches do some of their own food aid. But the culture is not amenable to food aid out there in places like Jordan valley – that is, if you can't feed yourself, you are a failure, etc. tough to get a positive presence.

Meals on wheels? Done by council on aging, has problems.
Warehouse is in the floodplain, have taken no real measures to do anything to mitigate it, though they do keep caselots on pallets off the ground.

Have had seepage in the walls in bad storms
It's an older facility, prolly not up to date on codes
Tillamook food bank has had flooding probs

"four rivers healthy communities" – does health awareness
When they ask "what about people who abuse the system?" – response – not like there's a street value for a case of peanut butter…

Stakeholder Interview

Date: December 1, 2006
Name: Jodie Marshall
Title: Emergency Services Director
Organization: American Red Cross of Greater Idaho

Summary

While the ARC of Greater Idaho is the official Red Cross organization representing Malheur County, historically it has not had significant post-disaster presence in the county. Currently there are no active local volunteers (though there have been several in the past).

ARC responds most commonly to single family fires but can respond to any natural or human-caused disaster. Through the state and national chapters, Marshall has access to supplies and resources for individuals, families, and entire communities: food, shelter, clean-up kits, financial assistance, etc.

Marshall considers natural hazard awareness in the region to be low and would like to conduct an awareness campaign in the county to educate residents and solicit ARC volunteers.

Hazard Preparedness Actions Taken:

- ARC has a good relationship and record of cooperation with county Emergency Services personnel, Eastern Oregon ARC chapter, and volunteers located in Idaho.

Hazard Areas of Concern:

- Currently ARC has no "shelter agreements" with local buildings which could be used as shelter sites in an emergency.
- There are no trained ARC volunteers in Malheur County.
- All disaster supplies would need to come from Idaho, which could slow distribution, especially in the event of damage to I-84.
- Community natural hazard awareness/preparedness is very low.

General Notes

Ms. Marshall is a member of the PDM Steering Committee but will be unable to attend the first meeting due to a prior commitment. She drove from Boise, ID to meet with Craig Smith and Sarah Hackney. She has just completed her first year in this position, meaning that her knowledge of natural hazards/natural hazard planning in Malheur County is

limited, but she is excited to begin building cooperative professional relationships in the county.

Stakeholder Interview

Date: November 9, 2006, August 22, 2007
Name: Jennifer Martin
Title: Program Coordinator
Organization: Owyhee Watershed Council

Transcribed Notes (Summary Unavailable)

Owyhee Dam – ID, Bureau of Reclamation, North + South Board of Control
S. Board of Control: Rex Barry, Homedale

OWC is doing a resource condition assessment of lands under its jurisdiction. Their contractor is Candace Shock (sci-eco @shockfamily.net, ccshock @fmtc.com), based on Ontario. Has done lots so far on hydrology of the watershed.

Her husband is Clint Shock, directs OSU ag. Experiment Station in Ontario. Ph.D.

Nyssa – having some issues with stream bank erosion.
Her cousin is married to the mayor, Jake Roe (Row? Rowe?). Good contact.

Question – is a shallow aquifer/shrinking water table a hazard? How would that fit into this plan? At all? Got lots of new sprinklers and irrigation going in..

West Nile – sage grouse got it! Weird. Vale vet clinic monitors it in horses – Dr. Boyle.
Walt Van Dyke follows it in grouse – ODFW in Ontario.

August 2007 notes:
Projects they're doing that are drought-related:

- livestock watering systems (wells, spring development, creeks)
- piping conversion from dirt ditches
- flood systems to sprinkler systems for irrigation

Projects that are fire related –

- mostly fuels reduction
    - seeding
    - work with ranchers on private, BLM, and state lands
    - weed program, have weed coordinator in JV

severe weather – not a major problem for ranchers, some losses, nothing too huge.

Stakeholder Interview

Date: July 6, 2007
Name: Mick Pressly
Title: Public Works Director

Organization: City of Vale

Transcribed notes (summary unavailable):
Dike system drains as much as it can, usually works fine, but if river were higher than the water in the dike then it wouldn't drain well.
- Dikes put in in 58 or 59.
- No problems with severe cold, frozen pipes only a few scattered residences.
- Bully creek has come close to breaching its dike but has never done so.
- Exercise valves and flaps annually.
- Bully creek dam constructed after 58 dikes, adds another level of control for water.
- 57 flood went all the way up to west main

ONE VALVE needs replacing in storm drain system – older valves in south part of town near the pool. This is the one that affects the school bus shed. Water has come close to flooding it, but never anything major, just a bit of water on floor. Last incident 92, did not move buses though. This valve/flapper drains into Malheur river. Need flapper valve and head gate valve. Their stopgap preventative measure currently is to put plywood and then gravel over the storm drain, temporary fix.
Contamination potential in high water from garbage overflow and sewage overflow.
Have backup generator power for all water systems for city, goooood.

Stakeholder Interview

Date: January 19, 2007
Name: Jason Simmons
Title: Fire & Fuels Management Specialist
Organization: Vale District Bureau of Land Management, Vale, OR

Transcribed Notes (from handwritten notes taken during interview)

In the Vale – Ontario – Adrian WUI, 950 acres treated, annual grass restoration on 2,000 acres to reduce noxious weeds

Haven't done Juntura yet, it's out for public comment at the moment, lookin to do annual grass restoration and juniper management
Fuel break lines around communities/WUI to help stop fire

Jackson fire – 2000 – 80,000 acres of land. Started in Brogan, burned to the prison in 8 hours.

100 miles of fuel breaks and disk lines. Treat the roads too.

2006 – 12,000 acre fire, stopped by fuel breaks

Rome – Arock: no fire protection, but BLM is doing fire breaks but without CWPP can't get cash for establishing an RFP. Breaks are all that they can do right now.

Other things they can do –

- increase response time by making sure roads are good and safe for response vehicles
- fire breaks (which help firefighters

- cheatgrass is a primary fire carrier – it's an annual grass, not native, but not considered a noxious weed
- 25-30 yr fire return is normal. With cheatgrass, it's a 4-5 yr fire return.

Big restoration project in Rome-McDermitt: 20,000 acres, fuel reduction, native grass restoration. 40% success rate. McDermitt Restoration Complex. Also do WUI stuff out there.

Treated juniper in Bully Creek area. And rangeland health stuff – 10-12,000 acres out there.

2,500 acres forest restoration in county, esp riparian areas.

They do juniper because we've suppressed fire for 100 yrs – 2 fire cycles – and it's gotten out of hand, encroaching etc. shouldn't see juniper in riparian areas – they get thick and choke other stuff out.

Castle rock – forest health, reintroducing fire, thinning in dominant old-growth areas, low intensity underburn.
--
Because there's no CWPP, they've been using the Community Assessment Reports as a basis for mitigation actions. CWPP gives funding access to landowners – cause sometimes they want to do treatments too.

Grazing on BLM = huge issue. Mixed bag as far as its benefits/drawbacks.

When rangeland burns, it displaces ranchers who have permits on the land. Sometimes they go out of business. Have to wait 2 yrs to regraze burned lands, this is contentious, some say sooner would be better, some say later would be better. Goes for natural disaster fire and prescribed fire.
HFI, HRI (healthy forests/rangelands initiatives), Nat'l Fire Plan don't have to do full NEPA process.
Funding – WUI is pretty stable, but haz fuels is tight and faces cuts. Many limits on WUI, not many on CWPP.\
CARs did social and economic costs of fire!
Ranchers – worst fear is always fire. Also think they can't graze enough. Contentious, of course.
Flood & BLM – no mitigation, just reactive. Most of that happens on private prop anyway.

Thinking about the PDM plan -

- Plan needs to identify roles and responsibilities for disaster situations
- How will each agency participate?
- Accountability
- How would BLM help in disaster? Need to know.
- MOU: mutual aid. Rural volunteer fire depts. Here and in Idaho. SRV (snake river valley?) chiefs.

Have some MOUs re: specifics of things like dispatch, resources, etc

Quakes – OR is def at risk.

Stakeholder Interview

Date: December 18, 2006
Name: Kelly Weideman
Title: Coordinator
Organization: Malheur Watershed Council

Summary

Malheur Watershed Council oversees the watershed of the Malheur River and its tributaries, Willow Creek and Bully Creek. As a non-profit it works with local government, landowners, and other nonprofits to manage the water resources of the watershed. The organization has conducted some hazard mitigation activities but its focus is resource management.

Hazard Mitigation Activities Taken:

- Rebuilding the shores of the Malheur River where it borders the Ontario wastewater treatment plant to reduce risk of contamination.
- Encourage vegetative buffer zones along waterways to reduce flooding risk and contamination from cattle.
- Irrigation systems typically are gravity-powered, making them resistant to loss of power/utilities.

Hazard Areas of Concern:

- Severe drought could cause problems for irrigation.
- MWC is unsure of the potential consequences of a major flood on the irrigation system in the watershed.

General Notes

Kelly Weideman met with Sarah Hackney in the MWC office in Ontario. She is enthusiastic about the project and willing to help in any way necessary. She also would like Hackney to meet the Council members and speak to them about the plan and the natural hazards risk assessment that is being done in the county. Like OWC, MWC will be a good access point for meeting and speaking with landowners regarding their hazard knowledge and concerns.

Stakeholder Interview

Date: January 17, 2007
Name: Linda White
Title: Emergency Services
Organization: Holy Rosary Medical Center, Ontario, OR

Summary

Holy Rosary Medical Center is the only full-service hospital in Malheur County. It maintains a clinic in Payette, ID as well (Dominican Health Services). HRMC has 49 hospital beds and approximately half are filled on an average day. There are two other medical clinics in the county, neither operated by HRMC: Physician's Primary and Valley Family Clinic.

White notes that HRMC is "not ready" for a serious natural or man-made disaster. The facility has taken some steps but considers itself in need of more.

Hazard preparedness activities taken:

- 2 1-MW generator power plant with 10 days' fuel supply and MOU for fuel replenishment within 24 hours of need.
- MOU with a truck company for a portable morgue.
- "Disaster Cart" with special equipment for toxic contamination, etc.
- Shared ownership in some portable medical equipment with Region 9 hospitals – ventilators, monitoring devices, satellite phones, large tents, etc.
- "Incident Command Training"
- Seem to be ok re: seismic risk (according to facilities mgr, state has ok'd them).
- Hospital is not located on the floodplain.

Hazard areas of concern:

- Need an automatic calldown system for employees in the event of urgent need.
- Need MOU arranging for off-site triage area in the event of a disaster where medical needs would overwhelm the hospital's capacity.
- Do not have MOUs with any area hospitals, clinics, nursing homes, etc regarding patient transfer in the event of an emergency.
- Dependent on the city for water supply, no reserves.
- Upper management is new to the area and has little knowledge/concern regarding natural hazard risks in the county.

General Notes

Mrs. White coordinates emergency services for the hospital and also oversees crisis care. Toward the end of the meeting she called Vince, the hospital's Facilities Manager, to help answer a few questions. She met with Sarah Hackney at HRMC. The hospital is excited about the Mitigation Plan and would like Hackney to present an overview of the plan, especially its risk assessment (when complete) to its management team.

Appendix B: Economic Analysis of Natural Hazard Mitigation Projects

This appendix was developed by the Community Service Center's Oregon Natural Hazards Workgroup at the University of Oregon. It has been reviewed and accepted by the Federal Emergency Management Agency as a means of documenting how the prioritization of actions shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

The appendix outlines three approaches for conducting economic analyses of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to eonomic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon State Police – Office of Emergency Management, 2000), and Federal Emergency Management Agency Publication 331, *Report on Costs and Benefits of Natural Hazard Mitigation*. This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred. Evaluating possible natural hazard mitigation activities provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools. Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce "ripple-effects" throughout the community, greatly increasing the disaster's social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

What are some Economic Analysis Approaches for Evaluating Mitigation Strategies?

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into three general categories: benefit/cost analysis, cost-effectiveness analysis and the STAPLE/E approach. The distinction between the three methods is outlined below:

Benefit/Cost Analysis

Benefit/cost analysis is a key mechanism used by the state Office of Emergency Management (OEM), the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

Benefit/cost analysis is used in natural hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoiding future damages, and risk. In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented. A project must have a benefit/cost ratio greater than 1 (i.e., the net benefits will exceed the net costs) to be eligible for FEMA funding.

Cost-Effectiveness Analysis

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in Public Sector Mitigation Activities

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions which involve a diverse set of beneficiaries and non-market benefits.

Investing in Private Sector Mitigation Activities

Private sector mitigation projects may occur on the basis of one or two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies;
2. Dispose of the building or land either by sale or demolition;
3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
4. Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchases. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

STAPLE/E Approach

Considering detailed benefit/cost or cost-effectiveness analysis for every possible mitigation activity could be very time consuming and may not be practical. There are some alternate approaches for conducting a quick evaluation of the proposed mitigation activities which could be used to identify those mitigation activities that merit more detailed assessment. One of those methods is the STAPLE/E approach.

Using STAPLE/E criteria, mitigation activities can be evaluated quickly by steering committees in a synthetic fashion. This set of criteria requires the committee to assess the mitigation activities based on the Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLE/E) constraints and opportunities of implementing the particular mitigation item in your community. The second chapter in FEMA's How-To Guide "Developing the Mitigation Plan – Identifying Mitigation Actions and Implementation Strategies" as well as the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process" outline some specific considerations in analyzing each aspect. The following are suggestions for how to examine each aspect of the STAPLE/E approach from the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process."

Social: Community development staff, local non-profit organizations, or a local planning board can help answer these questions.

- Is the proposed action socially acceptable to the community?
- Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Will the action cause social disruption?

Technical: The city or county public works staff, and building department staff can help answer these questions.

- Will the proposed action work?
- Will it create more problems than it solves?
- Does it solve a problem or only a symptom?
- Is it the most useful action in light of other community goals?

Administrative: Elected officials or the city or county administrator, can help answer these questions.

- Can the community implement the action?
- Is there someone to coordinate and lead the effort?
- Is there sufficient funding, staff, and technical support available?
- Are there ongoing administrative requirements that need to be met?

Political: Consult the mayor, city council or county planning commission, city or county administrator, and local planning commissions to help answer these questions.

- Is the action politically acceptable?

- Is there public support both to implement and to maintain the project?

Legal: Include legal counsel, land use planners, risk managers, and city council or county planning commission members, among others, in this discussion.

- Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity?
- Are there legal side effects? Could the activity be construed as a taking?
- Is the proposed action allowed by the comprehensive plan, or must the comprehensive plan be amended to allow the proposed action?
- Will the community be liable for action or lack of action?
- Will the activity be challenged?

Economic: Community economic development staff, civil engineers, building department staff, and the assessor's office can help answer these questions.

- What are the costs and benefits of this action?
- Do the benefits exceed the costs?
- Are initial, maintenance, and administrative costs taken into account?
- Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private?)
- How will this action affect the fiscal capability of the community?
- What burden will this action place on the tax base or local economy?
- What are the budget and revenue effects of this activity?
- Does the action contribute to other community goals, such as capital improvements or economic development?
- What benefits will the action provide? (This can include dollar amount of damages prevented, number of homes protected, credit under the CRS, potential for funding under the HMGP or the FMA program, etc.)

Environmental: Watershed councils, environmental groups, land use planners and natural resource managers can help answer these questions.

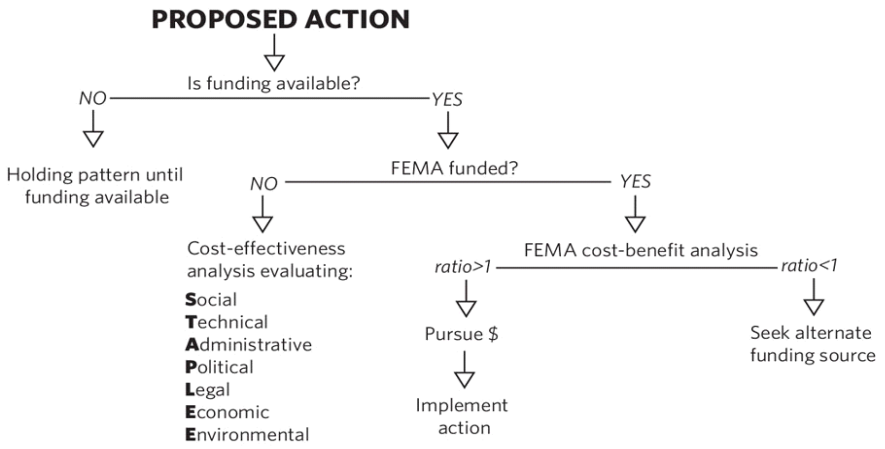
- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

The STAPLE/E approach is helpful for doing a quick analysis of mitigation projects. Most projects that seek federal funding and others often require more detailed benefit/cost analyses.

When to use the Various Approaches

It is important to realize that various funding sources require different types of economic analyses. The following figure is to serve as a guideline for when to use the various approaches.

Figure A.1: Economic Analysis Flowchart



Source: Community Service Center's Oregon Natural Hazards Workgroup at the University of Oregon, 2005

Implementing the Approaches

Benefit/cost analysis, cost-effectiveness analysis, and the STAPLE/E are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating mitigation activities is outlined below. This framework should be used in further analyzing the feasibility of prioritized mitigation activities.

1. Identify the Activities

Activities for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation projects can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits

Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate activities. Potential economic criteria to evaluate alternatives include:

- ***Determine the project cost***. This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- ***Estimate the benefits***. Projecting the benefits, or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.
- ***Consider costs and benefits to society and the environment***. These are not easily measured, but can be assessed through a variety of economic tools including existence

value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.

- ***Determine the correct discount rate***. Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Activities

Once costs and benefits have been quantified, economic analysis tools can rank the possible mitigation activities. Two methods for determining the best activities given varying costs and benefits include net present value and internal rate of return.

- ***Net present value***. Net present value is the value of the expected future returns of an investment minus the value of the expected future cost expressed in today's dollars. If the net present value is greater than the projected costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.
- ***Internal rate of return***. Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project. Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk, project effectiveness, and economic, environmental, and social returns in choosing the appropriate project for implementation.

Economic Returns of Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or land owners as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Natural Hazards

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

Resources

CURE Kajima Project, *Methodologies for Evaluating the Socio-Economic Consequences of Large Earthquakes*, Task 7.2 Economic Impact Analysis, Prepared by University of California, Berkeley Team, Robert A. Olson, VSP Associates, Team

Leader; John M. Eidinger, G&E Engineering Systems; Kenneth A. Goettel, Goettel and Associates, Inc.; and Gerald L. Horner, Hazard Mitigation Economics Inc., 1997

Federal Emergency Management Agency, *Benefit/Cost Analysis of Hazard Mitigation Projects*, Riverine Flood, Version 1.05, Hazard Mitigation Economics, Inc., 1996

Federal Emergency Management Agency, *Report on the Costs and Benefits of Natural Hazard Mitigation.* Publication 331, 1996.

Goettel & Horner Inc., *Earthquake Risk Analysis Volume III: The Economic Feasibility of Seismic Rehabilitation of Buildings in the City of Portland*, Submitted to the Bureau of Buildings, City of Portland, August 30, 1995.

Goettel & Horner Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects* Volume V, Earthquakes, Prepared for FEMA's Hazard Mitigation Branch, Ocbober 25, 1995.

Horner, Gerald, *Benefit/Cost Methodologies for Use in Evaluating the Cost Effectiveness of Proposed Hazard Mitigation Measures*, Robert Olsen Associates, Prepared for Oregon State Police, Office of Emergency Management, July 1999.

Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon State Police – Office of Emergency Management, 2000.)

Risk Management Solutions, Inc., *Development of a Standardized Earthquake Loss Estimation Methodology*, National Institute of Building Sciences, Volume I and II, 1994.

VSP Associates, Inc., *A Benefit/Cost Model for the Seismic Rehabilitation of Buildings*, Volumes 1 & 2, Federal Emergency management Agency, FEMA Publication Numbers 227 and 228, 1991.

VSP Associates, Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects: Section 404 Hazard Mitigation Program and Section 406 Public Assistance Program, Volume 3: Seismic Hazard Mitigation Projects*, 1993.

VSP Associates, Inc., *Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model*, Volume 1, Federal Emergency Management Agency, FEMA Publication Number 255, 1994.

Appendix F
Existing Plans, Policies, and Programs in Malheur County

The following appendix summarizes the existing plans, policies and programs in Malheur County. The first section covers plans and policies on the books for the County and the second section covers social service providers.

Existing Plans and Policies

The Disaster Mitigation Act of 2000 requires that communities identify a process where the requirements of the mitigation plan get incorporated into other planning mechanisms. The purpose of this appendix is to document those existing plans and policies in an effort to assist the community in identifying potential means to better integrate mitigation into the day-to-day decisions of local governments.

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from local residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.[1]

The Natural Hazards Mitigation Plan includes a range of recommended action items that, when implemented, will reduce the county's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the county's existing plans and policies. Linking existing plans and policies to the Natural Hazards Mitigation Plan helps identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the natural hazards mitigation plan's action items through existing plans and policies increases their likelihood of being supported and getting updated to remain current, and maximizes the county's resources.

Below is a table of the plans and policies that currently exist in Malheur County. For each plan or policy, the table provides information on its author, its purpose, and how it relates to natural hazard mitigation. The information provided in the table can also be used to complete action item worksheets by identifying rationale and potential ideas for implementation.

Name	Date of Last Revision	Author/Owner	Description	Relation to Natural Hazard Mitigation
Malheur County Comprehensive Plan	1978	Malheur County Planning Department	"The purpose of this comprehensive plan is to identify the present and future needs of Malheur County and to guide its future growth and development in compliance with state law."	Goal 7, "Natural Disasters and Hazards" outlines 14 policies Malheur County will follow "To protect life and property from natural disasters and hazards". These policies can be referred to when creating action items.
City of Ontario Comprehensive Plan	1-Jul	City of Ontario Planning Commission	To provide the city with a comprehensive guide to overall land use, economic development, resource management, and to provide this information in a simple manner	There is an entire section devoted to natural hazard mitigation, titled "Areas Subject to Natural Disasters and Hazards Objectives". This section outlines four mandates about building in flood prone areas
City of Ontario Public Safety Master Plan	2-Nov	City of Ontario City Council	The purpose of the plan is to assess the needs for land acquisition and public safety facilities through 2025.	This plan may be used to implement mitigation measures addressing critical facilities.
Malheur County Emergency Operations Plan	2002	Malheur County Emergency Services	The purpose of this plan is to provide a framework for emergency response in the county.	This plan may be used to implement mitigation measures addressing emergency response issues.
Malheur County Transportation System Plan	N/A	N/A	N/A	This plan may be used to implement mitigation measures addressing transportation issues.
City of Ontario Stormwater Master Plan	2003	Private Consultant	The purpose of this plan is to assess the city's stormwater management system and identify and prioritize repairs and mitigation actions to improve system performance.	This plan may be used to implement mitigation measures addressing stormwater and flood issues.
City of Nyssa Comprehensive Plan	N/A	City of Nyssa	To provide the city with a comprehensive guide to overall land use, economic development, resource management, and to provide this information in a simple manner	N/A
City of Adrian Comprehensive Plan	N/A	City of Adrian	To provide the city with a comprehensive guide to overall land use, economic development, resource management, and to provide this information in a simple manner	N/A

Name	Date of Last Revision	Author/Owner	Description	Relation to Natural Hazard Mitigation
City of Vale Comprehensive Plan	N/A	City of Vale	To provide the city with a comprehensive guide to overall land use, economic development, resource management, and to provide this information in a simple manner	N/A
City of Jordan Valley Comprehensive Plan	N/A	City of Jordan Valley	To provide the city with a comprehensive guide to overall land use, economic development, resource management, and to provide this information in a simple manner	N/A

Existing Social Service Providers

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. . Often times, actions identified by the plan involve communicating with the public, or specific subgroups within the population (e.g. elderly, children, low income). The County can use existing social systems as resources for implementing such communication related activities because these service providers already work directly with the public and have already established a trusted method for communicating with these subgroups. On a daily basis social service providers work and communicate directly with the public on a number of issues, one of which could be natural hazard preparedness and mitigation.

The following is a brief explanation of how the communication process works and how the community's existing social service providers could be used to provide natural hazard related messages to their clients.

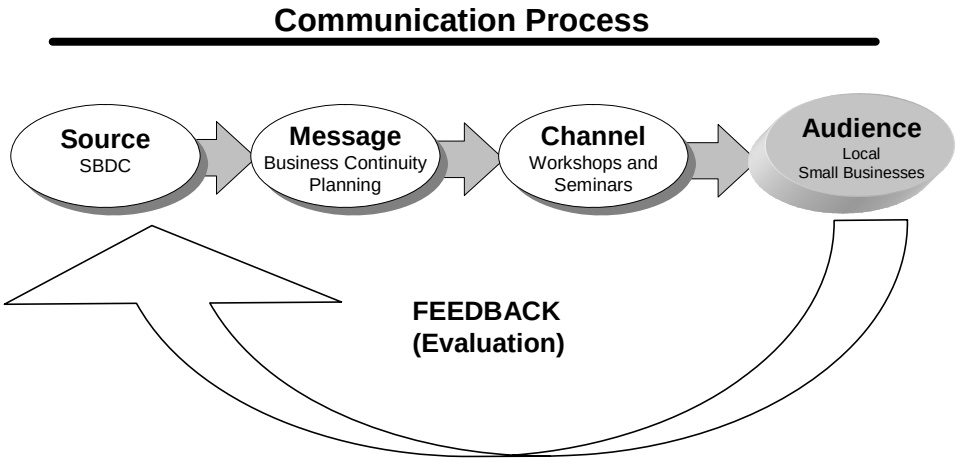
There are five essential elements for communicating effectively to a target audience:

- The **source** of the message must be credible,
- The **message** must be appropriately designed,
- The **channel** for communicating the message must be carefully selected,
- The **audience** must be clearly defined, and

The recommended action must be clearly stated and a **feedback** channel established for questions, comments and suggestions.

An example of an existing social system whose communication system can be linked to natural hazard mitigation is the Columbia Gorge Community College's Small Business Development Center (SBDC). The SBDC (the source) provides local businesses (the audience) with information on business contingency planning (the message) through workshops and seminars (the channel). To target small businesses, (insert name) County can provide the SBDC with information on developing business continuity plans and strategies for recovering from a natural hazard. When local small businesses attend the SBDC's workshops and seminars they can pick up this natural hazard mitigation information. This example communication process is graphically presented in ***Figure C.1***:

Figure C.1 Communication Process



Source: Adapted from the U.S. Environmental Protection Agency Radon Division's outreach program

The following table provides a list of existing social systems within Malheur County. The table provides information on each organization or program's service area, types of services offered, populations served, and how the organization or program could be involved in natural hazard mitigation. The three involvement methods identified in the table are defined below:

- Education and outreach – organization could partner with the community to educate the public or provide outreach assistance on natural hazard preparedness and mitigation.
- Information dissemination – organization could partner with the community to provide hazard related information to target audiences.
- Plan/project implementation – organization may have plans and/or policies that may be used to implement mitigation activities or the organization could serve as the coordinating or partner organization to implement mitigation actions.

The information provided in the table can also be used to complete action item worksheets by identifying potential coordinating agencies and internal and external partners.

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[1] Burby, Raymond J., ed. 1998. *Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities*.

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Aaron Brooke Ashley Manor Care Center 995 North Oregon Ontario , OR 97914 Tel: 541-881-1188	Sheltered care for the elderly with assisted daily living.	Malheur County				✓				• Information dissemination
Adult Developmental Education **Treasure Valley Community College** 650 College Blvd. Oregon Trail Building Ontario , OR 97914 Tel: 541-881-8822	Some services include: Adult Basic Skills Development, GED, Spanish GED, ESL, Family Literacy, and Citizenship. Administer the CASAS 130 test, TVCC Placement Test, and various tests required for certification in industry and construction.	Malheur County					✓		✓	• Education and outreach • Information dissemination
Babies First, Cacoon, Great Start, Child Health, N Malheur Co. Health Dept. 1108 SW 4th St Ontario, OR 97914 Tel: 541-889-7279 Fax: 541-889-8468	Home visits, special needs, developmental screening, wellness education, head lice management, family planning and immunizations.	Malheur County		✓			✓		✓	• Education and outreach • Information dissemination

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Brady & Associates 372 SW 1st Ave Ontario , OR 97914 Tel: 541-881-1271	Oregon and Idaho licensed. DUII education/ rehabilitation services, bilingual services, all alcohol and drug services, individual and group counseling.	Malheur County					✓		✓	• Education and outreach • Information dissemination
CASA/Court Appointed Special Advocates P O Box 1355 Ontario , OR 97914 Tel: 541-881-1676	Volunteers are appointed by the court to advocate for abused and/or neglected children who are involved in juvenile court dependency proceedings.	Malheur County		✓					✓	• Information dissemination
Child Care Center Treasure Valley Community College 650 College Blvd. Ontario , OR 97914 Tel: 541-881-8822 Ex. 317 Fax: 541-881-2743	Daycare for children ages 6 weeks to 5 years. Located at the college.	Malheur County		✓			✓		✓	• Information dissemination
Church of the Nazarene/Vale Holland and B Street Vale , OR 97918 Tel: 541-823-2710	Church. Overnight housing emergencies, transportation. Our food pantry is open to the public and we have hamburger, bread, and canned foods.	Malheur County						✓	✓	• Education and outreach • Information dissemination

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Community Counseling Center 2455 SW 4th Ave. Ste. 7 Ontario , OR 97914 Tel: 541-739-2156	Family Therapy, Depression, ADHD Evaluations	Malheur County						✓		• Information dissemination
Community Head Start/Central Office (MCCDC) **Malheur County Child Development Center** 790 SW 7th Place Ontario , OR 97914 Tel: 541-889-2393	Head Start Program	Malheur County		✓					✓	• Information dissemination
Disabilities Advisory Council 186 E Lane Ste 4 Ontario , OR 97914 Tel: 541-889-7553 Fax: 541-889-2485	Meetings are held at the Senior and People with Disabilities Conference Room at the address above. Advises Senior and Disabled Services on basic policy guidelines for clients receiving services.	Malheur County			✓	✓				• Information dissemination
Eastern Oregon Center for Independent Living (EOCI)	A nonprofit community-based resource and advocacy center that promotes independent living and equal access for all persons with disabilities.	Malheur County			✓		✓			• Information dissemination

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Eastern Oregon Center for Independent Living 114 South Oregon Ontario, OR 97914 Tel: 541-889-3119 Fax: 541-889-4573 Email: eocil@eocil.org	Eastern Oregon Center for Independent Living (EOCIL) is a nonprofit community-based resource and advocacy center that promotes independent living and equal access for all persons with disabilities. The desired outcome of all EOCIL independent living services is to improve the individual's ability to function, continue functioning, or move toward functioning independently in his or her family or community.	Baker, Gilliam, Grant, Harney, Malheur, Morrow, Umatilla, Union, Wallowa and Wheeler Counties			✓					• Education and outreach • Information dissemination
Farmworker Resource Committee Tel: 541-889-5394	Founded in 1992. Provides information and exchange of services between individuals who work with farmworkers. Location varies.	Malheur County	✓				✓		✓	• Information dissemination
First United Methodist Church 312 NW 2nd St. Ontario , OR 97914 Tel: 541-889-6601	Domestic Violence Support Group meets here, as well as Narcotics Anonymous Groups, Boy Scout Troop #400, 2 Girl Scout Troops, Silver Sage Mental Health Advocacy Group, Project DOVE Advisory Board, Overeater's Anonymous.	Malheur County		✓	✓	✓		✓	✓	• Information dissemination

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Giggle Tree Daycare & Preschool/Infant Child Care 815 S. Oregon St. Ontario , OR 97914	Quality preschool, daycare and infant card at a fair price. Offers preschool and child care to children ages 2 1/2 to 12 years old. Also have an excellent program for after school and summer, as well as children not yet attending school.	Malheur County		✓					✓	• Information dissemination
Growing Together **OSU Extension, 4-H** 710 SW 5th Ave. Ontario , OR 97914 Tel: 541-881-1417	After school 4-H program for youth grades 3-6 at Vale Middle School and Nyssa Public Library. This program targets life skill development through hands-on activities. Other 4-H programs throughout the county are led by adult volunteers open to all youth K-12 and are also targeting life skill development.	Malheur County		✓			✓			• Information dissemination

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Holy Rosary Medical Center (HRMC) 351 SW 9th St Ontario , OR 97914 Tel: 541-881-7000	A medical center serving the health care needs of Malheur and Payette Counties and adjacent areas. "Kid Smart" community-wide education program coordinating health care providers. Some of the things we offer are home care services, social services for questions and referrals, assistance with referrals to programs for sexual assault for children victims.	Malheur and Payette Counties		✓	✓	✓	✓	✓	✓	• Information dissemination
Housing Authority/Housing and Urban Development (Housing Authority of Malheur County) 959 Fortner St. Ontario , OR 97914 Tel: 541-889-9661	For low and moderate income in Malheur and Harney counties. Rental assistance, loans, farm labor housing, public housing, property management, home ownership, and family self-sufficiency.	Malheur and Harney Counties					✓		✓	• Information dissemination

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
La Familia Sana **Valley Family Health Care** 17 North 6th St. Nyssa , OR 97913 Tel: 541-372-0159	To improve health status among migrant seasonal workers, to increase access and appropriateness of existing services through enhanced collaboration with other agencies, pesticide training to migrant seasonal farmworkers. Prenatal care goal: to get women into early and adequate prenatal care. Also to capacitate Hispanic women in self breast exams.	Malheur County		✓			✓		✓	• Information dissemination

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Malheur Council on Aging and Community Services 842 SE 1st Ave. PO Box 937 Ontario , OR 97914 Tel: 541-889-7651 Fax: 541-889-4940	Provides a variety of supportive services to senior and disabled persons and to low income residents of Malheur County. Some include housing (transitional, emergency, & farmworker), home care (homemaker), personal care, self-sufficiency/case management, special transportation, advocacy, information and assistance, wellness education, elder abuse awareness, telephone reassurance (RUOK), respite care, care giver support, weatherization, low-income energy assistance.	Malheur County		✓	✓	✓	✓	✓	✓	• Education and outreach • Information dissemination
Malheur County Extension Office 710 SW 5th Avenue Ontario OR 97914 Tel: 541-881-1417 Fax: 541-889-8840	Provides research-based knowledge and education that focus on strengthening communities and economies, sustaining natural resources, and promoting healthy families and individuals.	Malheur County	✓							• Education and outreach • Information dissemination • Plan/project implementation

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Malheur County Child Development Center 790 SW 7th Pl. Ontario, OR 97914 Tel: 541-889-2393 Fax: 541-889-7137	Oregon Head Start PreKindergarten	Malheur County		✓						• Education and outreach • Information dissemination
Malheur County Special Transportation System 842 SE 1st Ave PO Box 937 Ontario , OR 97914 Tel: 541-881-0000	Transportation services available to seniors, disabled, and to general public if space permits. Provides rides to medical appointments and to meet other personal needs.	Malheur County			✓	✓				• Information dissemination
Malheur Memorial Health Center 301 Main St. PO Box 1726 Nyssa , OR 97913 Tel: 541-372-2211	Health Clinic	Malheur County		✓	✓	✓		✓	✓	• Information dissemination

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Malheur Migrant Head Start/Central Office (OCDC) Oregon Child Development Coalition (OCDO) 482 SE 3rd Street Ontario , OR 97914 Tel: 541-889-5325 Fax: 541-889-6281	Help with all health, nutritional and social well-being of the children and their families. Provide full services to low-income/migrant families and empower them to become self-sufficient.	Malheur County		✓			✓	✓	✓	• Information dissemination
Meadowbrook Residential Care 1372 SW 8th Ave. Ontario , OR 97914 Tel: 541-889-4600	Retirement Home	Malheur County				✓				• Information dissemination
Nyssa Chamber of Commerce 112 Main Street Nyssa, OR 97913 Tel: 541-372-3091	Provide economic development assistance to local businesses.	Nyssa	✓							• Education and outreach • Information dissemination • Plan/project implementation
Nyssa Senior Center 316 Good Ave. Nyssa , OR 97913 Tel: 541-372-5660	Provide a hot noon meal to Seniors 60 years and older 4 days per week. Provide transportation to frail elderly or disabled seniors. Phone 881-0000 (Malheur Co Special Transportation System) Suggestion Donation.	Malheur County				✓				• Information dissemination

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Ontario Auto Court Transitional Housing 842 SE 1st Ave PO Box 937 Ontario , OR 97914 Tel: 541-889-7651	Transitional/emergency housing units and associated supportive services to very low-income individuals or families who are at risk of being homeless. Section 8 housing assistance upon placement at Auto Court. Tenants are required to participate in self-sufficiency planning.	Malheur County					✓	✓	✓	• Information dissemination
Ontario Chamber of Commerce 676 S. W. 5th Ave. Ontario, Oregon 97914 Tel: 541-889-8012/ Toll Free 1-888-889-8012 Email: ontvcb@fmtc.com	Provide economic development assistance to local businesses.	Ontario	✓							• Education and outreach • Information dissemination • Plan/project implementation
Oregon Law Center 225 SW 1st Ave Ste 6 Ontario , OR 97914 Tel: 541-889-3121 Fax: 541-889-5562	Provides free legal services to low-income individuals and families in Baker, Grant, Harney and Malheur Counties in the area of civil law.	Malheur County					✓	✓	✓	• Information dissemination
Rainbow World Day Care & Preschool 161 SW 9th St. Ontario , OR 97914 Tel: 541-889-3344	Daycare and a preschool for children 2 1/2 years old up to 12 years.	Malheur County		✓						• Information dissemination

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Sierra Vista Apartments 789 Sierra Vista Dr., #28 Ontario , OR 97914 Tel: 541-881-1797 Fax: 541-823-0074	Affordable farmworker housing to anyone who qualifies. Tenant must be employed as a farm or agricultural laborer 90 days of each year and must be at or below 50% of median income upon initial entry. 2, 3, and 4 bedroom units, laundry facilities, and community room	Malheur County					✓	✓	✓	• Information dissemination
The Family Place 390 NE 2nd St. PO Box V Ontario , OR 97914 Tel: 541-889-1050	Strengthening and Empowering Families. Services include: The Family Resource Center, Family Fun Nites, individual and family therapy for children, adolescents, adults for the issues that make the difference in your life, conflict resolution.	Malheur County					✓	✓		• Information dissemination

Malheur County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Training and Employment Consortium (TEC) 190 East Lane Ontario , OR 97914 Tel: 541-889-7864 www.trainingemployment.org	To contribute to the economic vitality of the regions by being a valuable resource for education, vocational training. Offers employment and child care. Training partner for Workforce Oregon. Programs available include: Adult, Dislocated Worker, and Youth: Workforce Investment Act (WIA), Job Opportunity & Basic Skills (JOBS), Independent Living, Senior Community Service Employment Program (Title V), Youth Conservation Corp, Child Care Resources & Referral, Provides services for businesses.	Malheur County	✓	✓	✓	✓	✓	✓	✓	• Information dissemination
Vale Chamber of Commerce 252 B Street Vale, OR 97918 Tel: 541-473-3800	Provide economic development assistance to local businesses.	Malheur County	✓							• Education and outreach • Information dissemination • Plan/project implementation

Appendix D: Resource Directory

The following appendix includes local, regional, state and federal resources for some of the hazards addressed in the plan. The directory also includes key publications and additional resources. This appendix was developed by the Community Service Center's Oregon Natural Hazards Workgroup at the University of Oregon for use by Pre-Disaster Mitigation Communities.

Multi-Hazard Mitigation Resources

State Resources

Department of Land Conservation and Development (DLCD)

DLCD administers the state's Land Use Planning Program. The program is based on 19 Statewide Planning Goals, including Goal 7, related to natural hazards, with flood as its major focus. DLCD serves as the federally designated agency to coordinate floodplain management in Oregon. They also conduct various landslide related mitigation activities. In order to help local governments address natural hazards effectively, DLCD provides technical assistance such as conducting workshops, reviewing local land use plan amendments, and working interactively with other agencies.

Contact: Natural Hazards Program Manager, DLCD
Address: 635 Capitol St. NE, Suite 200, Salem, OR 97301-2540
Phone: (503) 373-0050
Fax: (503) 378-6033
Website: http://www.oregon.gov/LCD/HAZ/index.shtml
Oregon Floodplain Coordinator: (503) 373-0050 ext. 250

Oregon State Police (OSP)-Office of Emergency Management (OEM)

OEM administers FEMA's Hazard Mitigation Grant Program, which provides post-disaster monies for acquisition, elevation, relocation, and demolition of structures located in the floodplain. OEM also administers FEMA's Flood Mitigation Assistance Program. This program provides assistance for NFIP insured structures only. OEM also helps local jurisdictions to develop hazard mitigation plans. OEM is heavily involved in flood damage assessment and works mainly with disaster recovery and hazard mitigation programs. OEM provides training for local governments through workshops on recovery and mitigation. OEM also helps implement and manage federal disaster recovery programs.

Contact: Office of Emergency Management
Address: PO Box 14370, Salem, OR 97309-5062
Phone: (503) 378-2911
Fax: (503) 373-7833
Website: http://www.oregon.gov/OOHS/OEM/index.shtml
OEM Hazard Mitigation Officer: (503) 378-2911 xt. 22247
Recovery and Mitigation Specialist: (503) 378-2911 xt. 22240

Oregon Department of Geology and Mineral Industries (DOGAMI)

The mission of the Department of Geology and Mineral Industries is to serve a broad public by providing a cost-effective source of geologic information for Oregonians and to use that information

in partnership to reduce the future loss of life and property due to potentially devastating earthquakes, tsunamis, landslides, floods, and other geologic hazards. The Department has mapped earthquake hazards in most of western Oregon.

Contact: Deputy State Geologist, Seismic, Tsunami, and Coastal Hazards Team Leaders
Address: 800 NE Oregon St., Suite 965, Portland, Oregon 97232
Phone: (971) 673-1555
Fax: (971) 673-1562
Website: http://www.oregongeology.com

Federal Resources

Federal Emergency Management Agency (FEMA)

FEMA provides maps of flood hazard areas, various publications related to flood mitigation, funding for flood mitigation projects, and technical assistance. FEMA also operates the National Flood Insurance Program. FEMA's mission is "to reduce loss of life and property and protect the nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery." FEMA Region X serves the northwestern states of Alaska, Idaho, Oregon, and Washington.

Contact: FEMA, Federal Regional Center, Region 10
Address: 228th St. SW, Bothell, WA 98021-9796
Phone: (425) 487-4678
Website: http://www.fema.gov

United States Geological Survey (USGS)

The USGS website provides current stream flow conditions at USGS gauging stations in Oregon and throughout the Pacific Northwest. The Oregon USGS office is responsible for water-resources investigations for Oregon and part of southern Washington. Their office cooperates with more than 40 local, state, and federal agencies in Oregon. Cooperative activities include water-resources data collection and interpretive water-availability and water-quality studies.

Contact: USGS Oregon District Office
Address: 10615 S.E. Cherry Blossom Dr., Portland, OR 97216
Phone: (503) 251-3200
Fax: (503) 251-3470
Website: http://oregon.usgs.gov
Email: dc_or@usgs.gov

National Oceanic and Atmospheric Administration (NOAA)

NOAA's historical role has been to predict environmental changes, protect life and property, provide decision makers with reliable scientific information, and foster global environmental stewardship.

Contact: National Oceanic and Atmospheric Administration
Address: 14th Street & Constitution Avenue, NW, Room 6013, Washington, DC 20230
Phone: (202) 482-6090
Fax: (202) 482-3154
Website: http://www.noaa.gov
Email: answers@noaa.gov

National Weather Service, Boise

The National Weather Service provides flood watches, warnings, and informational statements for rivers in Malheur County.

Contact: National Weather Service, Boise Bureau
Address: NIFC Building 3807, Boise, ID 83705-5354
Phone: (208) 334-9860
Website: http://www.wrh.noaa.gov/

Additional Resources

American Red Cross

The American Red Cross is a humanitarian organization, led by volunteers, that provides relief to victims of disasters and helps people prevent, prepare for, and respond to emergencies. Malheur County is served by The American Red Cross of Greater Idaho, based in Boise, ID. This chapter provides a variety of community services which are consistent with the Red Cross mission and meet the specific needs of this area, including disaster planning, preparedness, and education.

Contact: American Red Cross of Greater Idaho
Address: 404 S. 8th St, Suite 232
Phone: (800) 853-2570
Website: www.redcrossidaho.org

Institute for Business & Home Safety (IBHS)

IBHS was created as an initiative of the insurance industry to reduce damage and losses caused by natural disasters. This website provides educational resources and on-line publications for insurers, businesses, and homeowners who are interested in taking the initiative to minimize future damages and losses.

Contact: Institute for Business and Home Safety
Address: 4775 E. Fowler Avenue, Tampa, FL 33617
Phone: (813) 286-3400
Fax: (813) 286-9960
Website: http://www.ibhs.org/

Flood Mitigation Resources

State Resources

Oregon Department of Fish and Wildlife (ODFW)

ODFW's mission is to protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations. ODFW regulates stream activity and engages in stream enhancement activities.

Contact: ODFW
Address: 3406 Cherry Avenue N.E., Salem, OR 97303
Phone: (503) 947-6000
Website: http://www.dfw.state.or.us/
Email: Odfw.Info@state.or.us

Oregon Department of State Lands (DSL)

DSL is a regulatory agency, responsible for administration of Oregon's Removal-Fill Law. This law is intended to protect, conserve, and make the best use of the state's water resources. It generally requires a permit from DSL to remove, fill, or alter more than 50 cubic yards of material within the bed or banks of waters of the state. Exceptions are in state scenic waterways and areas designated

essential salmon habitat, where a permit is required for all in-stream activity, regardless of size. DSL and the US Army Corps of Engineers may issue these permits jointly.

Contact: Department of State Lands
Address: 775 Summer Street NE, Suite 100, Salem, OR 97301-1279
Phone: (503) 378-3805
Fax: (503) 378-4844
Website: http://statelands.dsl.state.or.us/
Assistant Director: (503) 378-3805, ext. 279
Western Region Manager: (503) 378-3805, ext. 246

Oregon Water Resources Department (WRD)

The WRD's mission is to serve the public by practicing and promoting wise long-term water management. The WRD provides services through 19 watermaster offices throughout the state. In addition, five regional offices provide services based on geographic regions. The Department's main administration is performed from the central office in Salem.

Contact: WRD
Address: 725 Summer Street NE, Suite A, Salem, OR 97301-1271
Phone: (503) 986-0900
Website: http://www.wrd.state.or.us/OWRD/index.shtml

Federal Resources

Bureau of Reclamation

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. The Bureau of Reclamation owns the Bully Creek, Agency Valley, Warm Springs, and Owyhee Dams in Malheur County and prepares emergency action plans for events at the dam.

Contact: Bureau of Reclamation, Pacific Northwest Region
Address: 1150 N. Curtis Road, Boise, ID 83706
Phone: (208) 378-5012
Website: http://137.77.133.1/pn/index.html

Army Corps of Engineers

The Corps of Engineers administers a permit program to ensure that the nation's waterways are used in the public interest. Any person, firm, or agency planning to work in waters of the United States must first obtain a permit from the Army Corps of Engineers. In Oregon, joint permits may be issued with the Division of State Lands. The Corps is responsible for the protection and development of the nation's water resources, including navigation, flood control, energy production through hydropower management, water supply storage and recreation.

Contact: US Army Corps of Engineers-Portland District, Floodplain Information Branch
Address: P.O. Box 2946, Portland, OR 97208-2946
Phone: (503) 808-5150
Website: http://www.nwp.usace.army.mil/

Malheur County Soil and Water Conservation District (SWCD)

The SWCD works in partnership with the Natural Resource Conservation Service to promote soil and water conservation in Malheur County. SWCD works with agricultural interests and landowners to provide information on natural resource conservation practices. The partnership blends individual member resources to offer technical and financial assistance in planning and applying natural

resource conservation practices and systems. Areas of focus include: erosion management, wetlands preservation and restoration, resource inventories, watershed assessments, and conservation education.

Contact: Malheur County SWCD
Address: 2925 SW 6th Ave, Suite 2, Ontario, OR 97914
Phone: (541) 889-2588
Fax: (541) 889-4304
Website: N/A

National Resources Conservation Service (NRCS), US Department of Agriculture (USDA)

NRCS provides a suite of federal programs designed to assist state and local governments, and landowners in mitigating the impacts of flood events. The Watershed Surveys and Planning Program and the Small Watershed Program provide technical and financial assistance to help participants solve natural resource and related economic problems on a watershed basis. The Wetlands Reserve Program and the Flood Risk Reduction Program provide financial incentives to landowners to put aside land that is either a wetland resource or experiences frequent flooding. The Emergency Watershed Protection Program (EWP) provides technical and financial assistance for clearing debris from clogged waterways, restoring vegetation, and stabilizing riverbanks. The measures taken under the EWP must be environmentally and economically sound and generally benefit more that one property.

Contact: USDA-NRCS Ontario Service Center
Address: 2925 SW 6TH AVE ONTARIO, OR 97914
Phone: (541) 889-9689
Fax: (541) 889-4304

Additional Resources

The National Flood Insurance Program

The National Flood Insurance Program (NFIP) Website is a subsection of the Federal Emergency Management Agency (FEMA) site (http://www.fema.gov). The NFIP information is intended for both the general public and the many organizations and agencies participating in the program. It includes information about the NFIP and other flood disaster assistance available from the Federal Government. It also provides access to the newly revised NFIP booklet: *Answers to Questions about the National Flood Insurance Program*.

Contact: The National Flood Insurance Program
Phone: (888) FLOOD29 or (800) 427-5593
Website: http://www.fema.gov/business/nfip/index.shtm

The Association of State Floodplain Managers

The Association of State Floodplain Managers is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning, and recovery. ASFPM fosters communication among those responsible for flood hazard activities, provides technical advice to governments and other entities about proposed actions or policies that will affect flood hazards, and encourages flood hazard research, education, and training. The ASFPM Web site includes information on how to become a member, the organization's constitution and bylaws, directories of officers and committees, a publications list, information on upcoming conferences, a history of the association, and other useful information and Internet links.

Contact: The Association of State Floodplain Managers
Address: 2809 Fish Hatchery Road, Madison, WI 53713
Phone: (608) 274-0123
Website: http://www.floods.org

USGS Water Resources

This web page offers current US water news; extensive current (including real-time) and historical water data; numerous fact sheets and other publications; various technical resources; descriptions of ongoing water survey programs; local water information; and connections to other sources of water information.

Contact: USGS Water Resources
Phone: (503) 251-3200
Website: http://or.water.usgs.gov/
Email: info-or@usgs.gov

Office of Hydrologic Development, National Weather Service

The National Weather Service's Office of Hydrologic Development (OHD) and its Hydrological Information Center offer information on floods and other aquatic disasters. This site offers current and historical data including an archive of past flood summaries, information on current hydrologic conditions, water supply outlooks, an Automated Local Flood Warning Systems Handbook, Natural Disaster Survey Reports, and other scientific publications on hydrology and flooding.

Contact: Office of Hydrologic Development, National Weather Service
Website: http://www.nws.noaa.gov/oh/

The Floodplain Management Association

The Floodplain Management website was established by the Floodplain Management Association (FMA) to serve the entire floodplain management community. It includes full-text articles, a calendar of upcoming events, a list of positions available, an index of publications available free or at nominal cost, a list of associations, a list of firms and consultants in floodplain management, an index of newsletters dealing with flood issues (with hypertext links if available), a section on the basics of floodplain management, a list of frequently asked questions (FAQs) about the Website, and, of course, a copious catalog of Web links.

Contact: Floodplain Managers Association
Website: http://www.floodplain.org
Email: admin@floodplain.org

Northwest Regional Floodplain Managers Association (NORFMA)

This site is a resource for floodplains, fisheries, and river engineering information for the Northwest. This site provides technical information, articles, and Internet links in the field of floodplain and fisheries management

.

Contact: Northwest Regional Floodplain Managers Association
Website: http://www.norfma.org/

Publications

Planning for Natural Hazards: The Oregon Technical Resource Guide, Department of Land Conservation and Development (July 2000).

Produced by the Community Planning Workshop for the Department of Land Conservation and Development, this is a natural hazards planning and mitigation resource for Oregon cities and counties. It provides hazard-specific resources and plan evaluation tools. The document was written for local government employees and officials. The Technical Resource Guide includes a natural hazards comprehensive plan review, a hazard mitigation legal issues guide, and five hazard-specific technical resource guides, including: flooding, wildfires, landslides, coastal hazards, and earthquakes. This document is available online. You can also write, call, or fax to obtain this document:

Contact: Natural Hazards Program Manager, Department of Land Conservation and Development
Address: 635 Capitol St. NE, Suite 200, Salem, OR 97301-2540
Phone: (503) 373-0050
Fax: (503) 378-6033
Website: http://www.oregon.gov/LCD/HAZ/publications.shtml

NFIP Community Rating System Coordinator's Manual. FEMA/NFIP. Indianapolis, IN.

This informative brochure explains how the Community Rating System works and what the benefits are to communities. It explains in detail the CRS point system, and what activities communities can pursue to earn points. These points then add up to the "rating" for the community, and flood insurance premium discounts are calculated based upon that "rating." The brochure also provides a table on the percent discount realized for each rating (1-10). Instructions on how to apply to be a CRS community are also included.

Contact: NFIP Community Rating System
Phone: (800) 480-2520 or (317) 848-2898
Website: http://training.fema.gov/EMIWeb/CRS/ (select resources)

Floodplain Management: A Local Floodplain Administrator's Guide to the NFIP. FEMA-Region 10. Bothell, WA.

This document discusses floodplain processes and terminology. It contains floodplain management and mitigation strategies, as well as information on the NFIP, CRS, Community Assistance Visits, and floodplain development standards.

Contact: National Flood Insurance Program
Phone: (800) 480-2520
Website: http://www.oregon.gov/LCD/HAZ/docs/floods/localofficial_4th.pdf

Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials, (February 1987), FEMA-116.

This guidebook offers a table on actions that communities can take to reduce flood losses. It also offers a table with sources for floodplain mapping assistance for the various types of flooding hazards. There is information on various types of flood hazards with regard to existing mitigation efforts and options for action (policy and programs, mapping, regulatory, non-regulatory). Types of flooding which are covered include alluvial fan, areas behind levees, areas below unsafe dams, coastal flooding, flash floods, fluctuating lake level floods, ground failure triggered by earthquakes, ice jam flooding, and mudslides.

Contact: Federal Emergency Management Agency
Phone: (800) 480-2520
Website: http://www.fema.gov/hazard/flood/pubs/lib116.shtm

Oregon Model Flood Damage Prevention Ordinance, (January 1999), FEMA/DLCD.

This is an example of how to write an ordinance that complies with NFIP/FEMA standards. Communities can simply adopt this ordinance, word for word, filling in the blanks specific to their community or jurisdiction.

Contact: Department of Land Conservation and Development
Phone: (503) 373-0050
Website: http://www.oregon.gov/LCD/HAZ/docs/floods/floodord.pdf

Wildfire Resource Directory

State Resources

Oregon Department of Consumer and Business Services

The Building Codes Division of Oregon's Department of Consumer and Business Services is responsible for administering statewide building codes. Its responsibilities include adoption of statewide construction standards that help create disaster-resistant buildings, particularly for flood, wildfire, wind, foundation stability, and seismic hazards. Information about wildfire-related building codes is found through this department.

Contact: Building Codes Division
Address: 1535 Edgewater St. NW, P.O. Box 14470, Salem, OR 97309
Phone: (503) 373-4133
Fax: (503) 378-2322
Website: http://www.cbs.state.or.us/external/bcd

Oregon Department of Forestry (ODF)

ODF's Fire Prevention Unit is involved in interface wildfire mitigation and provides information about Oregon's Wildfire Hazard Zones. The Protection From Fire section of the ODF website includes Oregon-specific fire protection resources. Wildfire condition reports can be accessed on the website as well. ODF's Protection from Fire Program works to do the following:

- Clarify roles of ODF, landowners, and other agencies in relation to wildland fire protection in Oregon;
- Strengthen the role of forest landowners and the forest industry in the protection system;
- Understand and respond to needs for improving forest health conditions and the role/use of prescribed fire in relation to mixed ownerships, forest fuels and insects and disease; and
- Understand and respond to needs for improving the wildland/urban interface situation.

Contact: Oregon Department of Forestry, Fire Prevention Unit
Address: 2600 State Street, Salem, Oregon 97310
Phone: (503) 945-7440
Website: http://www.oregon.gov/ODF/FIRE/fire_protection.shtml

Office of the State Fire Marshal (OSFM)

The Prevention Unit of Oregon's Office of the State Fire Marshal contains 19 Deputy State Fire Marshals located in various regions. The responsibilities of these deputies include public education for local fire districts and inspection of businesses, public assemblies, schools, daycare centers, and adult foster homes. The State Fire Marshal's Community Education Services unit works to keep

Oregonians safe from fires and injury by providing them with the knowledge to protect themselves and their property.

Contact: Oregon State Fire Marshal
Address: 4760 Portland Road NE, Salem, Oregon 97305-1760
Phone: (503) 378-3473
Fax: (503) 373-1825
Website: http://159.121.82.250/ Oregon Laws on Fire Protection: http://159.121.82.250/SFM_Admin/firelaws.htm
Email: Oregon.sfm@state.or.us

Federal Resources and Programs

Federal Wildland Fire Policy, Wildland/Urban Interface Protection

This is a report describing federal policy and interface fire. Areas of needed improvement are identified and addressed through recommended goals and actions.

Website: http://www.fs.fed.us/fire/management/policy.html

National Fire Protection Association (NFPA)

This is the principal federal agency involved in the National Wildland/Urban Interface Fire Protection Initiative. NFPA has information on the Initiative's programs and documents. Other members of the initiative include: the National Association of State Foresters, the US Department of Agriculture Forest Service, the US Department of the Interior, and the United States Fire Administration.

Contact: Public Fire Protection Division
Address: 1 Battery March Park, P.O. Box 9101, Quincy, MA 02269-9101
Phone: (617) 770-3000
Website: www.nfpa.org

National Interagency Fire Center (NIFC)

The NIFC in Boise, Idaho is the nation's support center for wildland firefighting. Seven federal agencies work together to coordinate and support wildland fire and disaster operations. These agencies include the Bureau of Indian Affairs, Bureau of Land Management, Forest Service, Fish and Wildlife Service, National Park Service, National Weather Service, and Office of Aircraft Services.

Contact: National Interagency Fire Center
Address: 3833 S. Development Avenue, Boise, Idaho 83705-5354
Phone: **(**208) 387-5512
Website: http://www.nifc.gov/

United States Fire Administration (USFA) of the Federal Emergency Management Agency (FEMA)

As an entity of the Federal Emergency Management Agency, the mission of the USFA is to reduce life and economic losses due to fire and related emergencies through leadership, advocacy, coordination, and support.

Contact: USFA, Planning Branch, Mitigation Directorate
Address: 16825 S. Seton Ave., Emmitsburg, MD 21727
Phone: (301) 447-1000
Website: http://www.fema.gov/hazard/wildfire/index.shtm - Wildfire Mitigation Planning

http://www.usfa.fema.gov/index.htm - USFA Homepage
http://www.usfa.fema.gov/wildfire/- USFA Resources on Wildfire

United States Forest Service (USFS)

The USFS is a federal land management organization established to manage the nation's federally owned forests. As part of the Department of Agriculture, it provides timber for people, forage for cattle and wildlife, habitat for fish, plants, and animals, and recreation lands throughout the country.

The USFS offers a possible link from local jurisdictions to federal grant programs.

Contact: USDA Forest Service - Pacific Northwest Region
Address: 333 SW First Avenue, Portland, Oregon 97204-3440;
P.O. Box 3623, Portland, OR 97208-3623
Phone: 503-808-2468
Website: http://www.fs.fed.us/r6/welcome.htm

Additional Resources

FireFree Program to Promote Home Safety

In a pioneering effort to address wildfire danger in Bend, Oregon, four local agencies and a Fortune 500 corporation joined together to create "FireFree! Get In The Zone," a public education campaign designed to increase resident participation in wildfire safety and mitigate losses. Spearheaded by SAFECO Corporation, the partnership includes the Bend Fire Department, Deschutes County Rural Fire Protection District #2, Bend City Planning, and The Deschutes National Forest. The Oregon Department of Forestry and a number of local government agencies and businesses have joined the program.

Contact: FireFree
Address: 63377 Jamison St., Bend, OR 97701
Phone: (541) 318-0459
E-mail: dcrfpd2@dcrfpd2.com
Website: http://www.firefree.org

Firewise – The National Wildland/Urban Interface Fire program

Firewise maintains a Website designed for people who live in wildfire- prone areas, but it also can be of use to local planners and decision makers. The site offers online wildfire protection information and checklists, as well as listings of other publications, videos, and conferences.

Contact: Firewise
Address: PO Box 9101, Quincy, MA 02269-9101
Phone: (617) 984-7056
E-mail: firewise@firewise.org
Website: http://www.firewise.org/

Publications

National Fire Protection Association Standard 299: Protection of Life and Property from Wildfire. National Wildland/Urban Interface Fire Protection Program, (1991). National Fire Protection Association, Washington, D.C.

This document, developed by the NFPA Forest and Rural Fire Protection Committee, provides criteria for fire agencies, land use planners, architects, developers, and local governments to use in the development of areas that may be threatened by wildfire. To obtain this resource:

Contact: National Fire Protection Association Publications
Phone: (800) 344-3555
Website: http://www.nfpa.org or http://www.firewise.org

An International Collection of Wildland-Urban Interface Resource Materials (Information Report NOR-X-344). Hirsch, K., Pinedo, M., & Greenlee, J. (1996). Edmonton, Alberta: Canadian Forest Service.

This is a comprehensive bibliography of interface wildfire materials. Over 2,000 resources are included, grouped under the categories of general and technical reports, newspaper articles, and public education materials. The citation format allows the reader to obtain most items through a library or directly from the publisher. The bibliography is available in hard copy or diskette at no cost. It is also available in downloadable PDF form. To obtain this resource:

Contact: Canadian Forest Service, Northern Forestry Centre, I-Zone Series
Phone: (780) 435-7210
Website: http://www.pfc.cfs.nrcan.gc.ca/cgi-bin/bstore/catalog_e.pl?catalog=11794

Wildland/Urban Interface Fire Hazard Assessment Methodology. National Wildland/Urban Interface Fire Protection Program, (1998), NFPA, Washington, D.C. To obtain this resource:

Contact: Firewise (NFPA Public Fire Protection Division)
Phone: (617) 984-7486
Website: http://www.firewise.org

Fire Protection in the Wildland/Urban Interface: Everyone's Responsibility. National Wildland/Urban Interface Fire Protection Program. (1998). Washington, D.C.: Author. To obtain this resource:

Contact: Firewise (NFPA Public Fire Protection Division)
Phone: (617) 984-7486
Website: http://www.firewise.org

Planning for Natural Hazards: The Oregon Technical Resource Guide, Department of Land Conservation and Development (July 2000).

Produced by the Community Planning Workshop for the Department of Land Conservation and Development, this is a natural hazards planning and mitigation resource for Oregon cities and counties. It provides hazard-specific resources and plan evaluation tools. The document was written for local staffs and officials. The Technical Resource Guide includes a natural hazards comprehensive plan review, a hazard mitigation legal issues guide, and five hazard-specific technical resource guides, including: flooding, wildfires, landslides, coastal hazards, and earthquakes. This document is available online. You can also write, call, or fax to obtain this document:

Contact: Natural Hazards Program Manager
Address: 635 Capitol St. NE, Suite 200, Salem, OR 97301-2540
Phone: (503) 373-0050
Fax: (503) 378-6033
Website: http://www.oregon.gov/LCD/HAZ/index.shtml

Burning Questions. A Social Science Research Plan for Federal Wildland Fire Management, Machlis, G., Kaplan, A., Tuler, S., Bagby, K., and McKendry, J. (2002) National Wildfire Coordinating Group.

The plan covers a wide range of topics and questions related to the human dimensions of federal wildland fire management. Both the beneficial and harmful affects of wildland fire are considered.

The plan includes research in the social sciences or anthropology, economics, geography, psychology, political science, and sociology, as well as interdisciplinary fields of research. The plan is national in scale but recognizes the importance of regional variation in wildland fire issues.

Contact: Cooperative Park Studies Unit
Address: 635 Capitol St. NE, Suite 200, Salem, OR 97301-2540
Phone: (208) 885-7054
Fax: (503) 378-6033
Website: http://www.psu.uidaho.edu/

Severe Weather Event Resource Directory

State Resources

Oregon Climate Service

The Oregon Climate Service collects, manages, and maintains Oregon weather and climate data. OCS provides weather and climate information to those within and outside the state of Oregon and educates the citizens of Oregon on current and emerging climate issues. OCS also performs independent research related to weather and climate issues.

Contact: Oregon Climate Service
Address: Oregon Climate Service, Oregon State University
Strand Ag Hall Room 316, Corvallis, OR 97331-2209
Phone: (541) 737-5705
Website: http://www.ocs.orst.edu
Email: oregon@oce.orst.edu

Additional Resources

Public Assistance Debris Management Guide, Federal Emergency Management Agency (July 2000).

The Debris Management Guide was developed to assist local officials in planning, mobilizing, organizing, and controlling large-scale debris clearance, removal, and disposal operations. Debris management is generally associated with post-disaster recovery. While it should be compliant with local and county emergency operations plans, developing strategies to ensure strong debris management is a way to integrate debris management within mitigation activities. The *Public Assistance Debris Management Guide* is available in hard copy or on the FEMA website.

Contact: FEMA Distribution Center
Address: 130 228th Street, SW, Bothell, WA 98021-9796
Phone: (800) 480-2520
Fax: (425) 487-4622
Website: http://www.fema.gov/government/grant/pa/dmgtoc.shtm

Landslide Resource Directory

State Resources

Oregon Department of Forestry (ODF)

The mission of the Oregon Department of Forestry is to serve the people of Oregon through the protection, management, and promotion of a healthy forest environment, which will enhance

Oregon's livability and economy for today and tomorrow. ODF regulates forest operations to reduce the risk of serious injury or death from rapidly moving landslides related to forest operations, and assists local governments in the siting review of permanent dwellings on and adjacent to forestlands in further review areas.

Contact: Oregon Department of Forestry
Address: 2600 State Street, Salem OR 97310
Phone: (503) 945-7212
Website: http://www.odf.state.or.us

Oregon Department of Forestry Debris Flow Warning Page

The ODF debris flow warning page provides communities with up-to-date access to information regarding potential debris flows. As the lead agency, ODF is responsible for forecasting and measuring rainfall from storms that may trigger debris flows. Advisories and warnings are issued as appropriate. Information is broadcast over NOAA weather radio and on the Law Enforcement Data System. DOGAMI provides additional information on debris flows to the media that convey the information to the public. ODOT also provides warnings to motorists during periods determined to be of highest risk for rapidly moving landslides along areas on state highways with a history of being most vulnerable. Information is available on the ODF website at www.odf.state.or.us.

Oregon Department of Geology and Mineral Industries (DOGAMI)

DOGAMI is an important agency for landslide mitigation activities in Oregon. Some key functions of DOGAMI are development of geologic data, producing maps, and acting as lead regulator for mining and drilling for geological resources. The agency also provides technical resources for communities and provides public education on geologic hazards. DOGAMI provides data and geologic information to local, state, and federal natural resource agencies, industry, and private groups.

Contact: DOGAMI
Address: 800 NE Oregon Street, Suite 965, Portland, Oregon 97232
Phone: (971) 673-1555
Fax: (971) 673-1562
Website: www.oregongeology.com
Email: info@naturenw.org

Nature of the Northwest

Oregon Department of Geology and Mineral Industries and the USDA Forest Service jointly operate the Nature of the Northwest Information Center. The Center offers a selection of maps and publications from state, federal, and private agencies.

Contact: The Nature of the Northwest Information Center
Address: 800 NE Oregon Street #5, Suite 177, Portland, Oregon 97232
Phone: (503) 872- 2750
Fax: (503) 731-4066
Website: http://www.naturenw.org
Email: Nature.of.Northwest@state.or.us

Oregon Department of Transportation (ODOT)

ODOT provides warnings to motorists during periods determined to be of highest risk of rapidly moving landslides along areas on state highways with a history of being most vulnerable to rapidly moving landslides. ODOT also monitors for landslide activity and responds to slide events on state highways.

Contact: ODOT Transportation Building

Address: 355 Capitol St. NE, Salem, OR 97310
Phone: (888) 275-6368
Website: http://www.odot.state.or.us

Portland State University, Department of Geology

Portland State University conducts research and prepares inventories and reports for communities throughout Oregon. Research and projects conducted through the Department of Geology at Portland State University include an inventory of landslides for the Portland metropolitan region after the 1996 and 1997 floods and a subsequent susceptibility report and planning document for Metro in Portland.

Contact: Portland State University, Department of Geology
Address: 17 Cramer Hall; 1721 SW Broadway, Box 751, Portland, OR 97207
Phone: (503) 725-3389
Website: http://www.geol.pdx.edu

Federal Resources

Natural Resource Conservation Service (NRCS)

The NRCS produces soil surveys. These may be useful to local governments who are assessing areas with potential development limitations including steep slopes and soil types. They operate many programs dealing with the protection of natural resources.

Contact: NRCS, Oregon Branch
Address: 101 S.W. Main Street, Suite 1300, Portland, OR 97204
Phone: (503) 414-3200
Fax: (503) 414-3103
Website: http://www.or.nrcs.usda.gov

US Geological Survey, National Landslide Information Center (NLIC)

The NLIC website provides good information on the programs and resources regarding landslides. The page includes information on the National Landslide Hazards Program Information Center, a bibliography, publications, and current projects. USGS scientists are working to reduce long-term losses and casualties from landslide hazards through better understanding of the causes and mechanisms of ground failure both nationally and worldwide.

Contact: National Landslide Information Center
Phone: (800) 654-4966
Website: http://www.usgs.gov/hazards/landslides/

Additional Resources

American Planning Association (APA)

The APA's research department embarked on a program to bring together solutions from multiple disciplines into a single source. It will help serve local planning efforts in identifying landslide hazards during the planning process so as to minimize exposure to landslide risks. The APA's website highlights planning efforts to reduce risk and loss from landslides.

Contact: Principal Investigator, Landslides Project
Address: Research Department, American Planning Association
122 S. Michigan Ave., Suite 1600
Chicago, Illinois 60603-6107

Phone: (312) 431-9100
Fax: (312) 431-9985
Website: http://www.planning.org/landslides
Email: landslides@planning.org

State of Washington, Department of Ecology

The Washington State Department of Ecology has a landslide website with tips for reducing risk, warning signs, and maps.

Contact: Department of Ecology
Address: PO Box 47600, Olympia, WA 98504-7600
Website: http://www.ecy.wa.gov/programs/sea/landslides
Email: hshi461@ecy.wa.gov

Publications

Planning for Natural Hazards: The Oregon Technical Resource Guide, Department of Land Conservation and Development (July 2000).

Produced by the Community Planning Workshop for the Department of Land Conservation and Development, this is a natural hazards planning and mitigation resource for Oregon cities and counties. It provides hazard-specific resources and plan evaluation tools. The document was written for local government employees and officials. The Technical Resource Guide includes a natural hazards comprehensive plan review, a hazard mitigation legal issues guide, and five hazard-specific technical resource guides, including: flooding, wildfires, landslides, coastal hazards, and earthquakes. You can write, call, fax, or go on-line to obtain this document.

Contact: Natural Hazards Program Manager, DLCD
Address: 635 Capitol St. NE, Suite 200, Salem, OR 97301-2540
Phone: (503) 373-0050
Fax: (503) 378-6033
Website: http://www.oregon.gov/LCD/HAZ/index.shtml

Mileti, Dennis, Disasters by Design: A Reassessment of Natural Hazards in the United States *(1999) Joseph Henry Press.*

This book offers a way to view, study, and manage hazards in the United States that will help foster disaster-resilient communities, higher environmental quality, inter- and intragenerational equity, economic sustainability, and an improved quality of life. The volume provides an overview of what is known about natural hazards, recovery, and mitigation; reveals how research findings have been translated into policies and programs; and advances a sustainable hazard mitigation research agenda.

Olshansky, Robert B., *Planning for Hillside Development* (1996) American Planning Association.

This document describes the history, purpose, and functions of hillside development and regulation and the role of planning, and provides excerpts from hillside plans, ordinances, and guidelines from communities throughout the US.

Olshansky, Robert B. & Rogers, J. David, *Unstable Ground: Landslide Policy in the United States* (1987) Ecology Law Quarterly.

This is about the history and policy of landslide mitigation in the US.

Public Assistance Debris Management Guide (July 2000) Federal Emergency Management Agency

The Debris Management Guide was developed to assist local officials in planning, mobilizing, organizing, and controlling large-scale debris clearance, removal, and disposal operations. Debris management is generally associated with post-disaster recovery. While it should be compliant with local and county emergency operations plans, developing strategies to ensure strong debris management is a way to integrate debris management within mitigation activities. The Guide is available in hard copy or on the FEMA website.

Contact: FEMA Distribution Center
Address: 130 228th Street, SW, Bothell, WA 98021-9796
Phone: (800) 480-2520
Website: http://www.fema.gov/government/grant/pa/dmgtoc.shtm

USGS Landslide Program Brochure. National Landslide Information Center (NLIC), United States Geologic Survey

The brochure provides good, general information in simple terminology on the importance of landslide studies and a list of databases, outreach, and exhibits maintained by the NLIC. The brochure also includes information on the types and causes of landslides, rockfalls, and flows.

Contact: USGS- MS 966, Box 25046
Address: Denver, Federal Center, Denver, CO 80225
Phone: (800) 654-4966
Web: http://geohazards.cr.usgs.gov/

Earthquake

State Resources

Oregon Department of Consumer & Business Services-Building Codes Division

The Building Codes Division (BCD) sets statewide standards for design, construction, and alteration of buildings that include resistance to seismic forces. BCD is active on several earthquake committees and funds construction related continuing education programs. BCD registers persons qualified to inspect buildings as safe or unsafe to occupy following an earthquake and works with OEM to assign inspection teams where they are needed.

Contact: Building Codes Division
Address: 1535 Edgewater St. NW, P.O. Box 14470, Salem, Oregon 97309
Phone: (503) 378-4133
Fax: (503) 378-2322
Website: http://www.cbs.state.or.us/external/bcd/

The Nature of the Northwest Information Center

The Nature of the Northwest Information Center is operated jointly by the Oregon Department of Geology and Mineral Industries and the USDA Forest Service. It offers selections of maps and publications from state, federal, and private agencies. DOGAMI's earthquake hazard maps can be ordered from this site.

Address: Suite 177, 800 NE Oregon Street # 5, Portland, Oregon 97232
Phone: (503) 872-2750
Fax: (503) 731-4066
Email: Nature.of.NW@state.or.us
Website: http://www.naturenw.org/geo-earthquakes.htm

Federal Resources

US Geological Survey (USGS)

The USGS is an active seismic research organization that also provides funding for research. (For an example of such research, see Recommended Seismic Publications below).

Contact: USGS, National Earthquake Information Center
Address: Box 25046; DFC, MS 967; Denver, Colorado 80225
Phone: (303) 273-8500
Fax: (303) 273-8450
Website: http://neic.usgs.gov

Building Seismic Safety Council (BSSC)

The Building Seismic Safety Council (BSSC), established by the National Institute of Building Sciences (NIBS), deals with complex regulatory, technical, social, and economic issues and develops and promotes building earthquake risk mitigation regulatory provisions for the nation.

Address: 1090 Vermont Avenue, NW, Suite 700, Washington, DC 20005
Phone: (202) 289-7800
Fax: (202) 289-1092
Website: http://www.bssconline.org**/**

Western States Seismic Policy Council (WSSPC)

The WSSPC is a regional organization that includes representatives of the earthquake programs of thirteen states (Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon Utah, Washington, and Wyoming), three U.S. territories (American Samoa, Commonwealth of the Northern Mariana Islands and Guam), one Canadian Province (British Columbia), and one Canadian Territory (Yukon). The primary aims of the organization have been: to improve public understanding of seismic risk; to improve earthquake preparedness; and, to provide a cooperative forum to enhance transfer of mitigation technologies at the local, state, interstate, and national levels.

The mission of the Council is to provide a forum to advance earthquake hazard reduction programs throughout the western region and to develop, recommend, and present seismic policies and programs through information exchange, research and education.

Contact: WSSPC, Executive Director
Address: 121 Second Street, 4th Floor, San Francisco, CA 94105
Phone: (415) 974-6435
Fax: (415) 974-1747
Email: wsspc@wsspc.com
Website: http://www.wsspc.org/

Cascadia Region Earthquake Workgroup (CREW)

CREW provides information on regional earthquake hazards, facts and mitigation strategies for the home and business office. CREW is a coalition of private and public representative s working together to improve the ability of Cascadia Region communities to reduce the effects of earthquake events. Members are from Oregon, Washington, California, and British Columbia. Goals are to:

- Promote efforts to reduce the loss of life and property.

- Conduct education efforts to motivate key decision makers to reduce risks associated with earthquakes.
- Foster productive linkages between scientists, critical infrastructure provides, businesses and governmental agencies in order to improve the viability of communities after an earthquake.

Contact: CREW, Executive Director
Address: 1330A S. 2nd Street, #105, Mount Vernon, WA 97273
Phone: (360) 336-5494
Fax: (360) 336-2837
Website: http://www.crew.org/

Additional Resources

Publications

Planning for Natural Hazards: The Oregon Technical Resource Guide, Department of Land Conservation and Development (July 2000).

Produced by the Community Planning Workshop for the Department of Land Conservation and Development, this is a natural hazards planning and mitigation resource for Oregon cities and counties. It provides hazard-specific resources and plan evaluation tools. The document was written for local government employees and officials. The Technical Resource Guide includes a natural hazards comprehensive plan review, a hazard mitigation legal issues guide, and five hazard-specific technical resource guides, including: flooding, wildfires, landslides, coastal hazards, and earthquakes. You can write, call, fax, or go on-line to obtain this document.

Contact: Natural Hazards Program Manager, DLCD
Address: 635 Capitol St. NE, Suite 200, Salem, OR 97301-2540
Phone: (503) 373-0050
Fax: (503) 378-6033
Website: http://www.oregon.gov/LCD/HAZ/index.shtml

Environmental, Groundwater and Engineering Geology: Applications for Oregon – Earthquake Risks and Mitigation in Oregon, Yumei Wang, (1998) Oregon Department of Geology and Mineral Industries, Star Publishing.

This paper deals with earthquake risks in Oregon, what is being done today, and what policies and programs are in action to help prevent loss and damage from seismic events. This article also gives a good list of organizations that are doing work in this field within the state. This article is somewhat technical but provides vital information to communities around the state.

Contact: DOGAMI
Address: 800 NE Oregon St., Suite 965, Portland, Oregon 97232
Phone: (971) 673-1555
Fax: (971) 673-1562
Website: www.oregongeology.com

Special Paper 29: Earthquake damage in Oregon: Preliminary estimates of future earthquake losses, Yumei Wang, Oregon Department Of Geology And Mineral Industries.

Wang, a geotechnical engineer, analyzed all faults with a 10% chance of causing an earthquake in the next 50 years and projected potential damage. Wang stresses that these are preliminary figures. "There are two things we could not incorporate into this study that would significantly increase these figures. One is a tsunami. The other is an inventory of unreinforced brick or masonry buildings."

Contact: DOGAMI
Address: 800 NE Oregon St., Suite 965, Portland, Oregon 97232
Phone: (971) 673-1555
Fax: (971) 673-1562
Website: www.oregongeology.com

Land Use Planning for Earthquake Hazard Mitigation: A Handbook for Planners, *Wolfe, Myer R. et. al., (1986) University of Colorado, Institute of Behavioral Science, National Science Foundation.*

This handbook provides techniques that planners and others can utilize to help mitigate for seismic hazards. It provides information on the effects of earthquakes, sources on risk assessment, and effects of earthquakes on the built environment. The handbook also gives examples on application and implementation of planning techniques to be used by local communities.

Contact: Natural Hazards Research and Applications Information Center
Address: University of Colorado, 482 UCB, Boulder, CO 80309-0482
Phone: (303) 492-6818
Fax: (303) 492-2151
Website: http://www.colorado.edu/UCB/Research/IBS/hazards

Using Earthquake Hazard Maps: A Guide for Local Governments in the Portland Metropolitan Region; Evaluation of Earthquake Hazard Maps for the Portland Metropolitan Region Spangle Associates, (1998/1999) Urban Planning and Research, Portola Valley, California.

These two publications are useful for local governments concerned with land use in earthquake hazard areas. The proximity of Washington County to Portland and their interactive communities make these guides applicable to the County. The publications are written in clear and simplistic language and address issues such as how to apply earthquake hazard maps for land use decisions.

Contact: DOGAMI
Address: 800 NE Oregon St., Suite 965, Portland, Oregon 97232
Phone: (971) 673-1555
Fax: (971) 673-1562
Website: www.oregongeology.com

Public Assistance Debris Management Guide, Federal Emergency Management Agency (July 2000).

The Debris Management Guide was developed to assist local officials in planning, mobilizing, organizing, and controlling large-scale debris clearance, removal, and disposal operations. Debris management is generally associated with post-disaster recovery. While it should be compliant with local and county emergency operations plans, developing strategies to ensure strong debris management is a way to integrate debris management within mitigation activities. The *Public Assistance Debris Management Guide* is available in hard copy or on the FEMA website.

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Address: 130 228th Street, SW, Bothell, WA 98021-9796
Phone: (800) 480-2520
Fax: (425) 487-4622
Website: http http://www.fema.gov/government/grant/pa/dmgtoc.sht

Appendix E: Household Preparedness Survey

PARTNERS *for* DISASTER RESISTANCE RESILIENCE

Household Preparedness Survey

Jefferson, Harney, Lake and Malheur Counties

Photos: Gary Halvorson, Oregon State Archives

Oregon Natural Hazards Workgroup

Household Natural Hazards Preparedness Survey

Survey Report for:

Jefferson County, Oregon
Harney County, Oregon
Lake County, Oregon
Malheur County, Oregon

Prepared by:

Oregon Natural Hazards Workgroup

Community Service Center
1209 University of Oregon
Eugene, OR 97403-1209
Phone: 541.346.3889
Fax: 541.346.2040
Email: onhw@uoregon.edu
http://www.oregonshowcase.org

January 2007

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Rena Thompson, Jefferson County

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Craig Smith, Malheur County

Project Manager:

Bethany Johnson, Oregon Natural Hazards Workgroup

Project Advisors:

Krista Mitchell, Project Coordinator, Oregon Natural Hazards Workgroup

André LeDuc, Director, Oregon Natural Hazards Workgroup

Robert Parker, Managing Director, Community Service Center

Natural Hazard Household Preparedness Survey

Background

The *Partners for Disaster Resistance and Resilience: Oregon Showcase State Program* was established in 2000 to provide a more coordinated approach to addressing risks from natural hazards in Oregon. Establishing disaster safety as a public value is a shared objective among the partners involved with the Program. This Program strives to reduce deaths, injuries, property damage, economic losses and human suffering caused by natural disasters. The next flood, earthquake or wildfire cannot be avoided. However, we can make a comprehensive and concentrated effort to reduce the effects of these natural forces on our economic, social and environmental stability. The Program provides a comprehensive framework for government and the private sector to prepare for and minimize risk and impact of natural hazards.

The Federal Emergency Management Agency (FEMA) published Interim Rule 44 CFR Part 201 in February 2002, requiring all states and communities to develop natural hazard mitigation plans by November 2003. These planning and mitigation requirements for states and communities are being accomplished through the Pre-Disaster Mitigation Program (PDM). Oregon Natural Hazards Workgroup (ONHW) at the University of Oregon, as the coordinator of the *Partners for Disaster Resistance and Resilience: Oregon Showcase State Program*, is working with Oregon Emergency Management (OEM) and the PDM Program to assist local governments with their natural hazard mitigation planning efforts.

Citizen involvement is a key component in the natural hazard mitigation planning process. Citizens have the opportunity to voice their ideas, interests and concerns about the impact of natural disasters on their communities. To that end, the Disaster Mitigation Act of 2000[1] requires citizen involvement in the natural hazard mitigation planning process. It states:

> An open public involvement process is essential to the development of an effective plan. In order to develop a more

[1] National Archives and Records Administration. 2002. Federal Emergency Management Agency 44 CFR Parts 201 and 206 Hazard Mitigation Planning and Hazard Mitigation Grant Program; Interim Final Rule in Federal Register.

comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

1. An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.
2. An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process.

The benefits of citizen involvement, according to Bierle[2], include the following: (1) educate and inform public; (2) incorporate public values into decision making; (3) improve substantially the quality of decisions; (4) increase trust in institutions; (5) reduce conflict; and (6) ensure cost effectiveness.

The survey helps the counties of the Southeastern region, made up of Jefferson, Harney, Lake and Malheur Counties, realize Bierle's five benefits of citizen involvement in the natural hazard mitigation planning process. As part of the PDM Program, ONHW is assisting the Southeastern region of Oregon with the citizen involvement components of the natural hazard mitigation planning process.

Methodology

To conduct the household survey, ONHW modified the eight page survey administered statewide in 2002 to a five page survey. The purpose of the survey is to better understand the perceptions of risk to natural hazards held by citizens, as well as the level of preparedness and types of risk reduction activities in which citizens have engaged. (See Appendix A) The primary goal of the survey was to gauge the overall perception of natural disasters and determine a baseline level of loss reduction activity for residents in the community. ONHW adapted the statewide survey to include questions about citizens' support for different types of community planning actions. Planning actions mentioned included protecting critical facilities, disclosing natural hazard risks during real estate transactions, and the use of tax dollars to compensate land owners for not developing in hazardous areas.

The survey was sent to 1200 households in the Southeastern region, which includes: Jefferson, Harney, Lake and Malheur Counties. The households were randomly selected and population weighted based on registered voter lists provided to ONHW by each of the counties.

[2] Bierle, T. 1999. "Using social goals to evaluate public participation in environmental decisions." *Policy Studies Review*. 16(3/4) ,75-103.

The mailing contained a cover letter, the survey instrument, an entry raffle form for a gift certificate to a local hardware store, and a postage-paid return envelope. Completed surveys were returned to ONHW. A second mailing was sent to households who did not respond to the first mailing, approximately three weeks later. ONHW received 277 valid responses, for a 23% response rate.

Limitations

The study identifies key issues about how members of the Southeastern Oregon communities perceive their risk to natural hazards, providing a snapshot of those perceptions at a single point in time. As such, survey responses may reflect external issues, such as heightened concern about terrorism or the current state of the economy. This study was not intended to be representative of the perceptions of all residents, and cannot be generalized to the public.

Organization of Report

The survey results are organized into the following sections:

Characteristics of Survey Respondents: This section reports information about respondent characteristics including: educational attainment, age, and length of time as an Oregon resident.

Perception of Risk: This section identifies the general level of concern over natural hazards risk.

Household Preparedness and Risk Reduction: This section describes the types of structural and nonstructural measures that are being implemented by survey respondents, and the types of resources or programs that might increase risk reduction activities.

Community Natural Hazard Preparedness: This section describes citizens' priorities for planning for natural hazards and the community-wide strategies respondents support.

Written Responses to Open-Ended Questions: This section includes summarizes the responses of the open-ended questions and comments.

Characteristics of Survey Respondents

Demographic survey questions provide a statistical overview of the characteristics of the respondents. This section of the survey asked respondents about their age and gender, their level of education, and how long they have lived in Oregon. The survey also included questions regarding respondents' present housing.

There were 277 people who responded to the survey, giving the survey a 23% response rate. Of the four counties the survey was mailed to, the majority of surveys returned came from residents of Jefferson and Malheur Counties (Table 1). This is not surprising as Jefferson and

Malheur have the greatest number of residents in the region with 50,339 of the 65,370 total residents (2000 U.S. Census). Zip codes provide a more specific location of the survey respondents than the county level data. Of the 30 different zip codes indicated, the most respondents live in the 97914 zip code (City of Ontario) followed by 97741 (City of Madras) (Table 2).

Table 1. Percent of Surveys Received Per County

County	Percent of Surveys Received
Harney	14%
Lake	15%
Jefferson	33%
Malheur	38%

Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006).

Table 2. Percent of Surveys Per Zipcode

Zip code	Percent of Surveys
97914	21%
97741	15%
97630	10%
97760	9%
97918	8%
97913	6%
97738	6%
97720	6%
97734	4%
Other	16%

Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006).

Gender and Age

Women accounted for 57% of survey respondents even though they represented just less than 50% of the population in the Southeastern region according to the 2000 Census. The mean age of survey respondents was 58 years. This is considerably higher than the average median age, 40 years, of residents in Southeastern Oregon according to the U.S. Census 2000. Table 3 compares the ages of survey respondents to the 2000 U.S. Census. This shows that younger people were underrepresented while older people were overrepresented.

Table 3. Percentage of Southeastern Oregon Population and Survey Respondents by Age Category (persons 20 and over)

Age Category	Mid & Southeastern Oregon[3]	Survey Respondents
20 - 24	6.0%	1.1%
25 - 34	12.3%	6.2%
35 - 44	14.4%	11.8%
45 - 54	13.3%	23.2%
55 - 59	5.2%	14.1%
60 - 64	4.6%	9.9%
65 - 74	7.5%	18.1%
75 - 84	4.7%	13.1%
85+	1.7%	1.1%

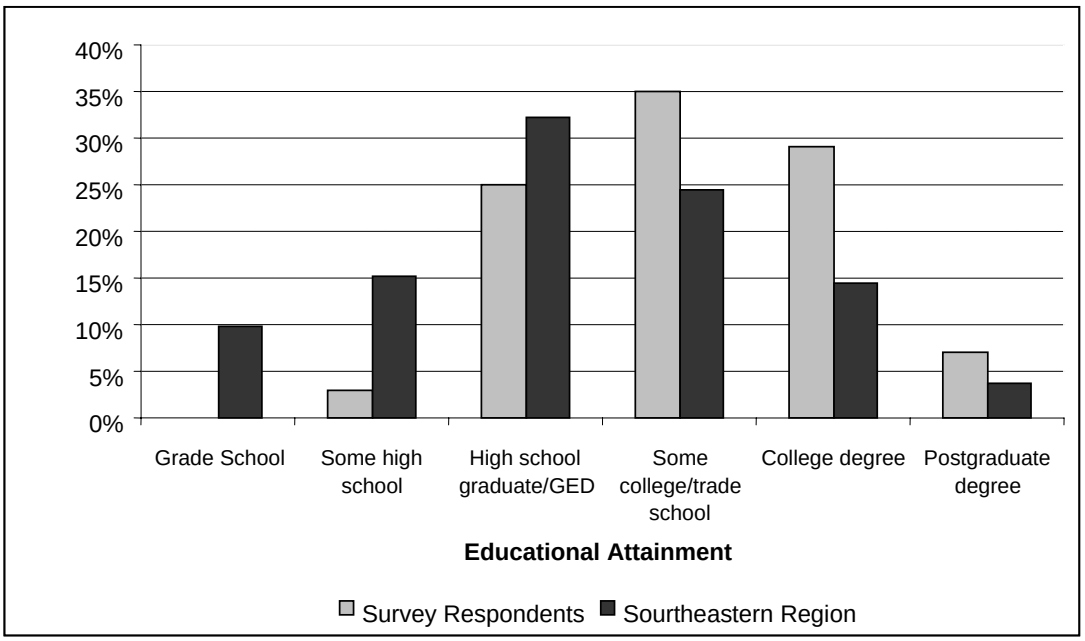
Source: U.S. Census Bureau: www.census.gov (2000) and Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006).

Level of Education

In general, survey respondents were relatively well educated. Figure 1 compares the level of education of survey respondents with the 2000 U.S. Census. About 71% of survey respondents have attended some college or gone to a trade school, obtained a college degree, or have a postgraduate degree. In contrast, figures from the Census show that an average of 43% of Southeastern residents have achieved this level of educational attainment. Survey respondents were much more likely to have completed a higher educational level than the overall population of the Southwestern region.

[3] The age categories are percentages of the total number of people in each age group for all four counties as reported by the US Census 2000

Figure 1. Level of Education of Southeastern Oregon Population and Survey Respondents

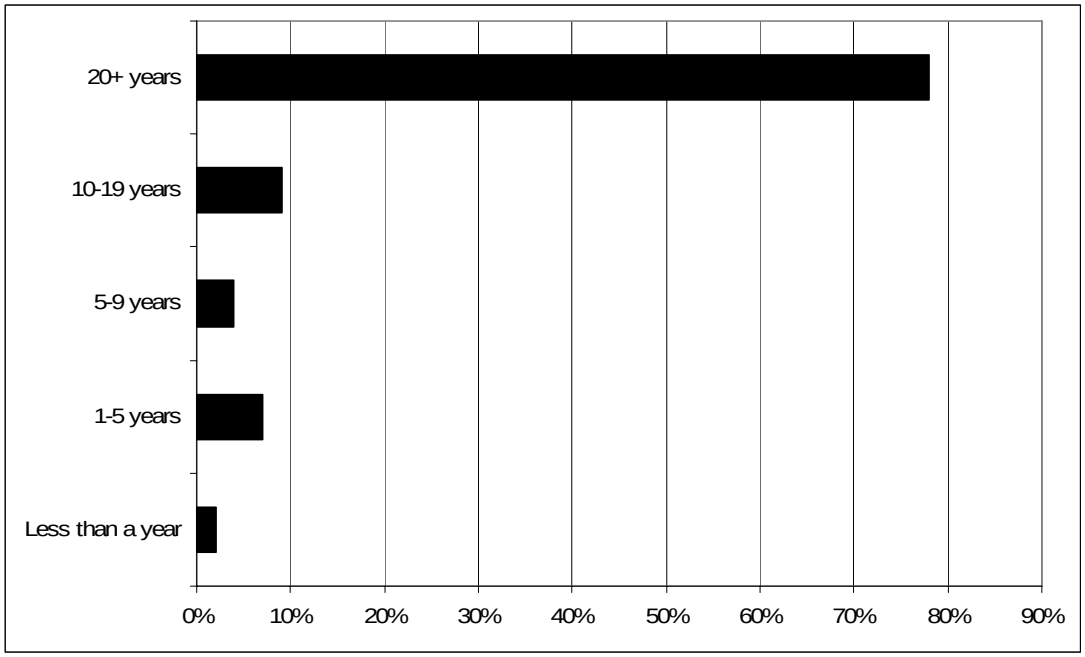


Source: U.S. Census Bureau: www.census.gov (2000) and Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006)

Oregon Residency

Approximately 78% percent of survey respondents have lived in Oregon for 20 years or more (see Figure 2). Respondents who have lived in Oregon for fewer than 20 years have most commonly moved from California (13%) and Idaho (13%).

Figure 2. Length of Time Survey Respondents Have Lived in Oregon



Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006)

Housing Characteristics

Housing characteristics are important variables in creating effective education and outreach programs. Knowledge of the percentage of homeowners in a community can help target the programs and homeowners might be more willing to invest time and money in making their homes more disaster resistance. Due to a data collection error, homeownership rates of survey respondents can not be reported. However, the US Census 2000 reports an average of 67% of Southeastern Oregon residents are homeowners.

Almost 66% of survey respondents live in single-family homes, 24% live in manufactured homes, 2% in apartments, and 3% live in duplexes. In addition, 76% said they have access to the internet.

Perception of Risk

It is helpful to understand community members' experiences and their perceptions of risk to natural hazards to make informed decisions about natural hazard risk reduction activities. The survey asked respondents about their level of concern for specific hazards in the Southeastern region. The primary objective of this question was to create a "natural hazard profile" of respondents to better understand how Southeastern residents perceive natural hazards.

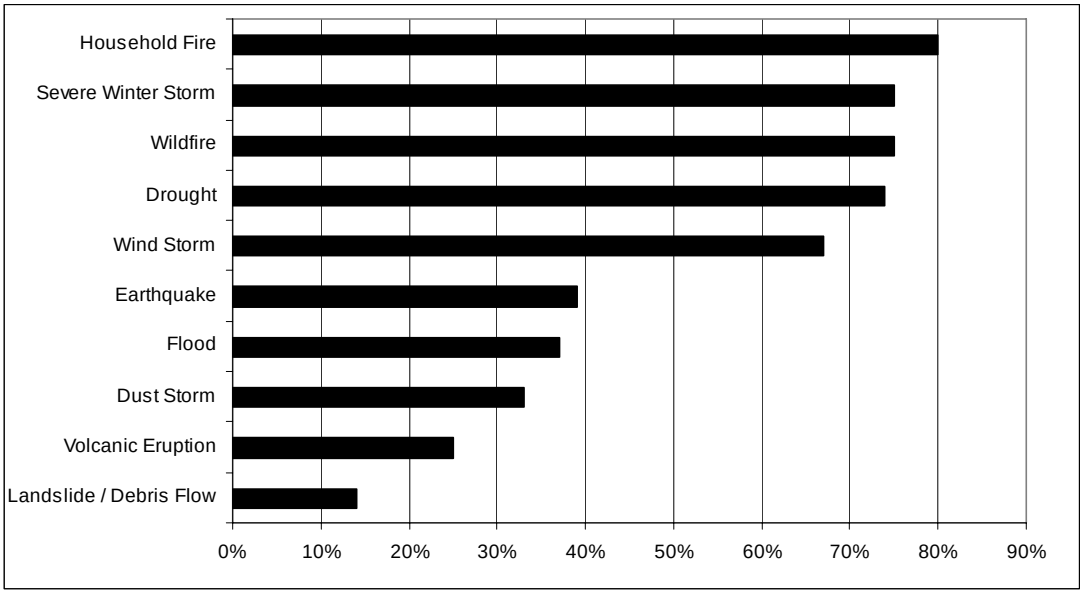
The survey asked respondents to rank their personal level of concern for specific natural disasters affecting their community. The results show that respondents were most concerned about household fire, wildfire, severe winter storm, drought and windstorm. The respondents are least concerned about landslide/debris flows. Figure 3 shows the percent of respondents that identified their level of concern as either "Very Concerned" or "Somewhat Concerned".

Table 4. Survey Respondents' Level of Concern Regarding Natural Hazards in the Southeastern Region

	Very Concerned	Somewhat Concerned	Neither Concerned nor Unconcerned	Not Very Concerned	Not Concerned
Drought	22%	52%	12%	9%	6%
Dust Storm	7%	26%	27%	22%	19%
Earthquake	11%	28%	21%	26%	14%
Flood	8%	29%	17%	23%	23%
Landslide / Debris Flow	4%	10%	23%	29%	34%
Wildfire	40%	35%	11%	8%	6%
Household Fire	31%	49%	11%	7%	2%
Volcanic Eruption	5%	20%	18%	20%	37%
Wind Storm	13%	54%	15%	11%	7%
Severe Winter Storm	23%	52%	14%	7%	4%

Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006)

Figure 3. Percentage of Survey Respondents' Who Are "Very Concerned" or "Somewhat Concerned" about Natural Hazards



Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006)

Household Preparedness and Risk Reduction

There are many steps people can take to prepare their households for a natural disaster or emergency. Preparing for a disaster can improve the safety and comfort of the members of a household immediately following a natural disaster or emergency. The survey asked respondents about what steps their households have taken or plan to take to increase their disaster preparedness.

Property Protection

Only 37% of the respondents considered the possible occurrence of a natural hazard when they bought or moved into their current homes. The need to have adequate provisions for financial and property recovery when natural disasters do occur is a necessary component of natural hazard preparedness. Fourteen percent of the respondents indicated they have flood insurance leaving 86% without it. However, 53% of those who don't have flood insurance indicated the reason is because their home is not located in the floodplain and 17% felt it was not necessary. Approximately the same amount of respondents (15%) indicated they have earthquake insurance. The top two reasons given by those who don't have earthquake insurance were that it is not necessary (37%) or that they never considered it (32%).

Table 5. Survey Respondents' Reasons For Not Having Flood and/or Earthquake Insurance

Flood Insurance		Earthquake Insurance	
Not located in the floodplain	53%	Not necessary	37%
Not necessary	17%	Not familiar with it/don't know	32%
Not familiar with it/don't know	9%	Not available	11%
Too Expensive	8%	Too Expensive	11%
Not available	6%	Deductible too high/not worth it	5%
Other	4%	Other	5%
Deductible too high/not worth it	3%		

Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006)

Sixty percent of respondents have used fire-resistant building or roofing materials and have secured their homes to its foundation. Fifty-six percent of respondents talked with members of their households about what to do in the case of a natural disaster or emergency. Table 6 summarizes the activities respondents indicated they have done, plan to do, have not done, or were unable to do to prepare for natural disasters.

Table 6. Survey Respondents' Household Disaster Preparedness Activities

	Have Done	Plan To Do	Not Done	Unable To Do	Does Not Apply
Attended meetings or received written information on natural disasters or emergency preparedness?	27%	7%	61%	5%	
Talked with members in your household about what to do in case of a natural disaster or emergency?	56%	14%	27%	2%	
Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a disaster?	39%	19%	40%	2%	
Prepared a "Disaster Supply Kit" (Stored extra food, water, batteries, or other emergency supplies)?	41%	23%	36%	1%	
In the last year, has anyone in your household been trained in First Aid or Cardio-Pulmonary Resuscitation (CPR)?	38%	6%	55%	1%	
Have you secured your water heaters, cabinets and bookcases to the wall?	26%	5%	62%	5%	4%
Have you fit your gas appliances with flexible connections?	24%	1%	14%	3%	58%
Used fire-resistant building or roofing materials?	60%	5%	22%	6%	7%
Secured your home to its foundation?	60%	3%	18%	9%	10%
Braced unreinforced masonry, concrete walls, and chimney?	22%	3%	27%	7%	41%
Elevated your home in preparation for floods?	19%	0%	20%	11%	50%

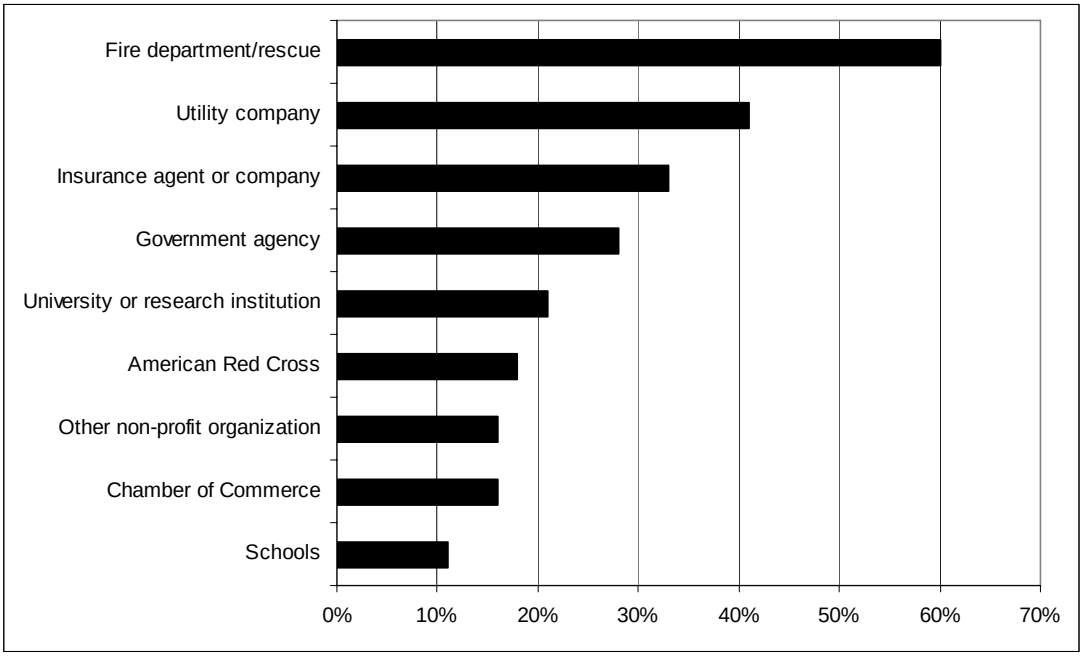
Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (June 2006)

Preferred Sources and Formats of Information

To develop and implement effective outreach and education activities, it is important to understand the mechanisms for information dissemination. Of the listed organizations that might provide information to households about household preparedness for natural disasters, respondents most frequently preferred the fire department or

rescue organization. Figure 4 shows that schools were the least preferred organization to be the primary information source.

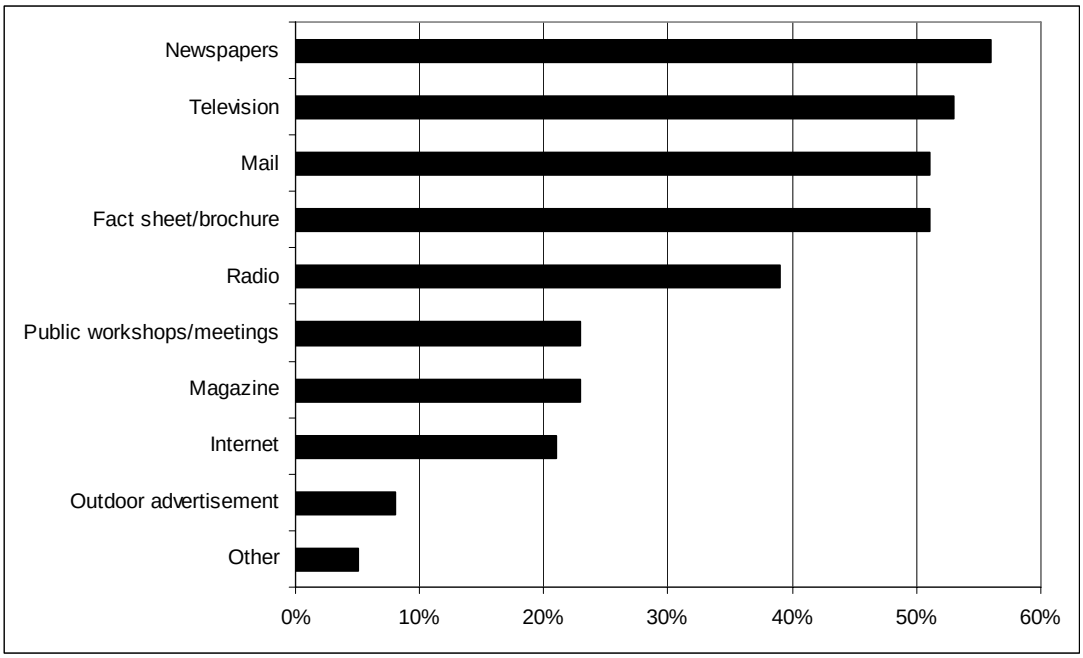
Figure 4. Survey Respondents' Preferred Sources of Information Regarding Household Preparedness



Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006)

When asked what the most effective way was to receive information, respondents indicated that the local newspaper (56%), television news (53%), fact sheet/brochure (51%), and mail (51%) were the most effective. Figure 5 shows how survey respondents rated the effectiveness of dissemination methods presented in the survey.

Figure 5. Survey Respondents' Ranking of Effectiveness of Selected Preparedness Outreach Methods



Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (September 2006)

Community Natural Hazard Preparedness

To assist those preparing the communities' natural hazard mitigation plans, it is essential to understand the importance community members place on specific community-level risk reduction actions. These questions could help Southeastern communities determine their citizens' priorities when planning for natural hazards. They also provide an idea of which types of strategies to reduce the communities' risk the citizens would be willing support. Table 7 illustrates the importance respondents placed on each potential natural hazard goal.

Over 95% of respondents indicated that it is very important or somewhat important to protect private property, protect critical facilities, protect and reduce damage to utilities, strengthen emergency services. The statement with the lowest priority (78%) is to protect historical and cultural landmarks.

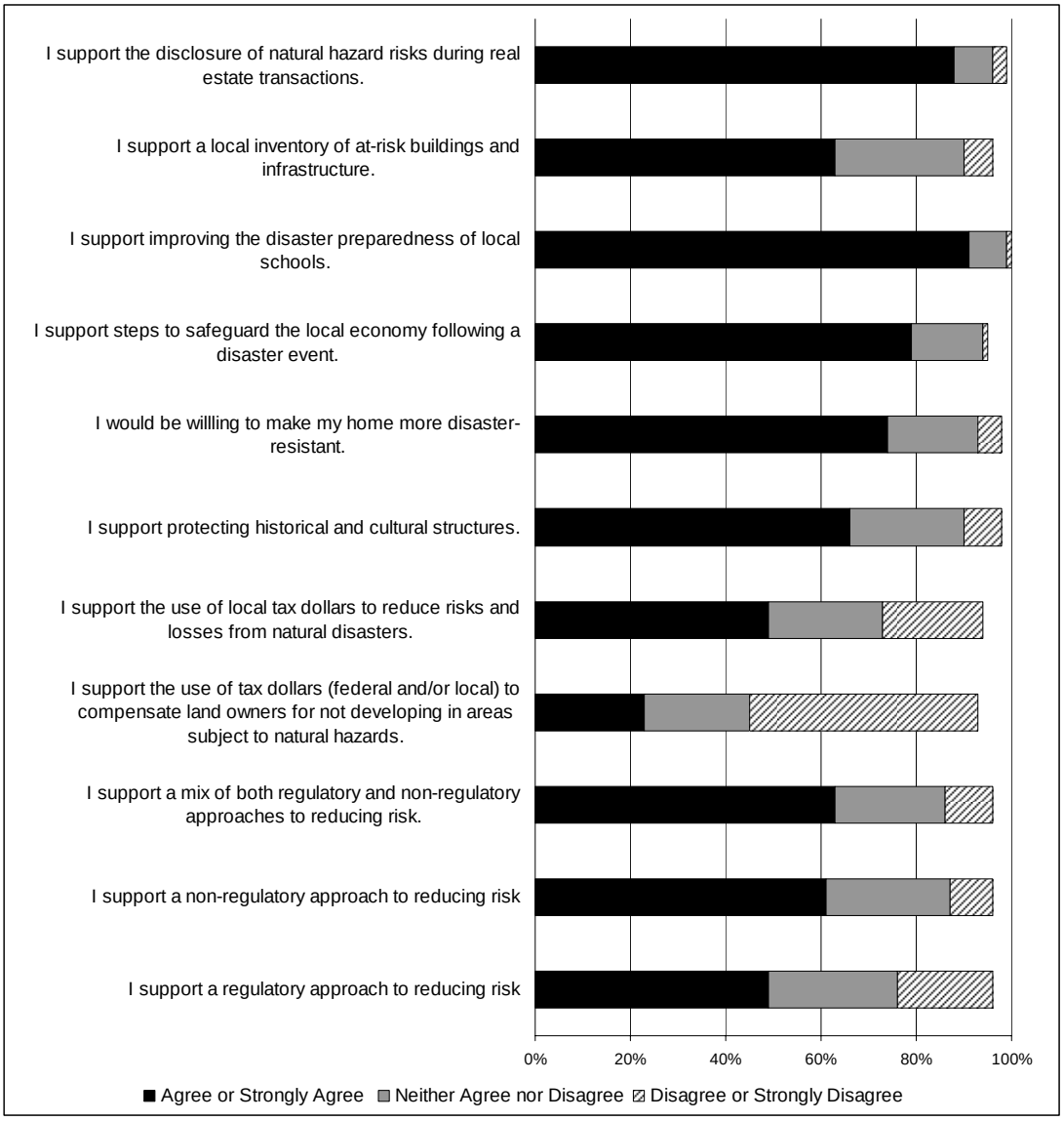
Table 7. Survey Respondents' Goal Prioritization

	Very Important	Somewhat Important	Neither Important nor Unimportant	Not Very Important	Not Important
Protecting private property	71%	24%	3%	1%	1%
Protecting critical facilities (e.g., transportation networks, hospitals, fire stations)	86%	12%	1%	0%	1%
Preventing development in hazard areas	46%	39%	10%	3%	2%
Enhancing the function of natural features (e.g., streams, wetlands)	37%	41%	14%	4%	4%
Protecting historical and cultural landmarks	31%	43%	19%	5%	2%
Protecting and reducing damage to utilities	70%	27%	3%	1%	0%
Strengthening emergency services (e.g., police, fire, ambulance)	68%	28%	3%	1%	1%
Disclosing natual hazard risks during real estate transactions	62%	29%	6%	2%	2%

Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006)

There are a number of activities a community can undertake to reduce the risk from natural hazards. These activities can be both regulatory and non-regulatory. Figure 6 and Table 8 shows respondents' general level of agreement regarding the community-wide strategies included in the survey.

Figure 6. Survey Respondents' General Level of Agreement Regarding Community-wide Strategies



Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006)

Table 8. Survey Respondents' General Level of Agreement by Percentage Regarding Community-wide Strategies

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Not Sure
I support a regulatory approach to reducing risk	13%	36%	27%	16%	4%	4%
I support a non-regulatory approach to reducing risk	18%	43%	26%	8%	1%	5%
I support a mix of both regulatory and non-regulatory approaches to reducing risk.	23%	40%	23%	8%	2%	4%
I support the use of tax dollars (federal and/or local) to compensate land owners for not developing in areas subject to natural hazards.	6%	17%	22%	32%	16%	6%
I support the use of local tax dollars to reduce risks and losses from natural disasters.	6%	43%	24%	16%	5%	6%
I support protecting historical and cultural structures.	13%	53%	24%	6%	2%	1%
I would be willling to make my home more disaster-resistant.	16%	58%	19%	4%	1%	3%
I support steps to safeguard the local economy following a disaster event.	17%	62%	15%	0%	1%	4%
I support improving the disaster preparedness of local schools.	34%	57%	8%	0%	1%	0%
I support a local inventory of at-risk buildings and infrastructure.	15%	48%	27%	4%	2%	4%
I support the disclosure of natural hazard risks during real estate transactions.	45%	43%	8%	2%	1%	1%

Source: Household Natural Hazards Preparedness Survey, Oregon Natural Hazards Workgroup, (Nov. 2006)

As shown in Figure 6 and Table 8, 91% of respondents indicated that it is very important or somewhat important for the community to improve the disaster preparedness of local schools. In addition, over 91% indicated that it is very important or somewhat important to disclosure natural hazard risks during real estate transactions.

Open-ended Survey Responses

Q3.1 If "NO" for flood, what is the main reason your household does not have insurance for flood events?

- Only through government agencies
- Haven't looked into it
- Not in flood zone
- We live on a hill (2)
- Refused by insurance company
- We rent
- House flood, not natural flood
- High desert
- No one will pay out even if you have flood insurance
- Told I didn't need it
- Wasn't suggested by agent

Q4.1 If "NO" for earthquake, what is the main reason your household does not have insurance for earthquake events?

Other

- Not offered in this area
- Didn't think there were earthquakes here
- Not sure, will find out. I think we do.
- Not in high risk area
- We rent
- Didn't think of it
- Probably not
- Looking into it/will consider
- Small chance of earthquake
- Not my home

Q6. Who is your preferred information source and what is the preferred way for you to receive information about how to make your household and home safer from natural disasters?

Other

- Want to talk to
- We called Andy Seebart and was told there was nothing available
- Our church has an excellent program to help w/preparedness
- Public service announcements over media: radio, TV
- Church
- Search & rescue meetings
- Church organization's meetings
- Landlord responsible
- Common sense
- Training in disaster
- Going to insurance agency & asking about coverage

Q 12. County

- Harney (37)
- Jefferson (84)
- Lake (38)
- Malheur (98)

Q16. Please indicate your level of education

- Lifetime of experience
- "5th" term college sr.
- Navy

Q17 Do you rent/own

- Mobile home 12' wide
- Acreage & shop
- Commercial bldg w/apartment
- Mobile home (2)
- Log home
- Apt. over store

Q18. If you have lived in Oregon for less than 20 years, in what state did you live before you moved to Oregon?

- Alaska (2)
- Arkansas
- Colorado (3)
- Illinois (2)
- Michigan
- Tennessee
- Wyoming (2)
- Arizona, Florida, Montana, Wyoming, Michigan, & Kansas
- North Carolina & Pennsylvania
- So. Dakota & Arizona

Please feel free to provide any additional comments.

- Some questions don't apply to me as I rent rather than own my residence!
- We always have extra food – in case of emergency. We have generator to keep refrigeration units & well operating, Lanterns & portable stove. The more information available will be good for everyone to get together to help in event of disaster.
- All is well – thank you.
- I think our rivers should be dredged so the high waters have a place to flow.
- Make the "Community Emergency Response Training" available to all residents in the state. It is an excellent program. It educates people in how to prepare themselves, family, & friends for disasters. It provides emergency response personnel with backup help.
- Of course because of global warming, the destruction of habitats, pollution, oil dependency, and people who either don't care or can't grasp what the consequences are of destroying all our resources, I am deeply concerned about eminent world-wide disasters.
- I am probably not a very good example to be completing this form – I'm a widow & live alone & was very <u>unsure</u> about how to answer most of these questions. I've only lived in this house about 2.5 years & it was new when I moved in, although it had a previous owner for a few months.

- Thank you for the time spent preparing, distributing, & utilizing citizens' input.
- 1) I would very much enjoy a final copy of survey results. 2) Civil servants are more & more forgetting who/whom. They work for why, they are on the personal list.
- I think we need less regulation.
- Home is located about 50 feet above 100 year flood plain and I am unaware of any history of earthquake history. It does concern me when I see construction (building) on steep slopes, or in areas prone to heavy runoffs.
- Tax dollars should not be used to restore homes/bldg built in known flood zones – flood zones should be clearly identified and public disclosure should be required. Give public information so they can make common sense discussion – regulations are too costly!
- We live on the rim of the Crooked River Gorge. The river is 100 feet out and 350 feet down.
- The more non-profit organizations (Red Cross) and churches are used the better. These have shown a great history of being closer to their communities, more compassionate, more sincere, and non-threatening. And they will be right there when a disaster occurs.
- Whatever approaches are used to assist us in making wiser choices regarding preparation for any emergencies, I believe they must be balanced – both regulatory & non-regulatory. One size does not fit all! For example, fire is a very real and present danger where we live, but flooding is not. So efforts need to be focused on what the most likely natural hazard(s) by area. Thank you for asking. Blessings on your work!
- My area is not subject to much by way of hazard – the Silvies River has flooded in the past, but I can't imagine it was more than 6-8 inches of water. Since this area is electric dependent, I have considered a small generator – not much else.
- In disaster preparedness I much prefer a non-regulated approach. But, to also have some regulations in place so that there is at least some disaster readiness in place should a disaster occur.
- Good luck. Most folks don't like being told what to do until there is an emergency & even then not! Compensating land owners to "not develop" seems an open unknown for a bottomless drain on the economy. Anyone can say "I want to build a huge [money-making] something" and you need to compensate them for their pipe dreams.
- It is hard for me to do these things, but family can do them. And I live with family. On Crooked River Ranch, over 4600 residents

reside. We have only one exit/access road. The BLM & State of Oregon have offered no solutions or help.

- Here in Summer Lake, we survived the winter fire, which became a firestorm due to inept state & federal performance. There was no common sense during the 1st 3 days of the fire, and the very agencies who should have been helping were exacerbating the situation. The best help came from local volunteers, friends, & neighbors. WE are now prepared & no longer count on state or federal help!!!
- People should depend on themselves and not expect the government to bail them out.
- Education is the main key to preparedness, not regulations. Some questions misleading, i.e. 8G, 7E. Historical & cultural protection is not necessarily the job of gov't, however, private & non-profit organizations can do this. *f – how would tax $ be used?
- I am 89 years old and live in a rented duplex so some of my answers are left blank or I don't know correct answer! I believe this is a very important project. Good luck!
- I live alone, so not all apply directly.
- I believe it is each person's responsibility to determine what hazards are likely to happen in an area and then act accordingly.
- Everyone should have an emergency plan. My plan I keep my camp trailer ready and cleaned up to use for an emergency.
- I never vote for more taxes.
- I'm never in support of more taxes. And I'm reluctant for allowing government to interfere in our private lives. More rules always means less freedom.
- Encourage people to use common sense.

September 20, 2006

Dear Resident:

We need your help! The Counties of Jefferson, Harney, Lake, and Malheur are currently engaged in a cooperative planning process to reduce the risks and losses associated with natural disasters. As a part of this process, the *Partners for Disaster Resistance and Resilience* and the Oregon Natural Hazards Workgroup at the University of Oregon are conducting a household survey. This survey provides an opportunity for you to share your opinions about preparing for and reducing your household's and your community's risks from natural disasters. The information you provide about your household's needs for disaster preparedness could help the Mid and Southeast Region improve local disaster preparedness and risk reduction activities.

Your opinions are important to us! Please complete the enclosed survey and return it in the postage-paid envelope. The survey will take 15-20 minutes to complete. Please complete and return this survey by **Thursday, October 12, 2006**.

We will also enter your name in a drawing to win a gift certificate at Stunz Lumber Company, True Value Hardware, Big R Ranch Farm Home Supply, or Parr Lumber Company. Please fill out the enclosed form and return with your survey, or mail the gift certificate preference form in a separate envelope to be entered into the drawing.

Your returned survey indicates your willingness to take part in the study. Your participation in this study is voluntary. If you have questions regarding your rights as a research participant, please contact the Office of Human Subjects Compliance, Riverfront Research Park, Suite 106, University of Oregon, Eugene, OR 97403-5219, or call (541) 346-2510. All individual survey responses are strictly confidential and are for research purposes only.

If you have questions regarding the survey, please contact the Oregon Natural Hazards Workgroup at the University of Oregon at (541) 346-3588.

If you have questions about the regional planning process, please contact:

Jefferson County: Rena Thompson, 541-475-4462
Harney County: Andy Seebart, 541-573-5961
Lake County: Phil McDonald, 541-947-6027
Malheur County: Craig Smith, 541-473-5120

For information on *Partners for Disaster Resistance: Oregon Showcase State*, please visit http://www.OregonShowcase.org.

Thank you for your participation! We look forward to hearing your opinions!

Andre LeDuc, State Coordinator
Partners for Disaster Resistance & Resilience

Oregon Natural Hazards Workgroup
Community Service Center • 1209 University of Oregon
Eugene • Oregon • 97403-1209 Phone: 541.346.5833 • Fax: 541.346.2040

Household Natural Hazards Preparedness Questionnaire

This questionnaire is designed to help gauge household preparedness for disasters, and knowledge of tools and techniques that assist in reducing risk and loss from natural hazards. The questionnaire should be completed by an adult, preferably the homeowner or head of household. The information you provide about your needs for disaster preparedness could help improve public/private coordination of preparedness and risk reduction activities within your community. We ask that you please take a few minutes to complete this questionnaire.

Natural Hazard Household Risk Reduction

Households can do many things to prepare for a natural disaster or emergency. What you have on hand or are trained to do when a disaster strikes can make a big difference in your comfort and safety in the hours and days following a natural disaster or emergency. In addition, modifications to your home, including retrofits to strengthen your home's structure, can protect your home and its contents. The following questions focus on your household's preparedness for disaster events.

1. How concerned are you about the following natural disasters affecting your community?
(Check the corresponding box for each hazard)

Natural Disaster	Very Concerned	Somewhat Concerned	Neither Concerned nor Unconcerned	Not Very Concerned	Not Concerned
Drought	☐	☐	☐	☐	☐
Dust Storm	☐	☐	☐	☐	☐
Earthquake	☐	☐	☐	☐	☐
Flood	☐	☐	☐	☐	☐
Landslide / Debris Flow	☐	☐	☐	☐	☐
Wildfire	☐	☐	☐	☐	☐
Household Fire	☐	☐	☐	☐	☐
Volcanic Eruption	☐	☐	☐	☐	☐
Wind Storm	☐	☐	☐	☐	☐
Severe Winter Storm	☐	☐	☐	☐	☐

2. Did you consider the possible occurrence of a natural hazard when you bought/moved into your current home?

☐ Yes ☐ No

3. Does your household have insurance coverage for flood events?

☐ Yes ☐ No

If you answered Yes, please skip to Question 4.

3.1 If "NO" for flood, what is the main reason your household does not have insurance for flood events? **(*Please check one)***

☐ Not available ☐ Deductibles too high/not worth it ☐ Not necessary
☐ Not located in the floodplain ☐ Not familiar with it/don't know ☐ Too expensive
☐ Other: _____

4. Does your household have insurance coverage for earthquake events?

☐ Yes ☐ No

If you answered Yes, please skip to Question 5.

4.1 If "NO" for earthquake, what is the main reason your household does not have insurance for earthquake events? **(*Please check one)***

☐Not available ☐Deductibles too high/not worth it ☐Too expensive
☐Not necessary ☐Not familiar with it/don't know ☐Other: _____

5. In the following list, please check those activities that you <u>have done</u> in your household, <u>plan to do</u> in the near future, <u>have not done</u>, or are <u>unable to do</u>. For Questions F-K, there is also the option to check <u>does not apply</u>, if the preparation action does not apply to a feature of your home. **(*Please check one answer for each preparedness activity*)**

In your household, have you or someone in your household:	**Have Done**	**Plan To Do**	**Not Done**	**Unable To Do**	**Does Not Apply**
A. Attended meetings or received written information on natural disasters or emergency preparedness?	☐	☐	☐	☐	
B. Talked with members in your household about what to do in case of a natural disaster or emergency?	☐	☐	☐	☐	
C. Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a disaster?	☐	☐	☐	☐	
D. Prepared a "Disaster Supply Kit" (Stored extra food, water, batteries, or other emergency supplies)?	☐	☐	☐	☐	
E. In the last year, has anyone in your household been trained in First Aid or Cardio-Pulmonary Resuscitation (CPR)?	☐	☐	☐	☐	
F. Have you secured your water heater, cabinets and bookcases to the wall?	☐	☐	☐	☐	☐
G. Have you fit your gas appliances with flexible connections?	☐	☐	☐	☐	☐
H. Used fire-resistant building or roofing materials?	☐	☐	☐	☐	☐
I. Secured your home to its foundation?	☐	☐	☐	☐	☐
J. Braced unreinforced masonry, concrete walls, and chimney?	☐	☐	☐	☐	☐
K. Elevated your home in preparation for floods?	☐	☐	☐	☐	☐

Household Risk Reduction

6. Who is your preferred information source and what is the preferred way for you to receive information about how to make your household and home safer from natural disasters? **(*Please check all that apply*)**

Information Sources:

- ☐ Chamber of Commerce
- ☐ University or research institution
- ☐ Schools
- ☐ Fire Department/Rescue
- ☐ Utility company
- ☐ Insurance agent or company
- ☐ University or research institution
- ☐ Government agency
- ☐ American Red Cross
- ☐ Other non-profit organization

Methods:

- ☐ Fact Sheet/brochure
- ☐ Internet
- ☐ Mail
- ☐ Outdoor advertisements (signs, etc.)
- ☐ Radio
- ☐ Television
- ☐ Magazine
- ☐ Public workshops/meetings
- ☐ Newspapers
- ☐ Other (please explain):

Community Risk Reduction

7. Natural hazards can have a significant impact on a community, but planning for these events can help lessen the impacts. The following statements will help determine citizen priorities for planning for natural hazards. Please tell us how important each one is to you.

Statements	Very Important	Somewhat Important	Neither Important nor Unimportant	Not Very Important	Not Important
A. Protecting private property	☐	☐	☐	☐	☐
B. Protecting critical facilities (e.g., transportation networks, hospitals, fire stations)	☐	☐	☐	☐	☐
C. Preventing development in hazard areas	☐	☐	☐	☐	☐
D. Enhancing the function of natural features (e.g., streams, wetlands)	☐	☐	☐	☐	☐
E. Protecting historical and cultural landmarks	☐	☐	☐	☐	☐
G. Protecting and reducing damage to utilities	☐	☐	☐	☐	☐
H. Strengthening emergency services (e.g.,- police, fire, ambulance)	☐	☐	☐	☐	☐
I. Disclosing natural hazard risks during real estate transactions	☐	☐	☐	☐	☐

8. A number of activities can reduce your community's risk from natural hazards. These activities can be both regulatory and non-regulatory. An example of a *regulatory* activity would be a policy that limits or prohibits development in a known hazard area such as a floodplain. An example of a *non-regulatory* activity would be to develop a public education program to demonstrate steps citizens can take to make their homes safer from natural hazards. **Please check the box that best represents your opinion of the following strategies to reduce the risk and loss associated with natural disasters.**

Community-wide Strategies	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Not Sure
A. I support a regulatory approach to reducing risk.	☐	☐	☐	☐	☐	☐
B. I support a non-regulatory approach to reducing risk.	☐	☐	☐	☐	☐	☐
C. I support a mix of both regulatory and non-regulatory approaches to reducing risk.	☐	☐	☐	☐	☐	☐
D. I support policies to prohibit development in areas subject to natural hazards.	☐	☐	☐	☐	☐	☐
E. I support the use of tax dollars (federal and/or local) to compensate land owners for not developing in areas subject to natural hazards.	☐	☐	☐	☐	☐	☐
F. I support the use of local tax dollars to reduce risks and losses from natural disasters.	☐	☐	☐	☐	☐	☐
G. I support protecting historical and cultural structures.	☐	☐	☐	☐	☐	☐
H. I would be willing to make my home more disaster-resistant.	☐	☐	☐	☐	☐	☐
I. I support steps to safeguard the local economy following a disaster event.	☐	☐	☐	☐	☐	☐
J. I support improving the disaster preparedness of local schools.	☐	☐	☐	☐	☐	☐
K. I support a local inventory of at-risk buildings and infrastructure.	☐	☐	☐	☐	☐	☐
L. I support the disclosure of natural hazard risks during real estate transactions.	☐	☐	☐	☐	☐	☐

General Household Information

9. Please indicate your age: _____

10. Gender: Male ☐ Female ☐

11. Zip Code: _____

12. County: _____

13. Do you have access to the internet?
- ☐ Yes
- ☐ No

14. Do you rent or own your home?
- ☐ Yes
- ☐ No

15. Please indicate your level of education:
- ☐ Grade School/No Schooling
- ☐ Some high school
- ☐ High school graduate/GED
- ☐ Some college/trade school
- ☐ College degree
- ☐ Postgraduate degree
- ☐ Other, please specify: _____

16. How long have you lived in Oregon?
- ☐ Less than a year
- ☐ 1-5 years
- ☐ 5-9 years
- ☐ 10-19 years
- ☐ 20 years or more

17. Do you rent/own
- ☐ Single-family home
- ☐ Duplex
- ☐ Apartment (3-4 units in structure)
- ☐ Apartment (5 or more unit structures)
- ☐ Condominium / townhouse
- ☐ Manufactured home
- ☐ Other: _____

18. If you have lived in Oregon for less than 20 years, in what state did you live before you moved to Oregon?
- ☐ Not Applicable
- ☐ California
- ☐ Idaho
- ☐ Washington
- ☐ Other_____

Please feel free to provide any additional comments in the space provided below:

THANK YOU VERY MUCH FOR PROVIDING THIS INFORMATION

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