Wasco County

Multi-Jurisdictional
Natural Hazards Mitigation Plan

Prepared for:

Wasco County Planning Department

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Prepared by:

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UNIVERSITY OF OREGON

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PARTNERSHIP FOR DISASTER RESILIENCE

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Special Thanks & Acknowledgements

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Regional partners include:

- Mid-Columbia Council of Governments
- Oregon Emergency Management
- Oregon Public Health
- FEMA Region X
- Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center
- Resource Assistance for Rural Environments at the University of Oregon's Community Service Center

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Plan Template Disclaimer

This Natural Hazards Mitigation Plan is based in part on a plan template developed by the Oregon Partnership for Disaster Resilience. The template is structured to address the requirements contained in 44 CFR 201.6; where language is applicable to communities throughout Oregon, OPDR encourages the use of standardized language. As part of this regional planning initiative, OPDR provided copies of the plan templates to communities for use in developing or updating their natural hazards mitigation plans. OPDR hereby authorizes the use of all content and language provided to Wasco County in the plan template.

About the Community Service Center

The Community Service Center (CSC), a research center affiliated with the Department of Planning, Public Policy, and Management at the University of Oregon, is an interdisciplinary organization that assists Oregon communities by providing planning and technical assistance to help solve local issues and improve the quality of life for Oregon residents. The role of the CSC is to link the skills, expertise, and innovation of higher education with the transportation, economic development, and environmental needs of communities and regions in the State of Oregon, thereby providing service to Oregon and learning opportunities to the students involved.

About the Oregon Partnership for Disaster Resilience

The Oregon Partnership for Disaster Resilience (OPDR) is a coalition of public, private, and professional organizations working collectively toward the mission of creating a disaster-resilient and sustainable state. Developed and coordinated by the Community Service Center at the University of Oregon, the OPDR employs a service-learning model to increase community capacity and enhance disaster safety and resilience statewide.

About Resource Assistance for Rural Environments

RARE is an AmeriCorps program administered through the University of Oregon's Community Service Center. RARE is currently supported through grants from the Corporation for National & Community Service (AmeriCorps), The Ford Family Foundation, the University of Oregon, the Oregon Food Bank, the Federal Emergency Management Agency, the Oregon Department of Transportation, and other agencies. In addition, each participating community provides $19,000 of approximately $32,000 needed to place, train, and support a full-time RARE member.

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Natural Hazards Mitigation Plan

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Volume I:
Basic Mitigation Plan

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Executive Summary

Wasco County developed this multi-jurisdictional Natural Hazards Mitigation Plan in an effort to prepare for the long term effects resulting from natural hazards. This plan was developed with and for the following jurisdictions: Wasco County and the City of The Dalles. It is impossible to predict exactly when these hazards 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 create a resilient community that will benefit from long-term recovery planning efforts.

44 CFR 201.6 – The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. . . .

The Federal Emergency Management Agency (FEMA) defines mitigation as ". . . the effort to reduce loss of life and property by lessening the impact of disasters . . . through risk analysis, which results in information that provides a foundation for mitigation activities that reduce risk." Said another way, natural hazard mitigation is 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 the "Whole Community" - individuals, private businesses and industries, state and local governments, and the federal government.

Why Develop this Mitigation Plan?

44 CFR 201.6(a)(1) – A local government must have a mitigation plan approved pursuant to this section in order to receive HMGP project grants . . .

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201 require that jurisdictions maintain an approved NHMP in order to receive federal funds for mitigation projects. Local and federal approval of this plan ensures that the county and listed cities will remain eligible for pre- and post-disaster mitigation project grants.

Who Participated in Developing the Plan?

The Wasco County Natural Hazards Mitigation Plan is the result of a collaborative effort between the county, cities, special districts, citizens, public agencies, non-profit organizations, the private sector and regional organizations. A project steering committee

guided the plan development process. The project steering committee included representatives from the following organizations.

44 CFR 201.6(c)(1) – Documentation of 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.

- Wasco County Planning Department
- Wasco County Emergency Management
- Wasco County Public Works
- Wasco County GIS
- Wasco County Soil and Water Conservation District
- Wasco County Board of Commissioners
- Northern Wasco County School District 21
- Columbia Gorge Community College
- City of The Dalles Planning
- Mid-Columbia Council of Governments

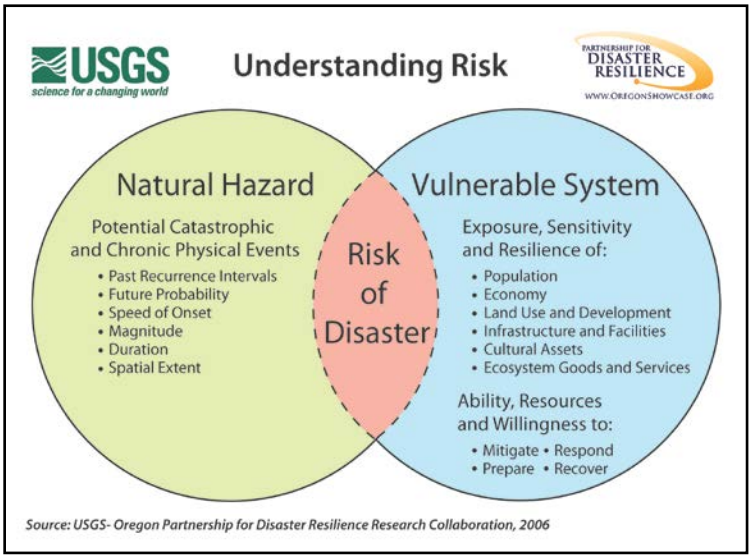
The Wasco County Planning Department convened the planning process and will take the lead in implementing, maintaining and updating the plan. Public participation played a key role in the development of goals and action items. At various stages during the plan update's development, county officials and the public were invited to learn of its progress and to comment on completed sections. This took place primarily during presentations before the county board of commissioners, but the public was also given a chance to comment on the plan development at city hall meetings throughout Wasco County, where city officials were offered a chance to join the process as separate jurisdictions. The public was also given a chance for involvement in the plan update process when 1,300 surveys were randomly mailed to Wasco County residents using voter registration records. The survey was meant to gauge the priorities of the public in terms of government efforts to address natural hazards, but also contained questions that gauged the public's knowledge and awareness of the county's current plan, and thus served an additional purpose as an informational outreach tool. Finally, when a working draft of the updated plan was completed it was posted online for public comment. Members of the general public were invited to view, critique, and otherwise express any concerns they may have had with the plan update, and these comments were addressed during the final plan editing process.

How Does this Mitigation Plan Reduce Risk?

44 CFR 201.6(c)(2) – A Risk Assessment that provides the factual basis for activities proposed in the strategy . . .

This natural hazard mitigation plan is intended to assist the City of The Dalles and Wasco County generally to reduce the risk from natural hazards by identifying resources, information, and strategies for risk reduction. It is also intended to guide and coordinate mitigation activities throughout the county. A risk assessment consists of three phases: hazard identification, vulnerability assessment, and risk analysis, as illustrated in the following graphic.

Figure i.1 Understanding Risk



Source: OPDR

By identifying and understanding the relationship between natural hazards, vulnerable systems, and existing capacity, communities in Wasco County are better equipped to identify and implement actions aimed at reducing the overall risk to natural hazards.

What is the county's Overall Risk to Hazards?

Wasco County conducted a risk assessment to evaluate the probability of each hazard as well as the vulnerability of the community to that hazard. Table i.1 below presents the overall risk assessment for Wasco County including both the county's hazard analysis and relative risk. The hazards are listed in rank order from high to low, taking consideration of past historical events, vulnerability to populations, the maximum threat, and the probability, or likelihood of a particular hazard event occurring.

Table i.1: Risk Assessment Summary

Hazard	Probability Total	Vulnerability Total	Total Threat Score	Severity Impact Score	Relative Probability	Relative Risk	Hazard Ranking
Flood - Riverine	63	15	142	2.7	4.5	12.2	1
Wildfire (WUI)	70	30	190	2.2	5	11	2
Severe Storm	63	45	216	2.2	4.5	9.9	3
Drought	56	40	192	1.9	4	7.6	4
Earthquake	28	25	111	2.8	2	5.6	5
Landslide / Debris Flow	35	20	103	1.7	2.5	4.3	6
Volcanic Event	7	10	61	3.3	0.5	1.7	7
Tornado	7	5	24	1.5	0.5	0.8	8

Source: Wasco County Strategic Preparedness Planning, Threat and Hazard Identification and Risk Assessment, Updated March, 2012; Wasco County Risk Assessment Steering Committee Meeting, February 15, 2012

What is the Plan's Mission?

The mission of the Wasco County Natural Hazards Mitigation Plan is to protect life, property and the environment through coordination and cooperation among public and private partners, which will reduce risk and loss, and enhance the quality of life for the people of Wasco County.

44 CFR 201.6(c)(3)(i) – A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

What are the Plan Goals?

The plan goals describe the overall direction that the participating jurisdiction's agencies, organizations, and citizens can take toward mitigating risk from natural hazards. Wasco County's plan goals include:

- Protection of Life and Property
- Emergency Services Enhancement
- Education and Outreach
- Facilitate Partnerships and Coordination
- Disaster Resilient Economy
- Natural Resource Systems Protection
- Acknowledge Responsibility

How are the Action Items Organized?

44 CFR 201.6(c)(3)(ii) – A section that identifies and analyzes a comprehensive range of specific mitigation actions . . .

The action items are organized within an action item matrix (located in Section 3 of the plan), which lists all of the 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 the action items. The Action Item Matrix portrays the overall plan framework and identifies linkages between the plan goals and actions. The matrix documents the title of each action along with the coordinating organization, timeline, and plan goals addressed. Action items are further detailed in individual action item forms located in Appendix A of the plan.

How will the plan be implemented?

44 CFR 201.6(c)(3)(iii) – An action plan describing how the actions . . . will be prioritized, implemented and administered . . .

44 CFR 201.6(c)(4) – A plan maintenance process . . .

The plan maintenance section of this plan details the formal process that will ensure that the Wasco County Natural Hazards Mitigation Plan remains an active and relevant document. The plan will be implemented, maintained and updated by a designated convener. The convener is responsible for overseeing annual review processes. Cities and special districts developing

addendums to the county plan will also designate a convener and will work closely with the county convener to keep the plans coordinated. 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 communities will integrate public participation throughout the plan maintenance process.

Plan Adoption

44 CFR 201.6(c)(5) – Documentation that the plan has been formally adopted by the governing body of the jurisdiction . . .

44 CFR 201.6(d) – Plan review [process] . . .

After the plan is locally reviewed and deemed complete the Director of the Wasco County Planning Department submits it to the State Hazard Mitigation Officer at Oregon Emergency Management. Oregon Emergency Management reviews the plan and submits it 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 201.6. Once the plan is pre-approved by FEMA, the county formally adopts the plan via resolution. The individual jurisdiction's conveners will be responsible for ensuring local adoption of the Wasco County multi-jurisdictional Natural Hazards Mitigation Plan and providing the support necessary to ensure plan implementation. Once the resolution is executed at the local level and documentation is provided to FEMA, the plan is formally acknowledged by FEMA and the county gains (or maintains) eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and the Flood Mitigation Assistance program funds.

The accomplishment of the Natural Hazards Mitigation Plan goals and actions depends upon the maintenance of a competent Steering Committee and adequate support from the county and city departments reflected in the plan in incorporating the outlined action items into existing county plans and procedures. 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 the potential for loss from future natural hazard events.

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Section I: Introduction

This section provides a general introduction to natural hazard mitigation planning in Wasco County. In addition, Section I: Introduction addresses the planning process requirements contained in 44 CFR 201.6(b) thereby meeting the planning process documentation requirement contained in 44 CFR 201.6(c)(1). The section concludes with a general description of how the plan is organized.

What is Natural Hazard Mitigation?

The Federal Emergency Management Agency (FEMA) defines mitigation as ". . . the effort to reduce loss of life and property by lessening the impact of disasters . . . through risk analysis, which results in information that provides a foundation for mitigation activities that reduce risk." Said another way, natural hazard mitigation is 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 the "Whole Community" - individuals, private businesses and industries, state and local governments, and the federal government.

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?

Wasco County updated this multi-jurisdictional Natural Hazards Mitigation Plan in an effort to reduce future loss of life and damage to property resulting from natural hazards. This plan applies to the following jurisdictions: Wasco County and the city of The Dalles. It is impossible to predict exactly when natural hazard events will occur, or the extent to which they will affect community assets. 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 hazards.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201 require that jurisdictions maintain an approved NHMP in order to receive federal funds for mitigation projects. Local and federal approval of this plan ensures that the county and listed cities will remain eligible for pre- and post-disaster mitigation project grants.

What Federal Requirements Does This Plan Address?

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 natural hazards 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 jurisdictions 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 and their capabilities.

Development of the local mitigation plan update process was pursued in compliance with subsections from 44 CFR 201.6 guidelines. These four subsections address plan requirements, the planning process, plan content, and plan review. Subsection (a) provides an outline of the overall plan requirements, including an overview of general plan components, exceptions to requirements, and multi-jurisdictional participation. Subsection (b) outlines the requirements of the planning process, with particular focus on public involvement in the update process, as well as the role of local agencies, organizations and other relevant entities in the development process, as well as standards for adequate levels of review and incorporation of existing plans and policies. Subsection (c) outlines requirements concerning the plan update's content, including an overview of necessary components for the update's planning process, risk assessment, mitigation strategy, plan maintenance, and overall process documentation. Subsection (d) outlines the steps and agencies required for proper review of the plan before finished plans are adopted by their respective communities.

What is the Policy Framework for Natural Hazards Planning 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 implementing ordinances that are required to comply with the statewide planning goals. The challenge faced by state and local governments is to keep this network of local plans coordinated in response to the changing conditions and needs of Oregon communities.

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 the jurisdiction's Comprehensive Plan, and helps each jurisdiction meet the requirements of statewide land use planning Goal 7.

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).

How was the Plan Developed?

The plan was developed following a pre-formulated schedule provided by the Oregon Partnership for Disaster Resilience, and described by the statement of work in the county's update and review process. The following schedule was developed to provide a timeline for completion of the plan update sections, though altered accordingly throughout the year to reflect then-current levels of progress.

Figure 1.1: NHMP Update Timeline

Source: Oregon Partnership for Disaster Resilience, 2012

The first four stages of the update process had their own corresponding steering committee meeting, during which previous work could be reviewed and new content developed for each particular session. The community profile was completed after the first steering committee meeting and reviewed by the committee in February as part of the update to the risk assessment. Content for the risk assessment was developed at the second steering committee meeting, and was reviewed and discussed in May before the steering committee reviewed the county's mission, goals and action items. The mission, goals and action items section was reviewed before discussion of updates to the plan implementation and maintenance strategy at the final steering committee meeting in June, and a final draft of the plan was completed at the beginning of August and circulated among county officials and interested public for review before submission to FEMA for plan pre-approval.

At various stages during the plan update's development, county officials and the public were invited to learn of its progress and to comment on completed sections. This took place

primarily during presentations before the county board of commissioners, but the public was also given a chance to comment on the plan development at city hall meetings throughout Wasco County, where city officials were offered a chance to join the process as separate jurisdictions. The public was also given a chance for involvement in the plan update process when 1,300 surveys were randomly mailed to Wasco County residents using voter registration records. The survey was meant to gauge the priorities of the public in terms of government efforts to address natural hazards, but also contained questions that gauged the public's knowledge and awareness of the county's current plan, and thus served an additional purpose as an informational outreach tool.

Multiple opportunities were also provided 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, particularly during Wasco County NHMP Update Steering Committee meetings. Representatives from potential partner organizations and agencies were invited to join the Steering Committee responsible for reviewing and updating the county's plan early in the planning process, and regular attendance was achieved for organizations and agencies that have direct involvement with potential hazard mitigation activities.

During early stages of the planning process, pre-existing plans, studies, reports and other technical information from Wasco County were identified and reviewed for inclusion in the updated plan. Information and policy cultivated from this review was used to inform updates of the county's community profile, risk assessment and mitigation strategy sections, and listed where appropriate for general reference.

How is the Plan Organized?

Each volume of the mitigation plan provides specific information and resources to assist readers in understanding the hazard-specific issues facing Wasco County citizens, businesses, and the environment. Combined, the sections work in synergy to create a mitigation plan that furthers the community's mission to ensure the provision of essential public services, which allow the people of Wasco County to enhance the quality of their lives. These services will be delivered in an efficient, effective and respectful manner. This plan structure enables stakeholders to use the section(s) of interest to them.

Volume I: Multi-jurisdictional Natural Hazards Mitigation Plan

SECTION 1: INTRODUCTION

The Introduction briefly describes the countywide mitigation planning efforts and the methodology used to develop the plan. City specific planning efforts are documented in Volume III: City/Special District Addendums.

SECTION 2: COMMUNITY RISK ASSESSMENT

Section 2 provides the factual basis for the mitigation strategies contained in Section 3.

The section includes a listing of existing plans, policies, and programs, listing of community organizations, a summary of existing mitigation actions, and an overview of the hazards addressed in the plan. This section allows readers to gain an understanding of the County's

sensitivities – those community assets and characteristics that may be impacted by natural hazards, as well as the county's resilience – the ability to manage risk and adapt to hazard event impacts. A Community Overview for each participating city and special district is located in Volume III: City/Special District Addendums.

SECTION 3: MITIGATION STRATEGY

This section documents the plan vision, mission, goals, and actions and also describes the components that guide implementation of the identified mitigation strategies. Actions are based on community sensitivity and resilience factors and the hazard assessments in Section 2 and the Hazard Annexes. City and special district-specific action items are located in Volume III: City/Special District Addendums.

SECTION 4: PLAN IMPLEMENTATION AND 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 semi-annual and 5-year review meetings. The participating cities and special districts will utilize this implementation and maintenance process as well.

Volume II: Hazard-Specific Annexes

The hazard annexes summarize 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, vulnerability, impacts, and probability. Hazard summaries are taken directly from the recently updated Wasco County Threat and Hazard Identification and Risk Assessment (THIRA).

The hazard specific annexes included with this plan are the following:

- Drought;
- Earthquake;
- Flood;
- Wildland Fire;
- Landslides;
- Severe Local Storm;
- Tornadoes; and
- Volcanoes

Volume III: City/Special District Addendums

Volume III of the plan is reserved for any city or special district addendums developed through this multi-jurisdictional planning process. Several cities and jurisdictions were approached to participate in the plan, but the City of The Dalles was the only jurisdiction to provide an addendum during the current update cycle. The City of The Dalles also provided an addendum to the original Wasco County plan, making the addendum included in Volume III an update to the version that was completed and then adopted on April 27, 2007.

Volume IV: Resource Appendices

The resource appendices are designed to provide the users of the Wasco County multi-jurisdictional Natural Hazards 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: ACTION ITEM FORMS

This appendix contains the detailed action item forms for each of the mitigation strategies identified in this plan.

APPENDIX B: PLANNING AND PUBLIC PROCESS

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

APPENDIX C: COMMUNITY PROFILE

This profile can be utilized to identify specific issues locally and to develop potential action items. A community profile was included as a main section in the original Wasco County Natural Hazards Mitigation Plan, whereas the expanded profile has been moved to the appendixes in the updated plan. The data in the updated profile are based on best available local, state and federal data. The profile includes a *Natural Environmental Capacity* section that details the physical geography of the county; a *Socio Demographic Capacity* section that discusses the population in the county; a *Regional Economic Capacity* section that discusses local industry, regional affordability, economic diversity, employment and wages, and an overview of labor and commute sheds; a *Built Capacity* section that addresses the county's housing building stock, physical infrastructure, critical facilities, utilities (including transportation and power transmission systems), dependent facilities, and correctional facilities; a *Community Connectivity Capacity* section that discusses the county's social organizations, civic engagement, cultural resources, and community stability; and lastly a *Political Capital* section that provides an overview of the county's government structure, and existing plans and policies. In addition to describing characteristics and trends, each profile section identifies the traits that indicate sensitivity to natural hazards.

APPENDIX D: 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 OPDR. 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 E: MID-COLUMBIA REGION NATURAL HAZARD MITIGATION PUBLIC OPINION SURVEY

This appendix includes the survey instrument and results from the regional household preparedness survey implemented by OPDR. 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.

APPENDIX F: GRANT PROGRAMS

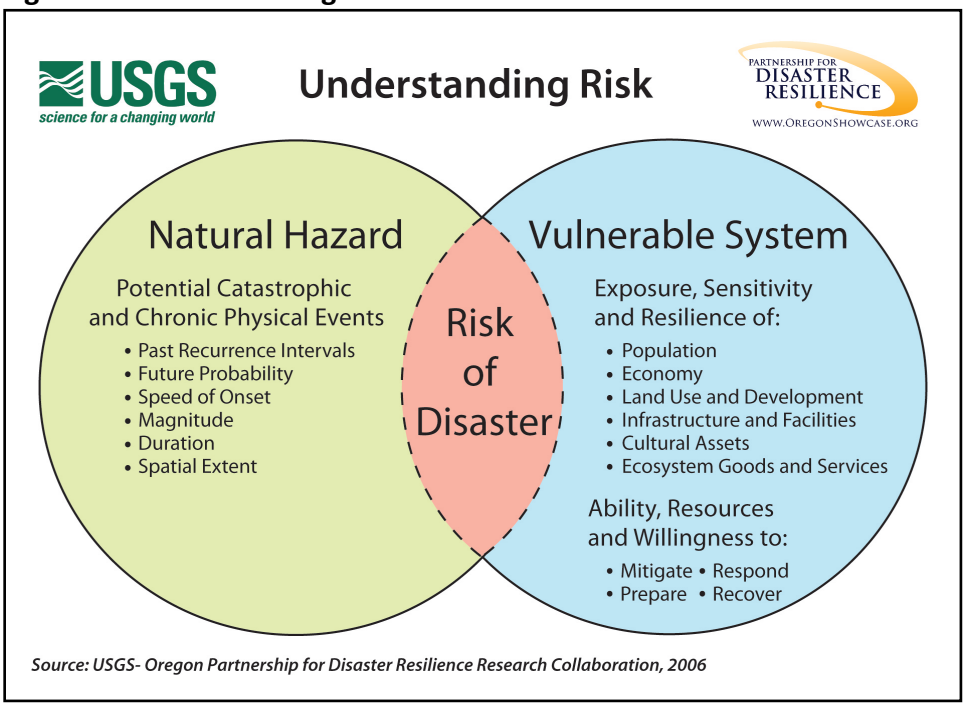
This appendix lists state and federal resources and programs by hazard.

Section 2:
Risk Assessment

This section of the NHMP addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk begins with the identification of hazards that can impact the jurisdiction. Included in the hazard assessment is an evaluation of potential hazard impacts – type, location, extent, etc. The second step in the risk assessment process is the identification of important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources. The last step is to evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The information presented below, along with hazard specific information presented in the Hazard Annexes and community characteristics presented in the Community Profile Appendix, will be used as the local level rationale for the risk reduction actions identified in Section 3 – Mitigation Strategy. The risk assessment process is graphically depicted in Figure 2.1 below. Ultimately, the goal of hazard mitigation is to reduce the area where hazards and vulnerable systems overlap.

Figure 2.1 Understanding Risk



Source: OPDR

Hazard Identification

Wasco County is regularly impacted by several Natural Hazards due to its geography, climate, and topography. These hazards include flood, wildfire, severe storms, and to a slightly lesser extent drought. Residents of the area are also at varying risks of exposure to landslide/debris flows, earthquakes, volcanic eruption, and tornados. A general overview of these hazards and their threat to Wasco County is listed below in Table 2.1.

Table 2.1: Wasco County Hazard Overview

Hazard	General location and extent
Drought	Countywide
Severe Storm	Countywide
Earthquake	A subduction zone earthquake could have impacts countywide. Crustal quake events are most likely near The Dalles and northeast of Condon where identified faults exist.
Wildfire	The entire county is vulnerable to the effects of wildfire, however agriculture, forest / woodland areas, and individuals living in wildland urban interface (WUI) zones are at the greatest risk
Flood	Many rivers in Wasco County historically flood every few years. These include the White River, the Deschutes River and the Columbia River.
Landslide/ Debris Flow	Wasco County has several areas where landslides have taken place and many areas that are susceptible to landslides. The slopes above the Columbia River are particularly susceptible.
Volcano	Wasco County may be impacted by a volcanic eruption at anytime (particularly Mt Hood)
Tornado	No recorded instance of a tornado causing damage in Wasco County is available.

Source: Wasco County Strategic Preparedness Planning, Threat and Hazard Identification and Risk Assessment, Updated March, 2012

The following subsections summarize the type, effects, location and history information for each of the hazard types listed above. For detailed information on Wasco County's natural hazards, refer to the hazard reports in this plan's Volume II: Hazard Annexes.

Drought

Drought is a condition of climatic dryness severe enough to reduce soil moisture and water below the minimum amount necessary for sustaining plant, animal, and human life systems. Nearly all areas of Wasco County may be vulnerable to drought. In every drought, agriculture has felt the impact, especially in non-irrigated areas. Droughts have left their major impact on individuals (farm owners), on the agricultural industry, and to a lesser extent, on other agriculture-related sectors.

Droughts in the county also lead to increased danger of wildfires, in which millions of board feet of timber have been lost. In many cases, erosion has occurred which caused serious damage to aquatic life, irrigation, and power development by heavy silting of streams,

reservoirs, and rivers. Low stream flows have also created high temperatures, oxygen depletion, disease, and lack of spawning areas for fish resources.

All of the above effects result in economic and revenue losses for business, cities and the county as a whole, and history of drought in the county suggests a high probability of occurrence. The entire population of the county is vulnerable to the effects of drought, though transportation and communications infrastructure would be minimally impacted, if at all. As growth places more pressure on limited local resources, future impacts may be greater.[1]

Earthquake

An earthquake is the shaking of the ground caused by an abrupt shift of rock along a fracture in the earth, called a fault. There are three categories of quakes and each type may affect Wasco County. The scope of damage is a function of earthquake magnitude and level of preparedness. Damage could range from minimal to moderate loss of life and destruction of property. The entire county population, property, commerce, infrastructure and services may be vulnerable to an earthquake.

There is really no past "recent" history of earthquakes in Wasco County, though county residents have felt some earthquakes distant from Wasco County. Even with this lack of history, geology clearly shows that the county has been impacted by significant events in the last 500 years.

Earthquakes in Wasco County are most likely to originate from two sources: 1) the Cascadia Subduction Zone and 2) faults near the eastern end of the Columbia River Gorge. Table 2.2 lists the class A and B faults that are located in or near the county.[2]

Table 2.2: Class A and B Faults Located in or near Wasco County

Name	Class	Fault ID	Primary County, State	Length (km)	Time of most recent deformation	Slip-rate category
Faults near The Dalles	A	580	Hood River County, Oregon	69 km	Quaternary (<1.6 Ma)	Less than 0.2 mm/yr
Unnamed faults northwest of Condon	B	814	Gilliam County, Oregon	22 km	Quaternary (<1.6 Ma)	Less than 0.2 mm/yr

Source: U.S. Geological Survey (USGS), Quaternary Fault and Fold Database, The Dalles 1° X 2° Sheet

Flood

The main cause of Northwest floods is the moist air masses that regularly move over the region in the winter. In Wasco County, the weather that produces the most serious flooding

[1] Source: Wasco County Strategic Preparedness Planning, Threat and Hazard Identification and Risk Assessment, Updated March, 2012

[2] Ibid.

events are extensive wet conditions that follow a period of mid and high elevation ice and snow pack development. The county is susceptible to both riverine and flash floods.

Many rivers in Wasco County historically flood every few years. These include the White River, the Deschutes River, and the Columbia River. Flooding on these rivers usually occurs between spring and early summer, when much of the snowpack that feeds the rivers melts in May, June and July. Long periods of heavy rainfall and mild temperatures can also contribute to flooding conditions.

Landslide/Debris Flow

Landslides are the sliding movement of masses of loosened rock and soil down a hillside or slope. The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. It is most common for landslides to occur on water saturated slopes when the base of the slope can no longer support the weight of the soil above it. Landslides are commonly associated with heavy rain and flooding conditions, but they may also be associated with earthquakes (the 1994 Northridge Earthquake caused an estimated 11,000 landslides) and with volcanic activity.

Slides in Wasco County generally range in size from thin masses of soil of a few yards wide to deep-seated bedrock slides. Travel rate may range in velocity from a few inches per month to many feet per second, depending largely on slope, material, and water content. The recognition of ancient dormant slide masses is important as they can be reactivated by earthquakes or unusually wet winters. Also, because they consist of broken materials and disrupted ground water, they are more susceptible to construction-triggered sliding than adjacent undisturbed material. Landslides in the county tend to occur in isolated, sparsely developed areas threatening individual structures and remote sections of the transportation, energy and communications infrastructure. However there is a risk that a major landslide could cause the partial closure of segments of Interstate 84, or impact developed regions along the I-84 corridor; for example residential developments between The Dalles and Mosier.

Volcanic Event

A volcano is a vent in the earth's crust through which molten rock, rock fragments, gases or ashes are ejected from the earth's interior. There are a wide variety of hazards related to volcanoes and volcano eruption, and these hazards are typically distinguished by the different ways in which volcanic materials and other debris flow from the volcano.

Mount Hood is a potentially active volcano close to rapidly growing communities and recreation areas that could have significant effects on the daily lives of Wasco County residents. The most likely widespread and hazardous consequence of a future eruption will be for lahars (rapidly moving mudflows) to sweep down the entire length of the Sandy (including the Zigzag) and White River valleys. Lahars can be generated by hot volcanic flows that melt snow and ice or by landslides from the steep upper flanks of the volcano. Structures close to river channels are at greatest risk of being destroyed. The degree of hazard decreases as height above a channel increases, but large lahars can affect areas more than 30 vertical meters (100 vertical feet) above river beds.

Cascade Range volcanoes in the U.S. have erupted more than 200 times during the past 12,000 years for an average of nearly two eruptions per century. At least five eruptions

have occurred during the past 150 years. The most recent eruptions in the Cascade Range are the well-documented 1980-1986 eruptions of Mt. St. Helens, which claimed 57 lives and caused nearly a billion dollars in damage and response costs. The effects were felt throughout the northwest, and another Cascade Range volcanic eruption could significantly impact various aspects of life in Wasco County.

Wildfire and Wildland Urban Interface (WUI)

Any instance of uncontrolled burning within a forested area is a wildland fire, whereas uncontrolled burning in grassland, brush, or woodlands is classified as a wildfire. Wasco County's fire season usually runs from mid-May through October. However, any prolonged period of lack of precipitation presents a potentially dangerous problem. The probability of a wildfire in any one locality on a particular day depends on fuel conditions, topography, the time of year, the past and present weather conditions, and the activities (debris burning, land clearing, camping, etc.) which are or will be taking place.

The effects of wildfires in Wasco County vary with intensity, area, and time of year. Factors affecting the degree of risk of fires include extent of rainfall, humidity, wind speed, type of vegetation, and proximity to fire fighting agencies. The greatest short-term loss is the complete destruction of valuable resources, such as timber, wildlife habitat, scenic vistas, and watersheds. There is also an immediate increase in vulnerability to flooding due to the destruction of all or part of affected watersheds. Long-term effects include reduced amounts of timber for commercial purposes and the reduction of travel and recreational activities in the affected area.

Home building in and near forests increases the risks from forest fires. These areas of new homes are referred to as interface areas. Often, structures have been built and maintained with minimal awareness of the need for protection from exterior fire sources, or the need to minimize interior fires from spreading to forested lands. Historically, it appears that the instance of wildfire is increasing in Wasco County and the region more generally. Additionally, the existence of open range lands and large forested areas, increasing population and recreational activities, and the uncertain impact of a changing climate combine to increase the probability of a hazard event. The destruction of large tracts of forest land during these events have immediate economic impacts to the community through lost jobs and reduced taxes, while collateral economic and social effect can impact the county for years.

Severe Storms

Wasco County is vulnerable to a variety of severe storm hazards including ice, snow, and windstorms, which all have the ability to severely impact the county. Severe local storms seldom cause death and serious property damage but they can cause major utility and transportation disruptions.

Ice Storm

Ice storms or freezing rain (black ice) conditions can occur in Wasco County. Ice storms occur when rain falls from warm moist upper layers of the atmosphere into a cold, dry layer near the ground. The rain freezes on contact with the cold ground and accumulates on exposed surfaces. This has the possibility to create real havoc when the ice accumulates on tree branches, and power lines. This can cause power outages and can obstruct

transportation routes. A snow and ice storm occurred in 2012 that caused extensive damage to regional utilities, and left two inches of ice in parts of the county for several days.

Snow Storm or Blizzard

It is possible for moderate or severe snowfall to occur in Wasco County. Wasco County has had accumulations that vary depending on geographic location. For example, accumulations average between 4 – 5 inches in the City of the Dalles each year. However, during December of 1884, almost 30 inches of snow fell over a 3 day period and again in 1909 more than 14 inches fell over 5 days. Significant snow related events have continued to occur in the county's recent history, as in 2005 when the county received over 4 feet of snow during the winter season. Accumulations of snow usually increase with distance and elevation as the terrain rises to the South of the Columbia River. January is usually the month with the greatest snowfall.

Wind Storm

Every so often the Northwest is severely impacted by strong windstorms. In the past, peak wind gusts have gone above 100 miles per hour. The strongest winds that impact Wasco County come from two sources. Frequent and widespread strong winds come from the west and are associated with strong storms moving onto the coast from the Pacific Ocean. Strong east winds may also originate from Eastern Washington and Oregon, when high atmospheric pressure is over the upper Columbia River Basin and low pressure is over the Pacific Ocean. The Columbia River Gorge acts as a funnel, concentrating the intensity of the winds as they flow to the West. This generates frequently strong winds throughout the Gorge.

Tornado

Tornadoes are the most violent weather phenomena known. They are characterized by funnel clouds of varying sizes that generate winds as fast as 500 miles per hour. They can affect an area of ¼ to ¾ of a mile though seldom more than 16 miles long. Tornadoes normally descend from the large cumulonimbus clouds that characterize severe thunderstorms. They form when a strong crosswind intersects with strong warm updrafts in these clouds causing a slowly spinning vortex to form within a cloud. No recorded instance of a tornado causing damage in Wasco County is available.

FEMA Declarations

President Dwight D. Eisenhower approved the first federal disaster declaration in May 1953 following a tornado in Georgia. Since then, federally declared disasters have been approved within every state. As of March 2012, FEMA has approved a total of 28 federal disaster declarations, two emergency declarations and 49 fire management assistance declarations in Oregon.[3] When requesting a presidential declaration for a major disaster or emergency, governors provide detailed information about the amount of value of public and private property damage resulting from the event. FEMA uses these damage assessments to determine if the event meets the disaster declaration threshold. In addition, FEMA uses the

[3] FEMA. Declared Disasters by Year or State. http://www.fema.gov/news/disaster_totals_annual.fema#markS. Accessed March 8, 2012

information to determine the amount of federal public and private assistance being made available as well as the specific counties being included in the declaration.

Disaster declarations can help inform hazard mitigation project priorities, by demonstrating and documenting which hazards historically have caused the most significant damage to the county. Table 2.3 summarizes the six major disasters declared for Wasco County by FEMA since 1953. The table shows that all of the major disaster declarations in Wasco County have been flood or weather related.

Table 2.3: FEMA Major Disaster Declarations for Oregon – Wasco County

Declaration Number:	Declaration Date:	Incident(s):	Incident(s) Period:	Individual Assistance:	Public Assistance Categories:
DR-1683	22-Feb-07	Severe Winter Storm and Flooding	14-Dec-06 to 15-Dec-06	None	A, B, C, D, E, F, G
DR-1510	19-Feb-04	Severe Winter Storms	26-Dec-03 to 14-Jan-04	None	A, B, C, D, E, F, G
DR-1099	9-Feb-96	Severe Storms, Flooding	4-Feb-96 to 21-Feb-96	Yes	A, B, C, D, E, F, G
DR-1061	3-Aug-95	Flash Flooding	8-Jul-95 to 9-Jul-95	None	A, B, C, D, E, F, G
DR-413	25-Jan-74	Severe Storms, Snowmelt, Flooding	25-Jan-74	Yes	A, B, C, D, E, F, G
DR-184	24-Dec-64	Heavy Rain, Flooding	24-Dec-64	Yes	A, B, C, D, E, F, G

Source: FEMA, Oregon Disaster History, Major Disaster Declarations

Hazard Probability

Hazard probability is the likelihood of future natural hazard events within a specified period of time. Wasco County evaluated the best available probability data to develop the probability scores presented below. For the purposes of this plan, the county utilized the Oregon Emergency Management Hazard Analysis methodology probability definitions to determine hazard probability. The definitions are:

LOW = one incident likely within 75 to 100 years scores between 1 and 3 points

MEDIUM = one incident likely within 35 to 75 years scores between 4 and 7 points

HIGH = one incident likely within 10 to 35 years scores between 8 and 10 points

Table 2.4 presents the probability scores for eight natural hazards that consistently affect or threaten Wasco County. As shown in the table, individual natural hazard events in the county have varying levels of probability. Wildfire, severe storm, flood, and drought all have a high probability of occurrence, while landslide/debris flow events and earthquakes are given a medium level of probability. Volcanic events and tornados are both given a very low probability of occurrence.

Table 2.4: Natural Hazard Probability Assessment Summary – Wasco County

Threat Event/Hazard	Severity	Weight Factor	Subtotal	Probability
Wildfire (WUI)	10	7	70	High
Severe Storm	9	7	63	High
Flood - Riverine	9	7	63	High
Drought	8	7	56	High
Landslide/Debris Flow	5	7	35	Medium
Earthquake	4	7	28	Medium
Volcanic Event	1	7	7	Low
Tornado	1	7	7	Low

Source: Wasco County Strategic Preparedness Planning, Threat and Hazard Identification and Risk Assessment, Updated March, 2012

Community Vulnerability

Natural disasters occur as a predictable interaction among three broad systems: natural environment (e.g., climate, rivers systems, geology, forest ecosystems, etc.), the built environment (e.g., cities, buildings, roads, utilities, etc.), and societal systems (e.g., cultural institutions, community organization, business climate, service provision, etc.). A natural disaster occurs when a hazard impacts the built environment or societal systems and creates adverse conditions within a community.

It is not always possible to predict exactly when natural disasters will occur or the extent to which they may impact the community. However, communities can minimize losses from disaster events through deliberate planning and mitigation, as well as by identifying distinct vulnerabilities.[4]

Populations[5]

There are several factors that contribute to the overall vulnerability of the people who live in Wasco County. For example, population densities, non-English speaking populations, and growth rates are all factors that may impact a community's vulnerability to hazards. Several factors that are commonly considered variables in a community's collective vulnerability to disaster are listed below, followed by Figure 2.2, which outlines specific and general county-wide concerns along with the hazards that are most likely to impact them.

[4] Source: State of Oregon Emergency Management Plan, NHMP Region 5: Mid-Columbia, February 2012

[5] Source: Wasco County HIVA, July 2008

Vulnerable Populations

One characteristic of disasters is that they often exceed the ability of emergency response agencies to provide assistance promptly. In a major disaster, members of the public may be on their own for at least three days, and might need to go for several days without utilities, and/or food and water sources. Disasters may also isolate individuals by damaging transportation routes. Not all people are able to respond to these conditions appropriately. Many people are in vulnerable populations that may have difficulty following official instructions and taking protective actions. For instance, someone who is developmentally disabled or deaf may not be able to hear or understand instructions on sanitation, evacuation routes, or shelter locations.

Vulnerable populations are those groups that possess specific characteristics that inhibit their ability to prepare for, respond to, or recover from a disaster. These characteristics include physical and developmental disabilities, mental illness, poverty, old age, or an inability to speak or understand English. These groups are more heavily impacted because they may lack the necessary knowledge, skills, social support structures, or the mental and physical abilities necessary to take care of themselves. Historically, vulnerable populations present a special challenge to emergency managers and response agencies and they are more likely to be victims of a disaster.

Fortunately, many people that fall into one of these categories have families, friends, neighbors, and other caretakers that will be able to assist them. But many of them do not have adequate support and those who do may not be able to rely on it in a major event.

Non-English speaking and special cultural characteristics

According to 2010 census estimates, approximately 15% of the Wasco County population is identified as Hispanic in origin. It should be noted that "Hispanic Origin" is considered an ethnicity, not a race, as Hispanics may be of any race. The US Census Bureau also estimates that 15.1% of the Wasco County population over the age of five speaks a language other than English at home.[6]

A lack of ability to speak or read the English language can present a challenge to emergency managers, since instructions for self-protective action and general disaster information is usually provided only in English. The non-English speaking population would be uninformed unless they have assistance from friends or services providers who may provide them with instruction and information in English. In certain areas of Wasco County it may be advisable for emergency managers and emergency response agencies to arrange for translation of instruction and information into different languages.

Elderly

According to 2010 census figures, persons 60 and older made up 24.9% of the total Wasco County population. An increase is expected over the next ten years, where this group is predicted to make up 27.5% of the county's population by 2020.

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[6] Source: US Census Bureau, 2010 Census, American FactFinder, S1601

Transient Population

The transient population includes those who do not have a permanent residence in Wasco County.

Visitors/Travelers

Due to its proximity to the Columbia River and the cities, rivers and mountains of central Oregon, Wasco County is considered a major Northwest visitor destination. Travelers and visitors are particularly vulnerable to disasters, because they are usually unfamiliar with the hazards in the region and because they do not have the knowledge or the materials needed to take care of themselves in a disaster. For example, a typical visitor or traveler may have difficulty using evacuation routes, or finding shelters. A light traveling visitor would also not have their own supply of food, water, flashlights, radios, and other supplies that locals can use to take care of themselves in a disaster. And finally, visitors or travelers usually do not have a local support structure of family, friends, and neighbors that most of us rely on.

Physically Disabled

According to 2008-2010 census estimates 3,518, or 14.6%, of Wasco County's non-institutionalized citizens are living with a disability.[7] These disabilities may or may not be permanent. Table 2.5 describes the number of people throughout Wasco County with disability status or other physical difficulties.

Table 2.5: Wasco County Disability Characteristics

Disability	Number of People	Percent of Non-institutionalized Population
Disability status	1,087	4.5%
Hearing difficulty	700	2.9%
Vision difficulty	821	3.4%
Cognitive difficulty	845	3.5%
Ambulatory difficulty	845	3.5%
Self-care difficulty	821	3.4%
Independent living difficulty	724	3.0%
Total civilian non-institutionalized population	**24,148**	

Source: US Census Bureau, 2008-2010 American Community Survey 3-Year Estimates, American FactFinder, S1810

Developmentally Disabled

According to national prevalence formulas approximately 1% of the Wasco County Population, or 204 residents (as of 2000), have a developmental disability. A developmental disability is defined as a disability that is attributable to mental retardation, cerebral palsy, epilepsy, autism, or any neurological or other condition closely related to mental retardation.

[7] Source: US Census Bureau, 2008-2010 American Community Survey 3-Year Estimates, American FactFinder, S1810

There is a wide variation in the vulnerability of the developmentally disabled population in Wasco County. Some developmentally disabled individuals may have strong support structures and a high level of care provided to them by friends, neighbors, and care providers, though others may not. Some individuals may be largely self-reliant, and some may have additional disabilities in addition to their developmental disabilities. Roughly 10% of the developmentally disabled population is wheelchair bound and approximately 2% of the county population or 476 residents (as of 2000) suffer from a mental illness.

Mentally Ill

Disaster conditions can aggravate the symptoms of those who suffer from mental illness. The mentally ill tend to be very sensitive to changes in their environment. There are case studies of this phenomenon from Clark County, Washington. During the Mt. St. Helens eruption disaster several individuals incorporated the fall of ash into their delusional symptoms. There was a marked increase in the caseload for mental health crisis services at the Columbia River Mental Health Services. During the February 1996 floods several mental health patients were hospitalized as a result of increased stress due to relocation, forgetting to take their medications when evacuated, and increased anxiety. Another important consideration is the ability of disaster conditions to cause mental illness. It is estimated that 10% of disaster victims can develop mental health problems, including depression and substance abuse.

Low Income

Not having sufficient financial resources during and after a disaster can be a great disadvantage. Lower income people are more likely to live in mobile homes or other homes that are less able to resist damage from flooding, windstorms, and severe weather. Low-income people also tend to have the greatest difficulty recovering from a disaster. According to 2010 census estimates, approximately 15.7% of the total population has income below the national poverty level.

Figure 2.2: Wasco County Population Issues

Wasco County Asset Identification	Drought	Earthquake	Flood	Landslide	Volcano	Wildfire	Windstorm	Winter storm	Other
Homeowners in WUI						x			
Homeowners in Mill Creek Area			x			x			
Landowners that live along stream in Wasco County (city and county)			x						
Agricultural producers – wheat, cattle, orchardists, etc. (county)	x		x			x			
Assisted Living Facilities (Evergreen, Cherry Heights) – Access during/after floods			x						
Elderly population in the City of The Dalles		x	x	x					
Housing and population on Seven Mile Hill outside of The Dalles	x					x		x	
Migrant workers – seasonal housing			x	x		x			
Students in High School building built c. 1940		x							
Students and staff in CGCC buildings 1 and 2 (built 1920s, 1960s)		x							

Source: Wasco County Risk Assessment Steering Committee Meeting, February 15, 2012

Economy[8]

Wasco County is highly susceptible to economic disturbance from Natural Hazards, as a great deal of funding for county services, and a substantial amount of the region's income come from agriculture and other sensitive industries which can be severely disrupted by drought, flood, fire and winter storms, hazards that occur with a high likelihood of probability across the entire county. Specific issues concerning the county's economy that were identified in the county's Risk Assessment Steering Committee Meeting are outlined in Figure 2.3 below, along with the hazards that are most likely to impact them.

[8] Source: Wasco County NHMP Community Profile, 2012

Figure 2.3: Wasco County Economic Issues

Wasco County Asset Identification	Drought	Earthquake	Flood	Landslide	Volcano	Wildfire	Windstorm	Winter storm	Other
Agriculture	x		x			x			
Downtown businesses		x	x					x	
Commercial and Industrial Properties in The Dalles		x	x					x	
Wineries			x					x	
Historic structures in The Dalles: Ft. Dalles, Civic Auditorium, Elks Lodge, St. Peter's Landmark, Commodore Building, City Hall, Second Courthouse, Wasco County Courthouse, The Dalles Branch Mint, Sunshine Mill, IDOF Lodge, Original Courthouse		x	x						
Google data center and other port facilities			x						
City water supply		x	x						
Wind farms		x						x	

Source: Wasco County Risk Assessment Steering Committee Meeting, February 15, 2012

Land-use and Development

To accommodate growth and development, communities engaged in mitigation planning should address infrastructure and service needs, specific engineering standards and building codes. Eliminating or limiting development in hazard prone areas, such as floodplains, can reduce vulnerability to hazards, and the potential loss of life, injury, and property damage. Communities in the process of developing land for housing and industry need to ensure that land-use and protection goals are being met to prevent future risks.[9]

Southern Wasco County remains steeped in its agricultural and recreational heritage, and land use is dominated by those processes. In northern Wasco County, industry, commercial and residential activities are concentrated within the City of The Dalles. State law requires that cities and the county jointly manage Urban Growth Areas, delineated by a city's Urban

[9] Source: State of Oregon Emergency Management Plan, Region 5: Mid-Columbia Regional Profile, February 2012

Growth Boundary (UGB) which identifies lands needed to meet population and economic demands for growth within a 20-year period.[10]

Environment

With four distinct mild seasons, a diverse terrain and its proximity to the Columbia Gorge, Wasco County historically has had to deal with habitual drought, flooding, wildfires and the occasional landslide. By identifying potential hazards, temperature and precipitation patterns, along with natural capitals such as key river systems, Wasco County can focus on key areas to better prepare, mitigate, and increase the resiliency of local communities.[11] Specific and general county-wide environmental concerns along with the hazards that are most likely to impact them are listed in Figure 2.4 below.

[10] Source: Wasco County Comprehensive Land Use Plan

[11] Source: Wasco County NHMP Community Profile, 2012

Figure 2.4: Wasco County Environmental Issues

Wasco County Asset Identification	Drought	Earthquake	Flood	Landslide	Volcano	Wildfire	Windstorm	Winter storm	Other
Streams/Riparian Zones (property damage, bridges/culverts)	x		x						
Forest/woodland areas	x					x			
Cropland (cereal grains)	x		x			x		x	
Hazardous material storage and chemical spills		x	x						x
Ground water issues	x		x			x			
Lockheed Martin superfund site in port area		x	x						x
Creosote plant site		x	x						x
Mill Creek @ 2nd Street – City of The Dalles should provide safe path/drain for out of bank flows to reach river under Freeway underpass			x						
City of The Dalles watershed			x			x			
Oregon Cherry Growers	x		x			x			
Wicks Water treatment plant		x	x			x			
County/city parks	x		x			x			

Source: Wasco County Risk Assessment Steering Committee Meeting, February 15, 2012

Critical Facilities and Infrastructure

Transportation networks, systems for power transmission, and critical facilities such as hospitals and police stations are all vital to the functioning of a county. Due to the fundamental role that infrastructure plays both pre- and post-disaster; it deserves special

attention in the context of creating more resilient communities.[12] Specific and general county-wide critical infrastructure and services concerns along with the hazards that are most likely to impact them are listed in Figure 2.5 below.

Figure 2.5: Wasco County Critical Infrastructure and Services Issues

Wasco County Asset Identification	Drought	Earthquake	Flood	Landslide	Volcano	Wildfire	Windstorm	Winter storm	Other
Evergreen Nursing Home – Access (bridge crosses Mill Creek)			x						
Mid-Columbia Medical Center		x	x						
911 center / EOC			x						
19th street extension to improve emergency access									x
The Dalles Oregon Military Department Readiness Center[13]		x	x						

Source: Wasco County Risk Assessment Steering Committee Meeting, February 15, 2012

National Flood Insurance Program (NFIP)

Wasco County's Flood Insurance Rate Maps are current as of September 24, 1984, making them some of the oldest FIRMs in the state. Table 2.6 shows that as of February, 2011, there were a total of 104 National Flood Insurance Program (NFIP) policies in force with a total coverage value of nearly $20 million. Between 1978 and July 25, 2011, there were fourteen NFIP claims including one in Dufur, five in The Dalles, and eight across Wasco County in unincorporated areas.

[12] Source: State of Oregon Emergency Management Plan, Region 5: Mid-Columbia Regional Profile, February 2012

[13] The new Oregon Military Department Readiness Center will be located on the Columbia Gorge Community College campus in The Dalles near Sorosis Park

Table 2.6: NFIP Summary Table

Jurisdiction	FIRM Status	FIRM Date	NFIP Status^	# NFIP Policies	Total Coverage	Total Premium	# NFIP Claims	Total Paid
Wasco County	ALL ZONE A,C,X- NO ELEVATION DETERMINED	Sep-84	P	65	$10,459,100	$34,608	8	$240,950
Antelope	NEVER MAPPED	Jan-50	NP	0	0	0	0	0
Dufur	ALL ZONE A,C,X- NO ELEVATION DETERMINED	Sep-84	P	10	$1,562,200	$6,600	1	$3,139
Maupin	ALL ZONE A,C,X- NO ELEVATION DETERMINED	Sep-84	P	4	$1,505,800	$6,847	0	0
Mosier	ORIGINAL	Feb-89	P	1	$350,000	$355	0	0
Shaniko	NEVER MAPPED	Jan-50	NP	0	0	0	0	0
The Dalles	ALL ZONE A,C,X- NO ELEVATION DETERMINED	Jan-84	P	24	$6,074,300	$29,301	5	$35,847
TOTALS				**104**	**$19,951,400**	**$77,711**	**14**	**$279,936**

Source: State NFIP Coordinator; ^ P = Participating, NP = Not Participating

Table 2.7 illustrates that as of February, 2011, Wasco County and its incorporated cities have zero repetitive flood loss properties. The opening date of Wasco County's last Community Assistance Visit was August, 2005. The City of Mosier's last opening Community Assistance Visit was May, 1994, and the City of Maupin's was April, 1985. Neither Wasco County nor its incorporated cities are currently members of the Community Rating System. "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."[14] Participation in the program typically results in discounted flood insurance premium rates that reflect the reduced flood risk from community actions to meet CRS goals.

[14] Federal Emergency Management Agency, National Flood Insurance Program, Community Rating System, http://www.fema.gov/business/nfip/crs.shtm Accessed: May 30, 2012

Table 2.7: NFIP Repetitive Loss and Severe Repetitive Loss Summary

Jurisdiction	# SRL Properties-Validated	# SRL Properties-Pending	# RL Properties
Wasco County	0	0	0
Antelope	0	0	0
Dufur	0	0	0
Maupin	0	0	0
Mosier	0	0	0
Shaniko	0	0	0
The Dalles	0	0	0
TOTALS	**0**	**0**	**0**

Source: State NFIP Coordinator

Vulnerability Summary

Vulnerability is a measure of the exposure of the built environment to hazards. The exposure of community assets to hazards is critical in the assessment of the degree of risk a community has to each hazard. Identifying the facilities and infrastructure at risk from various hazards can assist the county in prioritizing resources for mitigation, and can assist in directing damage assessment efforts after a hazard event has occurred. The exposure of county assets to each hazard and potential implications are explained in each hazard section.

Vulnerability is the percentage of population and property likely to be affected under an "average" occurrence of the hazard. Wasco County evaluated the best available vulnerability data to develop the vulnerability scores presented below. For the purposes of this plan, the county utilized the Oregon Emergency Management Hazard Analysis methodology vulnerability definitions to determine hazard probability. The definitions are:

LOW = less than 1-percent affected scores between 1 and 3 points

MEDIUM = between 1 and 10-percent affected scores between 4 and 7 points

HIGH = more than 10-percent affected scores between 8 and 10 points

Table 2.8 presents the vulnerability scores for each of the natural hazards present in Wasco County. As shown in the table, the county is highly vulnerable to severe storm and drought. In addition, Wasco County is moderately vulnerable to wildfire, earthquakes and landslide/debris flow events, and has a low level of vulnerability to flood, volcanic events and tornados.

Table 2.8: Community Vulnerability Assessment Summary – Wasco County

Threat Event/Hazard	Severity	Weight Factor	Subtotal	Vulnerability
Severe Storm	9	5	45	High
Drought	8	5	40	High
Wildfire (WUI)	6	5	30	Medium
Earthquake	5	5	25	Medium
Landslide/Debris Flow	4	5	20	Medium
Flood - Riverine	3	5	15	Low
Volcanic Event	2	5	10	Low
Tornado	1	5	5	Low

Source: Wasco County Strategic Preparedness Planning, Threat and Hazard Identification and Risk Assessment, Updated March, 2012

Risk Assessment

In order to develop a more comprehensive understanding of the risks facing Wasco County from various natural hazards, several scores were developed by members of the Wasco County NHMP Steering Committee to develop a hazard analysis. A vulnerability score (described in Table 2.8 and its preceding paragraph) was combined with a probability score (described in Table 2.4 and its preceding paragraph) along with two other variables (event history and maximum threat) to develop a total threat score for each individual hazard. The scores were used for strategic preparedness planning in Wasco County's 2012 Threat and Hazard Identification and Risk Assessment, and to justify the level of priority for addressing individual natural hazards in the action item section of Wasco County's initial 2007 Natural Hazards Mitigation Plan.

At the Wasco County Risk Assessment Steering Committee Meeting on February 15, 2012, Severity Impact scores were developed by steering committee members to represent the potential impact of various natural hazards to general health and safety (by potential deaths and injuries), facilities (by physical damage and costs), and community (by expected economic, ecologic and social interruption). An overall severity impact score was developed for each hazard using the prescribed metric, and then multiplied by each hazard's relative probability score to produce an overall relative risk score.

Table 2.9 presents the overall risk assessment for Wasco County including both the county's hazard analysis and relative risk. The hazards are listed in rank order from high to low, taking consideration of past historical events, vulnerability to populations, the maximum threat, and the probability, or likelihood of a particular hazard event occurring. The data show that flood is the highest ranked hazard in the county, followed closely by wildfire and then severe storm. Drought, earthquake, and landslide/debris flow make up the next three highest ranked hazards in the county, whereas volcano and tornado are the two lowest ranked hazards in terms of overall relative risk.

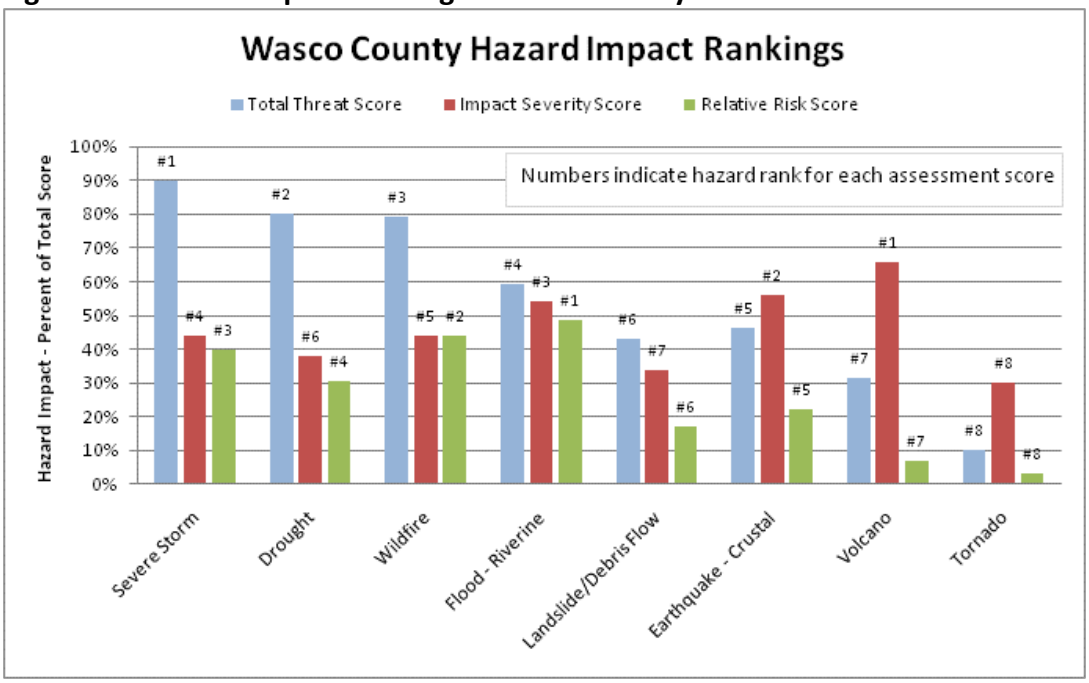
Table 2.9: Risk Assessment Summary – Wasco County

Hazard	Probability Total	Vulnerability Total	Total Threat Score	Severity Impact Score	Relative Probability	Relative Risk	Hazard Ranking
Flood - Riverine	63	15	142	2.7	4.5	12.2	1
Wildfire (WUI)	70	30	190	2.2	5	11	2
Severe Storm	63	45	216	2.2	4.5	9.9	3
Drought	56	40	192	1.9	4	7.6	4
Earthquake	28	25	111	2.8	2	5.6	5
Landslide / Debris Flow	35	20	103	1.7	2.5	4.3	6
Volcanic Event	7	10	61	3.3	0.5	1.7	7
Tornado	7	5	24	1.5	0.5	0.8	8

Source: Wasco County Strategic Preparedness Planning, Threat and Hazard Identification and Risk Assessment, Updated March, 2012; Wasco County Risk Assessment Steering Committee Meeting, February 15, 2012

Figure 2.6 below provides additional analysis for the total threat, impact severity and relative risk scores from Table 2.9. The scores are presented as a percentage of the overall scoring potential for each hazard, and then assigned a rank based on their placement among the other hazard scores. In other words, the figure dissects the relative placement of each hazard's scores by contrasting the components of each hazard's overall relative risk score components. For example, though severe storm has the highest total threat score among the hazards in Wasco County, it is only ranked #4 in terms of impact severity, and has the third highest relative risk score. Conversely, volcano has the highest impact severity score, but is only ranked #7 in terms of its total threat and overall relative risk scores.

Figure 2.6: Hazard Impact Rankings – Wasco County



Source: Wasco County Strategic Preparedness Planning, Threat and Hazard Identification and Risk Assessment, Updated March, 2012; Wasco County Risk Assessment Steering Committee Meeting, February 15, 2012

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Section 3: Mitigation Strategy

This section of the NHMP addresses 44 CFR 201.6(c)(3) – Mitigation Strategy. The information provided in Section 2 and the Hazard Annexes provide the basis and justification for the mitigation actions identified in this plan. This section provides information on the process used to develop a mission, goals and action items. 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

Mitigation Plan Mission

Wasco County's vision is "…to be the best performing rural county government in Oregon and to preserve the beauty, livability, and economy of Wasco County for future generations." The 2006 NHMP used this as the guiding principle when developing the NHMP mission. For this update, the Wasco County NHMP Steering Committee reviewed and reaffirmed the plan mission at its Mitigation Strategy Meeting on 23 May, 2012.

The mission of the Wasco County mitigation plan mission is to:

> *Protect life, property and the environment through coordination and cooperation among public and private partners, which will reduce risk and loss, and enhance the quality of life for the people of Wasco County.*

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. Each goal has a series of statements which further reflect and more clearly define the goals.

Background

Soliciting community input during stakeholder interviews was a critical aspect of initial goal development. Armed with Stakeholder Interview input, the mitigation plan goals and goal statements were drafted by the NHMP Coordinator using assistance from OPDR during the creation of the Wasco County NHMP in 2006. The draft goals were brought before the 2006 Wasco County Steering Committee for review and approval. The goals were revised with Steering Committee input before adoption by the committee.

In an effort to prioritize goals, each member of the Steering Committee was asked to (i) identify three statements that were most important to them and (ii) speak to why they chose those statements. Their statement choices were tallied and goals prioritized by the

number of statements selected; goals with the most statements selected are ranked in priority from I-IV. This exercise was not meant to exclude the importance of the other goals, but rather assist in the implementation of this plan by identifying which of the high priority risk reducing action items to pursue funding for first.

Goal update Process

The 2011/2012 Wasco County NHMP Steering Committee reviewed the plan goals during its Mitigation Strategy Meeting on 23 May, 2012. The committee revised the language of some of the statements in four of the plan goals, and removed one goal, "Intergenerational Equity," because it was not seen to fit within the scope of the NHMP. The goals were then reaffirmed and re-prioritized using a similar method to the one used by the previous Steering Committee. It was also decided that the goals should be listed in order of their new level of priority.

The outcome of the goal review and re-prioritization process is represented in Table 3.4 below. The "CHOICE" column indicates the number of times a given statement was identified as a community priority by Steering Committee members. The "PRIORITY" column tallies the number of statements selected for each goal and identifies the principal goals to serve as a starting point in the implementation of mitigation activities for Wasco County.

The primary goal identified is the Protection of Life & Property, and the secondary goal is Emergency Services Enhancement. Tertiary and quaternary goals are Education and Outreach efforts, and Facilitate Partnerships and Coordination.

Table 3.4: Wasco County NHMP Goals

Goal	Statement	Choice	Priority
Protection of Life & Property	Develop and implement activities to protect human life, commerce, property and natural resource systems	4	I
	Reduce insurance losses and repetitive claims for chronic hazard events while promoting insurance for catastrophic hazards	3	
	Evaluate guideline/codes, and permitting processes in addressing hazard mitigation; emphasize non-structural means of mitigating hazard impact		
	Utilize mitigation activities to minimize risks associated with hazard events		
Emergency Services Enhancement	Evaluate performance of critical facilities during a natural hazard event	2	II
	Minimize threat to life safety issues	2	
	Ensure resources, staffing and volunteer base keeps pace with county growth and needs	1	
Education & Outreach	Develop and implement education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, businesses, and industry	3	III
	Develop and conduct outreach programs to increase the number of local activities implemented by public and private sector organizations		
	Build community consensus through outreach, education and activities		
Facilitate Partnerships & Coordination	Strengthen communication and coordination of public/private partnerships and emergency services among local, county and regional governments and the private sector	3	IV
	Incorporate hazard mitigation into the greater social, economic and natural resource goal framework		
Disaster Resilient Economy	Foster a diverse economy to reduce the impacts of a hazard event on any one sector		
	Create the conditions for a transitional economy that welcomes new development and innovative ideas that are sensitive to potential hazard risks faced by the county	2	
	Protect recreation and tourism industries by raising awareness of potential hazard impacts		
	Provide support for agricultural and forest industries to help them prepare for hazardous events		
Natural Resource Systems Protection	Link watershed planning, natural resource management, and land use planning with natural hazard mitigation activities	2	
	Preserve and rehabilitate natural systems to serve natural hazard mitigation functions and protect recreation resources		
Acknowledge Responsibility	Coordinate programs to increase natural hazard knowledge base and use technology to better record events and model vulnerability	2	
	Actively acknowledge amount of loss the county is susceptible to and develop efforts to overcome that loss without significant reliance on outside resources		
	Incorporate hazard mitigation as part of the county leadership's routine decision making process		

Source: Hood River County NHMP Steering Committee

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 participating jurisdictions to better understand risk and can assist in documenting successes. The following table lists existing programs, mitigation projects and other efforts that have been implemented since the Wasco County NHMP was adopted in February 2007, along with the hazards that were addressed by each activity.

Table 3.3: Wasco County Mitigation Activities

Hazard	Program, Project, or Effort
Multi-Hazard (MH)	Developed Post-Disaster Recovery Plan as a Component of Update to the Wasco County Emergency Operations Plan
Multi-Hazard (MH)	Created Interoperable County-wide Emergency Communication System with Increased Radio Coverage
Flood Hazard (FH)	Updated County Flood Ordinances in 2008/2009
Severe Storm Hazard (SH)	Installed Emergency Power Generators to Several Critical Facilities
Wildfire Hazard (WH)	Cleaned Up Brownsfield Bark Piles in Maupin
Wildfire Hazard (WH)	Formed Tygh Valley and Wamic Fire Districts, Bringing more Unincorporated Lands Under Some Form of Wildfire Protection Coverage

Source: Wasco County NHMP Mitigation Strategy Steering Committee Meeting, May 23, 2012

The information provided in Section 2 and the Hazard Annexes provide the basis and justification for the mitigation actions identified in this plan. This section describes the components that guide implementation of the identified mitigation strategies and is based on strategic planning principles. This section 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. City or special district specific documentation of how actions will be implemented through existing plans and policies is located in Volume III: City/Special District Addendums. This section also provides information on the process used to develop a mission, goals and action items, the definitions of which are presented below:

- 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 multi-jurisdictional 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.

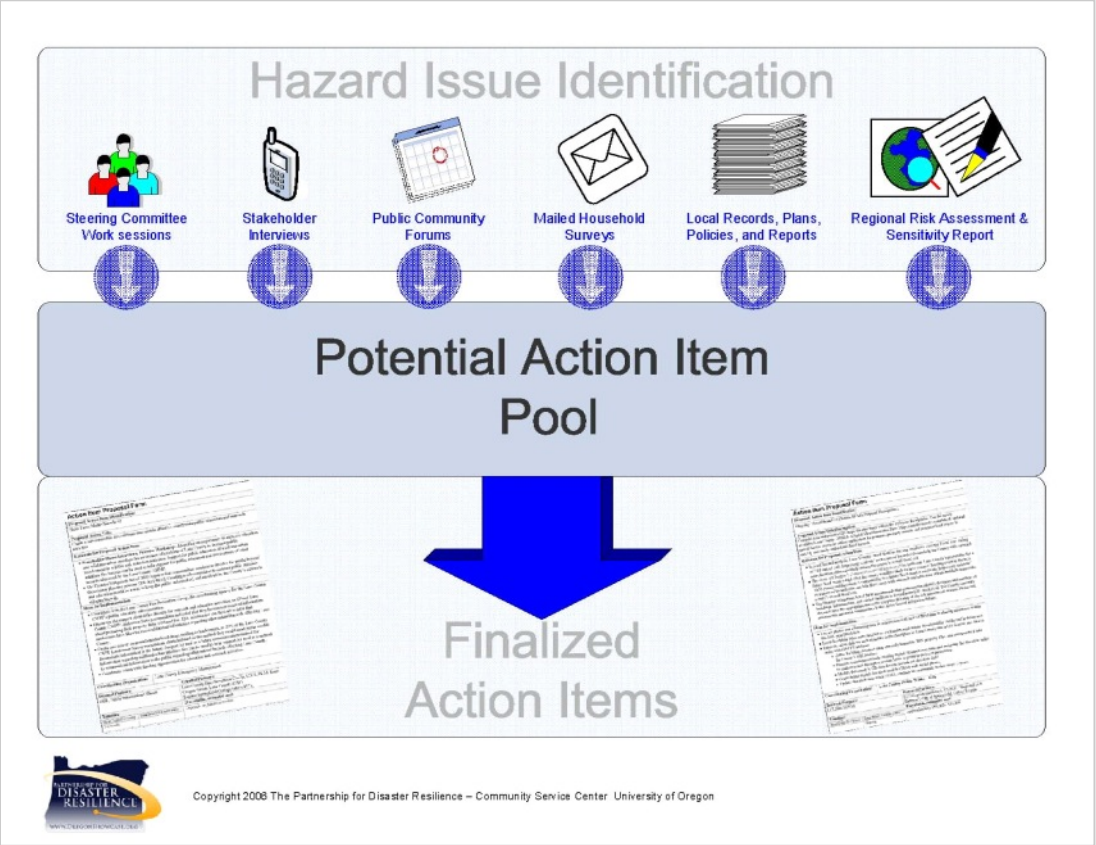
- Goals— Goals are designed to drive actions and they are intended to represent the general end toward which the county effort is directed. Goals identify how the county intends to work toward mitigating risk from natural hazards. The goals are guiding principles for the specific recommendations that 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 Action Items

Short and long-term action items 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 address both 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 3.1 Action Item Sources



Source: Partnership for Disaster Resilience, 2006

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 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 in Appendix A.

Rationale or Key Issues Addressed

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items 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. The rationale for proposed action items is based on the information documented in Section 2 and the Hazard Annexes.

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 action item 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.

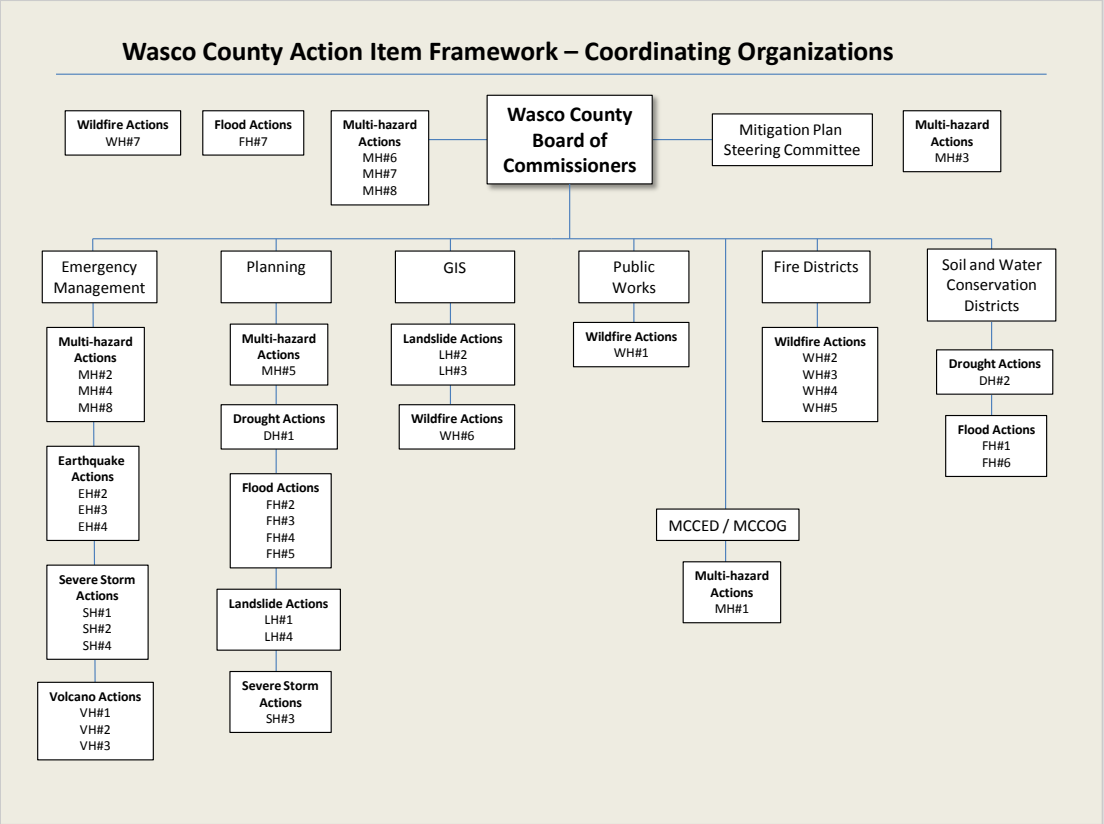
Implementation through Existing Programs

The Wasco County multi-jurisdictional 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. Wasco County currently addresses statewide planning goals and legislative requirements through its comprehensive plan, county land use and development ordinances, and building codes. To the extent possible, Wasco County will work to incorporate the recommended mitigation action items into existing programs and procedures.

Many of the Wasco County multi-jurisdictional Natural Hazards Mitigation Plan's recommendations are consistent with the goals and objectives of the county's existing plans and policies. Where possible, Wasco County will implement the multi-jurisdictional 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. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.[1] Implementing the Natural Hazard Mitigation Plan's action items through such plans and policies increases their likelihood of being supported and implemented.

[1] Burby, Raymond J., ed. 1998. Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities.

Figure 3.2 Wasco County Action Item Framework



Source: Wasco County

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 or other participating jurisdiction 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 action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

TIMELINE:

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

Action Item Development:

The 2006 NHMP Coordinator led the effort to collect and document action item ideas, disperse action worksheets to government agencies and community stakeholders, and ultimately draft action item worksheets to present to the Steering Committee. Action item input was gathered through the NHMP Community Stakeholder Forum, stakeholder interviews, and Steering Committee meetings. The Steering Committee was charged with the selection of draft action items to document in the plan and prioritization (high or low) of action items to help guide implementation.

Selection and prioritization of action items was accomplished during the NHMP Steering Committee Goals and Action Items meeting on 13 July 2006. The method of selection and prioritization was as follows:

(1) First pass review (selection):

Each action item was reviewed individually by the Steering Committee with the question posed: "is this an action item worth pursuing, i.e. will it effectively reduce the county's risk from natural hazards?" The action items were placed in "Yes" or "No" piles accordingly.

(2) Second pass review (prioritization):

Of those action items in the "Yes" pile, each item was reviewed individually by the Steering Committee and given a "High" or "Low" priority rating based on potential impact and feasibility.

(3) Third pass review (detail):

The details of the selected action items were discussed and debated with emphasis on rationale for the action, ideas for implementation, and the coordinating organization.

Action Item Review and Update

The action items were reviewed and revised by the 2011/2012 Wasco County NHMP Steering Committee during the Mitigation Strategy Meeting on 23 May, 2012. Steering Committee Members analyzed each of the action items developed by the previous Steering Committee, and documented the status of completion for each action item over the past five years since the plan's creation. Completed action items were described and removed, or deferred if the nature of the action item made its progress or timeline "ongoing." Action items that had not been completed were either deleted or deferred. Most deferred action

items were modified in some way, either in terms of the action itself, partner organizations, or the timeline for completion. The actions taken by the 2011/2012 Wasco County NHMP Steering Committee during their review of the plan's action items, along with justifications for these decisions, can be found in Appendix B: Planning and Public Process.

Action Item Matrix

The Action Item matrix portrays the overall action plan framework and identifies linkages between the plan goals, partnerships (coordination and partner organizations), and actions. The matrix documents a description of the action, Steering Committee identified priority, the coordinating organization, partner organizations, timeline, and the plan goals addressed.

Wasco County NHMP Action Item Matrix

Action Item	Priority	Proposed Action Title	Coordinating Organization	Partner Organizations	Timeline	Alignment with Plan Goals						
						Education & Outreach	Disaster Resilient Economy	Protection of Life & Property	Acknowledge Responsibility	Facilitate Partnerships & Coordination	Natural Resource Systems Protection	Emergency Services Enhancement
Multi-Hazard (MH)												
MH #1	H	Pursue regional funding for mitigation actions and coordination of efforts	MCCED, MCCOG	Emergency Management, Planning, Public Works, SWCD, Cities, State Agencies, Non-Government/Quasi-governmental Organizations, Public	ST (ongoing)				X	X		X
MH#2	H	Develop Public Outreach /Educational Programs	Emergency Management	County Agencies (Planning, SWCD, Building specifically), Cities, State Agencies, Non-Government/Quasi-governmental Organizations, Public, Media, Schools, Public Works	ST (ongoing)	X			X	X		
MH#3	H	Annual Review and Update of the County Emergency Operations Plan, Community Wildfire Protection Plan, and Natural Hazards Mitigation Plan; Re-Adoption is required	Wasco County Hazard Resilence Committee	Planning, BOC, Emergency Management, OEM, OPDR, Public Works	ST (ongoing)				X	X		
MH#4	H	Create Systems to Support and Maintain at-risk Populations	Emergency Management	Public Health, Planning, Records and Assessment, Red Cross, Hospitals, OR Senior Advisory Council	ST (ongoing)				X	X		X
MH#5	L	Update County Comprehensive Plan	Planning	BOC, DLCD	LT		X	X	X		X	
MH#6	L	Create Emergency Disaster Fund	BOC	Emergency Response, Emergency Management, OEM, FEMA, Public Works	LT		X		X	X		
MH#7	L	Develop Small Business Awareness & Continuity Planning Campaign	Emergency Management / BOC	Chamber of Commerce	LT (ongoing)	X	X			X		
Drought Hazard (DH)												
DH#1	H	Ensure Long-range Water Resources Development and Quality	Planning	Watermaster, BOC, SWCD, OSU Extension, DEQ, ODFW, OECDD, DOGAMI, DLCD, City of The Dalles	ST (ongoing)		X	X		X	X	
DH#2	L	Support Local Agencies Training on Water Conservation Measures and Drought Management Practices	SWCD	Planning, OSU Extension, Cherry Growers, Cattlemen's Association, NRCS	LT (ongoing)	X	X			X	X	
Flood Hazard (FH)												
FH#1	H	Mitigate Flood Event Resulting from Naturally Induced Dam Failure	SWCD	Public Works, GIS, Fire Dept., Emergency Management, Army Corps of Engineers, BPA, DEQ, WRD	ST (ongoing)			X	X			
FH#2	H	Retain NFIP Community Rating System / CRS Rating System	Planning	BOC, Cities, LCDC, FEMA, OEM, OECDD	ST (ongoing)	X			X			
FH#3	H	Address Repetitive Loss	Planning	BOC, Cities, LCDC, FEMA, OEM, OECDD	ST (ongoing)	X		X	X			
FH#4	H	Update FIRM Maps	Planning	GIS, Public Works, FEMA	ST			X			X	
FH#5	H	Continue to Update County Flood Ordinances as Required	Planning	County Surveyor, DLCD	ST (ongoing)		X	X	X		X	
FH#6	L	Removal of Passage Barriers along Fifteen Mile Subbasin	SWCD	Planning, Public Works, ODF&W	LT (ongoing)			X			X	
FH#7	L	Develop Flood Education & Outreach Programs	BOC	EM, Planning, Building, SWCD, OPDR, FEMA, OEM	LT (ongoing)	X	X	X		X	X	
Earthquake Hazard (EH)												
EH#1	H	Rehabilitate Identified Vulnerable Schools, Emergency Facilities, and Public Buildings /Lifelines	Facility Managers	Emergency Management, BOC, Planning, GIS, Public Works, DOGAMI, OEM, DLCD	LT			X				X
EH#2	L	Improve Knowledge of Earthquake Sources /Improve Earthquake Hazard Zone Maps	Emergency Management	GIS, Public Works, DOGAMI, OEM, DLCD	LT (ongoing)				X			
EH#3	L	Improve Understanding of Vulnerability and Risk	Emergency Management	GIS, Public Works, DOGAMI, OEM, DLCD	LT (ongoing)				X			
EH#4	L	Educate Those at Risk	Emergency Management	GIS, Public Works, DOGAMI, OEM, DLCD	LT (ongoing)	X		X	X			

Wasco County NHMP Action Item Matrix

Action Item	Priority	Proposed Action Title	Coordinating Organization	Partner Organizations	Timeline	Alignment with Plan Goals						
						Education & Outreach	Disaster Resilient Economy	Protection of Life & Property	Acknowledge Responsibility	Facilitate Partnerships & Coordination	Natural Resource Systems Protection	Emergency Services Enhancement
Landslide Hazard (LH)												
LH#1	H	Update County Landslide Ordinance	Planning	Planning Commission, OPDR, OEM	LT		X	X	X			
LH#2	L	Improve Understanding of Landslide Risk Inside Hazard Areas and Improve Warning Systems	GIS	Planning, Emergency Management, DOGAMI, ODF, DLCD	LT (ongoing)		X	X	X			X
LH#3	L	Update Landslide Hazard Area Maps	GIS	Planning, Emergency Management, DOGAMI, ODF, DLCD	LT (ongoing)				X			
LH#4	L	Provide Education/Awareness for Those at Risk	Planning	GIS, Emergency Management, DOGAMI, ODF, DLCD	LT (ongoing)	X		X				
Severe Storm Hazard (SH)												
SH#1	H	Develop Partnership Programs to Reduce Vulnerability of Public Infrastructure from Severe Winter Storms	Emergency Management	Planning, Public Works, Cities, Utilities	LT (ongoing)		X	X		X		
SH#2	H	Encourage Critical Facilities to Secure Emergency Power	Emergency Management	Planning, Public Works	ST (ongoing)							X
SH#3	H	Support/Encourage Electrical Utilities to Use Undergroud Construction Methods	Planning	Emergency Management, GIS, Cities, Utilities, Building Contractors, Real Estate	ST (ongoing)		X					
SH#4	L	Increase and Maintain Public Awareness of Severe Storms.	Emergency Management	Planning, Public Works, Utilities, Cities, American Red Cross, St. Vincent DePaul, Churches, Fire, FEMA	LT (ongoing)	X	X					
Wildfire Hazard (WH)												
WH#1	H	Assessment of Non-County Roads for Response to Wildfire Hazards	Wasco County Road Department	Planning, Rural Fire Departments, Oregon's Fire Marshall's Office, ODF	ST (ongoing)			X	X			X
WH#2	H	Increase Wildfire Prevention Awareness and Encourage WUI Areas to Conduct Firewise Workshops	Fire Districts	Rural Fire Districts, County Planning Director, Emergency Management, GIS Coordinator, ODF, USFS, Oregon Fire Marshall's Office, Fire Prevention Co-op	ST (ongoing)	X		X	X			
WH#3	H	Provide Parcel/Lot Identification Signage	Fire Districts	Planning	ST (ongoing)			X				X
WH#4	H	Accomplish Defensible Space Around Structures	Rural Fire Districts / Planning	Landowners, ODF, USFS, Oregon Fire Marshall's Office, Emergency Management	ST (ongoing)			X				X
WH#5	H	Treat Hazard Fuels in the Wildland Urban Interface Including in The Dalles Municipal Watershed	Rural Fire Districts	Landowners, ODF, USFS, Oregon Fire Marshall's Office, Emergency Management	ST (ongoing)			X			X	X
WH#6	L	Map Fire Regimes and Condition Classes	GIS	Rural Fire Districts, BOC, ODF, USFS, Oregon Fire Marshall's Office	LT				X			
Volcano Hazard (VH)												
VH#1	L	Acquire Detailed Volcanic Hazard Maps	Emergency Management	GIS, DOGAMI, OEM, USGS	ST (ongoing)				X			
VH#2	L	Improve Knowledge Base of Volcanic Risk and Vulnerability	Emergency Management	GIS, DOGAMI, OEM, USGS	LT (ongoing)				X			
VH#3	L	Evaluate Emergency Response Plan and Identify Areas of Public Notification and Evacuation Routes	Emergency Management	Emergency Response, Cities, ODF, BLM, Warm Springs	LT (ongoing)			X	X	X		X

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Section 4: Plan Implementation and Maintenance

This section of the NHMP addresses 44 CFR 201.6(c)(4) – Plan Maintenance. Specifically, the section details the formal process that will ensure that the Wasco 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. Finally, this section describes how the county and participating jurisdictions will integrate public participation throughout the plan maintenance and implementation process.

Implementing the Plan

After the Plan is locally reviewed and deemed complete, the Wasco County Planning Department submits it to the State Hazard Mitigation Officer at Oregon Emergency Management. Oregon Emergency Management submits the plan to the Federal Emergency Management Agency (FEMA--Region X) for review. This review addresses the federal criteria outlined in the FEMA Interim Final Rule 44 CFR Part 201. Upon pre-approval by FEMA, the county will adopt the plan via resolution. Once FEMA is provided with final resolution documentation, they will formally approve the Wasco County NHMP. At that point the county will maintain their eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds. Following county adoption, the participating jurisdictions will need to adopt their addendums and provide documentation to FEMA in order to obtain or maintain city eligibility.

Co-conveners

The Wasco County Planning Department and Wasco County Emergency Management shall serve as co-conveners of this plan. The agencies shall split responsibilities with (1) Emergency Management coordinating emergency service related aspects of the plan and its projects; and (2) Planning Department coordinating documentation, GIS and land use related aspects.

EMERGENCY SERVICES CONVENER: WASCO COUNTY EMERGENCY MANAGEMENT

The county's Emergency Management system strives to coordinate activities to mitigate, prepare for, respond to and recover from major emergencies or disasters. As the agency responsible for the implementation and maintenance of the mitigation plan, Wasco County Emergency Management shall:

- Serve as a communication conduit between the Steering Committee and key plan stakeholders;

- Identify emergency management-related funding sources for natural hazards mitigation projects;

Contact: Mike Davidson, Emergency Manager
Wasco County Emergency Management
511 Washington St., Suite 102
The Dalles, OR 97058
V: (541) 506-2790
E: miked@co.wasco.or.us

LAND USE CONVENER: WASCO COUNTY PLANNING DEPARTMENT

The agency administers and enforces land use planning regulations for the county. Wasco County Planning Department strives to protect life, property, the environment, and economic health of the county by (1) coordinating private development with the provision of public services and infrastructure and (2) determining how and where development occurs in a way that preserves and enhances the beauty, livability and economy of Wasco County for future generations. As the agency responsible for the implementation and maintenance of the mitigation plan, the Wasco County Planning Department shall:

- Coordinate Steering Committee meeting dates, times, locations, agendas, and member notification;
- Document outcomes of Committee meetings;
- Incorporate, maintain, and update the county's natural hazards risk GIS data elements; and
- Utilize the Risk Assessment as a tool for prioritizing proposed natural hazards risk reduction projects.

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E: johnr@co.wasco.or.us

Coordinating Body

The Steering Committee serves as the coordinating body for the mitigation plan. The roles and responsibilities of the coordinating body include:

- Serving as the local evaluation committee for funding programs such as the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds;
- Prioritizing and recommending funding for natural hazard risk reduction projects;
- Documenting successes and lessons learned;
- Evaluating and updating the Natural Hazards Mitigation Plan following a disaster;
- Evaluating and updating the Natural Hazards Mitigation Plan in accordance with the prescribed maintenance schedule; and
- Developing and coordinating ad hoc and/or standing subcommittees as needed.

Members

The following organizations were represented and served on the Steering Committee during the development of the Wasco County multi-jurisdictional Natural Hazards Mitigation Plan:

Table 4.1: Wasco County NHMP Update Steering Committee

Name	Title	Organization
John Roberts	Planning Director	Wasco County Planning Department
Mike Davidson	Emergency Manager	Wasco County Emergency Management
Marty Matherly	Director	Wasco County Public Works
Tycho Granville	GIS Coordinator	Wasco County GIS
Ryan Bessette	Conservation Planner	Wasco County Soil and Water Conservation District
Rod Runyon	County Commissioner Chairman	Wasco County Board of Commissioners
Dennis Whitehouse	Facilities Director	Northern Wasco County School District 21
Dan Spatz	Chief Institutional Advancement Officer	Columbia Gorge Community College
Dick Gassman	Senior Planner	City of the Dalles Community Development
Bill Fashing	Community Development Director	Mid-Columbia Council of Governments

Source: Wasco County

To make the coordination and review of Wasco County's multi-jurisdictional Natural Hazards Mitigation Plan as broad and useful as possible, the coordinating body will engage additional stakeholders and other relevant hazard mitigation organizations and agencies to implement the identified action items. Specific organizations have been identified as either internal or external partners on the individual action item forms found in Appendix A.

Implementation through Existing Programs

The Natural Hazards 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. Wasco County currently addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvement plans, mandated standards and building codes. To the extent possible, Wasco County 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, Wasco County should implement the Natural Hazards Mitigation Plan's recommended

actions through existing plans and policies. Plans and policies already in existence often 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. Implementing the Natural Hazards Mitigation Plan's action items through such plans and policies increases their likelihood of being supported and implemented.

Examples of plans, programs or agencies that may be used to implement mitigation activities include:

- Community Wildfire Protection Plan
- Wasco County Budget
- Wasco County Economic Development Action Plan
- Wasco County Comprehensive Land Use Plan
- Soil and Water Conservation District
- Mid-Columbia Council of Governments

For additional examples of plans, programs or agencies that may be used to implement mitigation activities refer to Tables 3.1 and 3.2 in Section 3: Mitigation Strategy.

Plan Maintenance

Plan maintenance is a critical component of the natural hazard mitigation plan. Proper maintenance of the plan ensures that this plan will maximize the county's and city/special district's efforts to reduce the risks posed by natural hazards. This section was developed by the University of Oregon's Partnership for Disaster Resilience and includes a process to ensure that a regular review and update of the plan occurs. The Steering Committee and local staff are responsible for implementing this process, in addition to maintaining and updating the plan through a series of meetings outlined in the maintenance schedule below.

Semi-Annual Meetings

The Committee will meet on a semi-annual basis to complete the following tasks. During the first meeting the Committee will:

- Review existing action items to determine appropriateness for funding;
- Educate and train new members on the plan and mitigation in general;
- Identify issues that may not have been identified when the plan was developed; and
- Prioritize potential mitigation projects using the methodology described below.

During the second meeting of the year the Committee will:

- Review existing and new risk assessment data;
- Discuss methods for continued public involvement; and
- Document successes and lessons learned during the year.

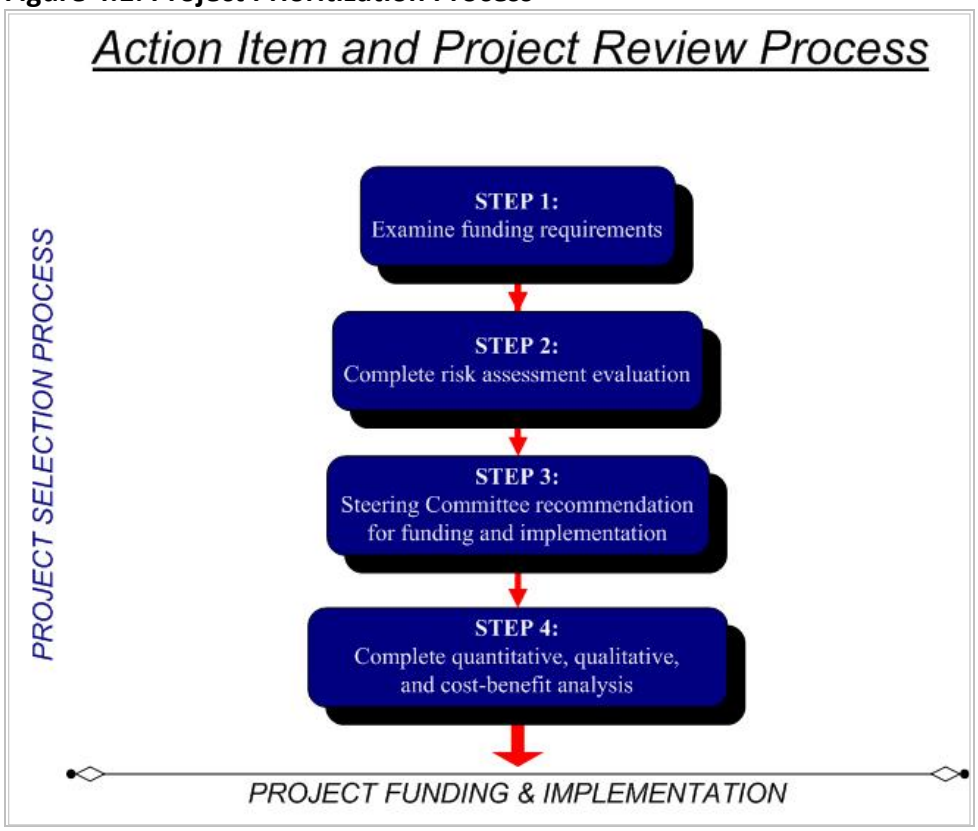
The convener will be responsible for documenting the outcome of the semi-annual meetings in Appendix B. The process the coordinating body will use to prioritize mitigation projects is detailed in the section below. The plan's format allows the county and participating jurisdictions to review and update sections when new data becomes available. New data

can be easily incorporated, resulting in a natural hazards mitigation plan that remains current and relevant to the participating jurisdictions.

Project Prioritization Process

The Disaster Mitigation Act of 2000 requires that jurisdictions identify a process for prioritizing potential actions. Potential mitigation activities 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. Figure 4.1 illustrates the project development and prioritization process.

Figure 4.1: Project Prioritization Process



Source: Community Service Center's Partnership for Disaster Resilience at the University of Oregon, 2008.

Step 1: Examine funding requirements

The first step in prioritizing the plan's action items is to determine which funding sources are open for application. Several funding sources may be appropriate for the county's proposed mitigation projects. Examples of mitigation funding sources include but are not limited to: FEMA's Pre-Disaster Mitigation competitive grant program (PDM), Flood Mitigation Assistance (FMA) program, Hazard Mitigation Grant Program (HMGP), National Fire Plan (NFP), Community Development Block Grants (CDBG), local general funds, and private foundations, among others. Please see Appendix F: Grant Programs for a more comprehensive list of potential grant programs.

Because grant programs open and close on differing schedules, the coordinating body will examine upcoming funding streams' requirements to determine which mitigation activities

would be eligible. The coordinating body may consult with the funding entity, Oregon Emergency Management, or other appropriate state or regional organizations about project eligibility requirements. This examination of funding sources and requirements will happen during the coordinating body's semi-annual plan maintenance meetings.

STEP 2: COMPLETE RISK ASSESSMENT EVALUATION

The second step in prioritizing the plan's action items is to examine which hazards the selected actions are associated with and where these hazards rank in terms of community risk. The coordinating body will determine whether or not the plan's risk assessment supports the implementation of eligible mitigation activities. This determination will be based on the location of the potential activities, their proximity to known hazard areas, and whether community assets are at risk. The coordinating body will additionally consider whether the selected actions mitigate hazards that are likely to occur in the future, or are likely to result in severe / catastrophic damages.

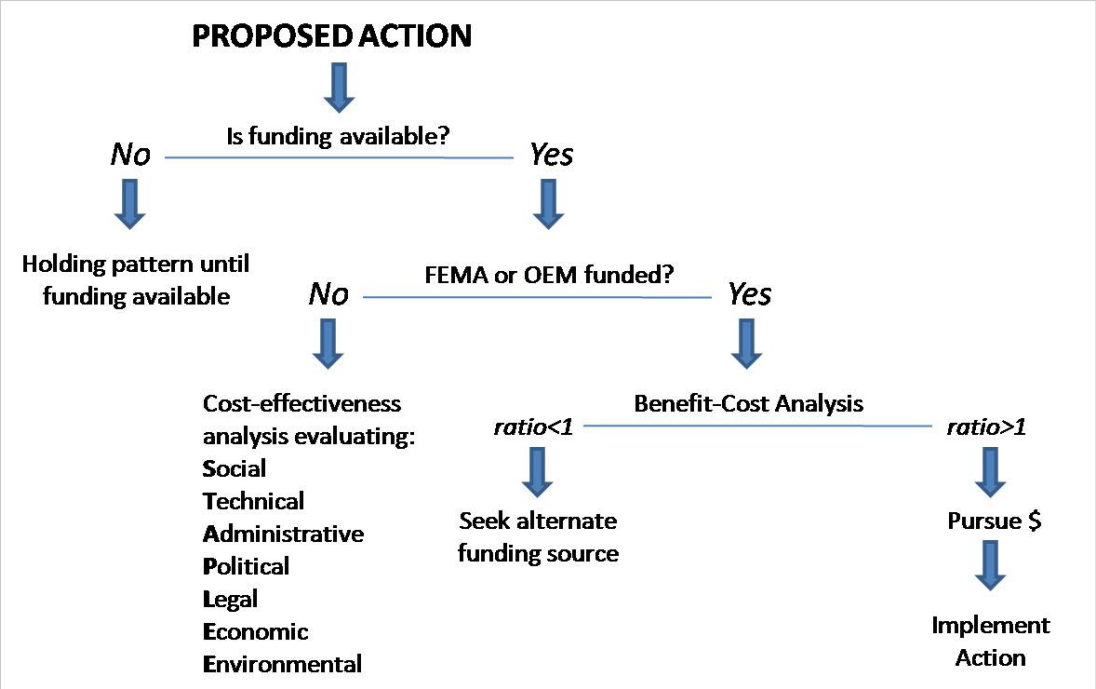
STEP 3: COMMITTEE RECOMMENDATION

Based on the steps above, the coordinating body will recommend which mitigation activities should be moved forward. If the coordinating body decides to move forward with an action, the coordinating organization designated on the action item form will be responsible for taking further action and, if applicable, documenting success upon project completion. The coordinating body 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.

STEP 4: COMPLETE QUANTITATIVE AND QUALITATIVE ASSESSMENT, AND ECONOMIC ANALYSIS

The fourth step is to identify the costs and benefits associated with the selected 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 assists 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 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. Figure 4.2 shows decision criteria for selecting the appropriate method of analysis.

Figure 4.2: Benefit Cost Decision Criteria



Source: Community Service Center's Partnership for Disaster Resilience at the University of Oregon, 2010.

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 will 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 Partnership for Disaster Resilience at the University of Oregon's Community Service Center. See Appendix D for a description of the STAPLE/E evaluation methodology.

Continued Public Involvement & Participation

The participating jurisdictions are dedicated to involving the public directly in the continual reshaping and updating of the Wasco County multi-jurisdictional Natural Hazards Mitigation Plan. Although members of the Steering Committee represent the public to some extent, the public will also have the opportunity to continue to provide feedback about the Plan.

To ensure continued public engagement and support of this plan, Wasco County shall invite the public to participate in future plan developments in the following ways:

- Post plan on the Wasco County Planning Department Website for comment (http://co.wasco.or.us/planning/default.html)

- Post notices that invite public to participate in one of the semi-annual Steering Committee meetings
- Hold community hazard workshops
- Implement various other outreach activities documented in this plan (See *Section 3: Mitigation Strategy*)

In addition to the involvement activities listed above, the county's multi-jurisdictional Natural Hazards Mitigation Plan has been 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. The Wasco County Natural Hazards Mitigation Plan is due to be updated on August 2017. The convener will be responsible for organizing the coordinating body to address plan update needs. The coordinating body will be responsible for updating any deficiencies found in the plan, and for ultimately meeting the Disaster Mitigation Act of 2000's plan update requirements.

The following 'toolkit' can assist the convener in determining which plan update activities can be discussed during regularly-scheduled plan maintenance meetings, and which activities require additional meeting time and/or the formation of sub-committees.

Table 4.1: Natural Hazards Mitigation Plan Update Toolkit

Question	Yes	No	Plan Update Action
Is the planning process description still relevant?			Modify this section to include a description of the plan update process. Document how the planning team reviewed and analyzed each section of the plan, and whether each section was revised as part of the update process. (This toolkit will help you do that).
Do you have a public involvement strategy for the plan update process?			Decide how the public will be involved in the plan update process. Allow the public an opportunity to comment on the plan process and prior to plan approval.
Have public involvement activities taken place since the plan was adopted?			Document activities in the "planning process" section of the plan update
Are there new hazards that should be addressed?			Add new hazards to the risk assessment section
Have there been hazard events in the community since the plan was adopted?			Document hazard history in the risk assessment section
Have new studies or previous events identified changes in any hazard's location or extent?			Document changes in location and extent in the risk assessment section
Has vulnerability to any hazard changed?			Document changes in vulnerability in the risk assessment section
Have development patterns changed? Is there more development in hazard prone areas?			Document changes in vulnerability in the risk assessment section
Do future annexations include hazard prone areas?			Document changes in vulnerability in the risk assessment section
Are there new high risk populations?			Document changes in vulnerability in the risk assessment section
Are there completed mitigation actions that have decreased overall vulnerability?			Document changes in vulnerability in the risk assessment section
Did the plan document and/or address National Flood Insurance Program repetitive flood loss properties?			Document any changes to flood loss property status
Did the plan identify the number and type of existing and future buildings, infrastructure, and critical facilities in hazards areas?			1) Update existing data in risk assessment section, or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Did the plan identify data limitations?			If yes, the plan update must address them: either state how deficiencies were overcome or why they couldn't be addressed
Did the plan identify potential dollar losses for vulnerable structures?			1) Update existing data in risk assessment section, or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Are the plan goals still relevant?			Document any updates in the plan goal section
What is the status of each mitigation action?			Document whether each action is completed or pending. For those that remain pending explain why. For completed actions, provide a 'success' story.
Are there new actions that should be added?			Add new actions to the plan. Make sure that the mitigation plan includes actions that reduce the effects of hazards on both new and existing buildings.
Is there an action dealing with continued compliance with the National Flood Insurance Program?			If not, add this action to meet minimum NFIP planning requirements
Are changes to the action item prioritization, implementation, and/or administration processes needed?			Document these changes in the plan implementation and maintenance section
Do you need to make any changes to the plan maintenance schedule?			Document these changes in the plan implementation and maintenance section
Is mitigation being implemented through existing planning mechanisms (such as comprehensive plans, or capital improvement plans)?			If the community has not made progress on process of implementing mitigation into existing mechanisms, further refine the process and document in the plan.

Source: Oregon Partnership for Disaster Resilience (2010).

Volume II:
Hazard Annexes[1]

[1] Pages 14-41 of the 2012 Wasco County Threat and Hazard Identification and Risk Assessment (THIRA)

DROUGHT

Hazard Definition

Drought is a condition of climatic dryness severe enough to reduce soil moisture and water below the minimum necessary for sustaining plant, animal, and human life systems.

Drought is typically measured in terms of water availability in a defined geographical area. It is common to express drought with a numerical index that ranks severity. Most federal agencies use the Palmer Method that incorporates precipitation, runoff, evaporation and soil moisture. However, the Palmer Method does not incorporate snowpack as a variable. Therefore it is not believed to provide a very accurate indication of drought conditions in Oregon and the Pacific Northwest. For more information on the Palmer Index see Appendix D.

The Oregon Drought Severity Index is the most commonly used drought measurement in the state. It is considered to be a better indicator of drought severity because it incorporates both local conditions and mountain snowpack. The Oregon Drought Severity Index categorizes droughts as mild, moderate, severe, and extreme. The index is available from the Oregon Drought Council.

Early Oregon records, dating back to the late 1800s, clearly associate drought with a departure from expected rainfall. Concern for mountain snowpack, which feeds the streams and rivers, came later. Droughts were particularly noteworthy in the 1890s and during the following years:

History

Occurrences (Oregon State)

1904-05:	Drought period of about 18 months
1917-31:	Very dry period punctuated by brief wet spells (1920, 1927)
1939-41:	Three-year intense drought
1965-68:	Three-year drought following the big regional floods of 1964-65
1976-77:	Brief very intense statewide drought
1985-94:	Generally dry period, capped by statewide droughts in 1992 and 1994

Hazard Identification

Nearly all areas of the county may be vulnerable to drought.

Vulnerability Analysis 192

In every drought, agriculture has felt the impact, especially in non-irrigated areas such as farms. Droughts have left their major impact on individuals (farm owners), on the agricultural industry, and to a lesser extent, on other agriculture-related sectors.

There is increased danger of forest fires. Millions of board feet of timber have been lost. In many cases, erosion has occurred which caused serious damage to aquatic life, irrigation, and power development by heavy silting of streams, reservoirs, and rivers.

Low stream flows have created high temperatures, oxygen depletion, disease, and lack of spawning areas for our fish resources.

All of the above effects result in economic and revenue losses for business, cities and the county.

History suggests a **high probability of occurrence.** The entire population of the county is vulnerable to the effects of drought. Transportation and communications infrastructure would be minimally impacted, if at all. As growth places more pressure on limited local resources, future impacts may be greater, suggesting **high vulnerability**. A **high risk rating** is assigned.

Conclusions

As a result of droughts, new techniques have occurred in agriculture. Federal and state governments have also assumed an active role in developing new water projects and soil conservation programs. OARS 536.700 pertains to drought relief and emergency water shortage powers.

Better forest fire protection techniques have been developed and total acreage burned has continually decreased.

Progress is being made in dealing with the impact of droughts through proper management of Oregon's water resources. Hopefully, information being collected and shared will assist in the formulation of effective programs for future water-short years.

EARTHQUAKE

Hazard Definition

An earthquake is the shaking of the ground caused by an abrupt shift of rock along a fracture in the earth, called a fault. There are three categories of quakes and each type may affect Wasco County. The first is a shallow or crustal quake. These occur at a depth of 5 to 10 miles beneath the earth's surface. These quakes are associated with fault movement within a surface plate. The second type of earthquake is an intraplate, or "deep" earthquake. Intraplate quakes occur when an earthquake on a geologic plate affects another plate. In Pacific Northwest geology, intraplate quakes happen when the Juan de Fuca plate breaks up underneath the continental plate, approximately 30 miles beneath the earth's surface. The third type of quake is a subduction zone earthquake. These occur when two converging plates become stuck along their interface. Continued movements between the plates will build up energy across the locked surface until the plates abruptly slip along the interface when the strain is released.

Magnitude is the measure of the strength of an earthquake, or the strain energy released by it, as determined by seismographic observations (size or length of a seismic signal). There are several types of magnitude scales of which the Richter Scale is the best known. Magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude of 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude. As an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value. See Appendix D for more information on earthquake measuring scales.

History

Each year, since 1980, the Pacific Northwest Seismograph Network has recorded an average of more than two thousand earthquakes in Washington and Oregon. The vast majority are shallow earthquakes and 99% had a magnitude less than 3.0.

The shallow 1872 earthquake in Washington's North Cascades was the largest in the history of Washington and Oregon. It had an estimated magnitude of 7.4 and was followed by many aftershocks.

Because we do not have a complete history of Oregon earthquakes, we cannot fully assess the future risk. In western Oregon, the high rainfall promotes high erosion rates and dense ground cover, both of which tend to hide faults.

- Approximate years: 1400BCE, 1050BCE, 600BCE, 400, 750, 900, Offshore, Cascadia subduction zone, probably 8-9, Researchers Brian Atwater and Eileen Hemphill-Haley have dated earthquakes and tsunamis at Willapa Bay, Washington; these are the midpoints of the age ranges for these six events.

- January 26, 1700, Offshore, Cascadia subduction zone, Approximately 9, generated a tsunami that struck Oregon, Washington and Japan; destroyed Native American villages along the coast.

- November 23, 1873, Oregon/California border, near Brookings, 6.8, Felt as far away as Portland and San Francisco; may have been an intraplate event because of lack of aftershocks.

- July 15, 1936, Milton-Freewater, 6.4, two foreshocks and many aftershocks felt; $100,000 damage (in 1936 dollars).

- April 13, 1949, Olympia, Washington, 7.1, Eight deaths and $25 million damage (in 1949 dollars); cracked plaster, other minor damage in northwest Oregon.

- November 5, 1962, Portland/Vancouver, 5.5, Shaking lasted up to 30 seconds; chimneys cracked, windows broke, furniture moved.

- 1968 Adel Swarm, largest 5.1 Swarm, lasted May through July, decreasing in intensity; increased flow at a hot spring was reported.

- April 12, 1976, Near Maupin, 4.8, Sounds described as distant thunder, sonic booms, and strong wind.

- April 25, 1992, Cape Mendocino, California,7.0, Subduction earthquake at the triple junction of the Cascadia subduction zone and the San Andreas and Mendocino faults.

- March 25, 1993, Scotts Mills, 5.6, On Mount Angel-Gales Creek fault; $30 million damage, including Molalla High School and Mount Angel church.

- September 20, 1993, Klamath Falls, 5.9 and 6.0, Two deaths, $10 million damage, including county courthouse; rockfalls induced by ground motion.

A northwest subduction zone earthquake has not occurred locally since the 1700's. However, similar subduction zones worldwide have produced earthquakes of magnitude 8 or larger. An example is the 9.2 Alaska earthquake of 1964. Geologic evidence indicates that the Cascadia Subduction Zone has generated great earthquakes at roughly 500 year intervals, most recently about 300 years ago. Researchers estimate there is a 10% chance of a local subduction zone earthquake within the next 200 years.

Hazard Identification

The Pacific Northwest is a very seismically active area. Potential earthquake sources in Wasco County are not well known because there have not been frequent large earthquakes here as there have been in California. Estimations of possible earthquake sources are limited to studies of many small earthquakes, investigations of known faults, and other geological surveys.

Earthquakes in Wasco County are most likely to originate from two sources: 1) the Cascadia Subduction Zone and 2) faults located near the eastern end of the Columbia River Gorge.

Cascadia Subduction Zone - The Cascadia Subduction Zone lies about 50 miles offshore, extending from near Vancouver Island to northern California. The zone is

where the oceanic Juan de Fuca plate dives beneath the continental North American plate. These plates are converging at a rate of 1 – 1.5 inches per year.

Vulnerability Analysis 111

The entire county population, property, commerce, infrastructure and services may be vulnerable to an earthquake. The scope of damage is a function of earthquake magnitude and level of preparedness. Damage could range from minimal to moderate loss of life and destruction of property.

Most injury, death, and property damage in an earthquake result from seismic impacts on structural and non-structural materials. The vulnerability of certain areas partially depends on the types of structures in that area. A wood frame residential structure that is adequately secured to the foundation is relatively safe. Un-reinforced masonry buildings are at greatest risk from seismic impacts. Most injuries in earthquakes result from non-structural materials such as light fixtures, equipment, and furniture, falling on people and causing injury.

There is really no past "recent" history of earthquakes in Wasco County. County residents have felt some earthquakes distant from Wasco County. Even with this lack of history, geology clearly shows that the county has been impacted by significant events in the last 500 years. It is this 500 year history that Oregon Department of Geology and Mineral Industries based the 1999 damage estimates on.

Cascadia Subduction Zone Model

Expected losses from the magnitude 8.5 Cascadia earthquake include:

- No casualties or deaths
- No buildings extensively damaged
- Over $950,000 of economic damage

500 Year Return Interval model

Every part of Oregon has earthquakes. The 500 year model is an attempt to quantify the risk across the state. This estimate does not look at a single earthquake. Instead, this study includes many faults, each with a 10 percent chance of producing an earthquake in the next 50 years. It assumes each fault will produce a single "average" earthquake during this time. More and higher magnitude earthquakes than used in this study may occur.

This model under-represents losses, because a single fault might produce the "average" event, and also larger or smaller events, but only the average magnitude event is counted. So, if all expected earthquakes were included, the cumulative losses over the next 500 years would be higher than the estimated losses reported in this study.

Expected losses in Wasco County from the 500 year model include:

- 5 casualties, no deaths
- Over 3% buildings extensively damaged
- Over $31 million of economic damage

Wasco County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	6
Deaths	0	0
Displaced households	0	23
Short term shelter needs	0	17
Economic losses for buildings	$795,000	$25 million
Operating the day after the quake:		
Fire stations	99%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	99%	NA
Economic losses to:		
Highways	$71,000	$3 million
Airports	0	$2 million
Communication systems:		
Economic losses	$6,000	$1 million
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	1	16

These figures have a high degree of uncertainty and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	98	1	1	0	0
Commercial	98	1	1	0	0
Education	Unknown				
Government	98	1	0	0	0
Industrial	98	2	0	0	0
Residential	99	1	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	74	13	10	3	0
Commercial	68	16	12	3	0
Education	56	10	7	2	0
Government	66	16	14	4	1
Industrial	65	16	15	5	0
Residential	80	12	6	1	0

Another factor in earthquake vulnerability is soil type. Water-saturated loose sand and silt loses its ability to support structures in an earthquake. Areas in Wasco County that are near the flood plains near the Columbia River or areas with silt deposits are at the greatest risk during an earthquake.

Within the limits of predictability, we must assume a **moderate probability of occurrence** for a damaging earthquake during the next 50 years. A large earthquake centered in Western Oregon could have a minor impact on Wasco County suggesting **moderate vulnerability**. Accordingly, a **moderate-risk rating** is assigned.

Conclusions

It is difficult to identify a part of the community that is not vulnerable to an earthquake. People, buildings, emergency services, hospitals, transportation lifelines, and water and wastewater utilities are susceptible to the effects of an earthquake. In addition, electric and natural gas utilities and dams have a potential to be damaged.

Earthquakes are unique in impact to structures. Injuries result from structural materials falling on people and creating hazards.

Effects of a major earthquake in the Pacific Northwest could be catastrophic, providing the worst case disaster short of war. Thousands of persons could be killed and many tens of thousands injured or left homeless. A major earthquake may create additional hazards such as pipeline line leaks and ruptures, hazardous materials releases, train derailments, and fires.

Mitigation activities such as the following should be instituted and maintained to lessen the potential problems.

a. Examination, evaluation, and enforcement of effective building and zoning codes.

b. Geologically hazardous areas, as defined by the Growth Management Act, should be identified and land use policies adopted to lessen risk.

c. Public information on what to do before, during, and after an earthquake should be provided to citizens.

d. Local and state governments should develop and maintain response procedures and keep mitigation programs ongoing.

FLOODS

Hazard Definition

The main cause of Northwest floods is the moist air masses that regularly move over the region in the winter. In Wasco County, the weather that produces the most serious flooding events are extensive wet conditions that follow a period of mid and high elevation ice and snow pack development.

Riverine and flash floods may both occur in Wasco County. Riverine floods happen when the amount of water flowing through a river channel exceeds the capacity of that channel. Riverine floods are the most common type of flooding. Flash flooding occurs during sudden rainstorms when a large amount or rain falls in a very short period of time. These happen in steeply sloping valleys and in small waterways.

A secondary category of flood is the storm water or urban flood. Storm water flooding occurs when runoff from rainfall concentrates in developed areas, drainage, and low-lying areas. Poor drainage, elevated groundwater levels, and ponding are all symptoms of storm water flooding that can cause property damage.

Storm water flooding should be a concern in Wasco County because of rapid development. In the February 1996 flooding there were a surprising number of properties that were impacted that were not near a tributary. Instead these properties were in poorly drained areas where ponding and runoff patterns caused basements to flood and other types of water damage. Not all of this is due to development. Natural soil conditions and geological features often determine drainage patterns.

History

January 1923 – Record flood levels on the Deschutes River.

May 1928 – Columbia River flooding occurred.

March 1932 - Flooding occurred on the John Day and Grande Ronde Rivers

May 30, 1948 – Columbia River crested at 34.4 ft. Flood stage at that time was 15 ft. This is the flood that destroyed the City of Vanport. Fifteen people died in the flood.

March 1952 - Flooding occurred on the John Day and Grande Ronde Rivers, highest flood stages on these rivers in over 40 years

July 1956 – Flash flooding occurred in Central Oregon

December 1964 – Region wide flooding occurred

July 1995 – Fifteen Mile Creek Flash Food, This flood was caused by a summer thunderstorm

January - February 1996 - This widespread flood in the Pacific Northwest was the result of heavy rain and warming on heavy mid elevation snowpack, and was similar to regional flooding in December 1964. The Columbia River crested at 27.1 ft. on February

9. This flood occurred because of the confluence of several factors. The winter of 1995/96 was extremely rainy. Prior to the flooding period, the region experienced a cold snap with low elevation freezing, ice, and snow. As a result, Mill Creek flooded downtown The Dalles where heavy damage was caused. The last 850 ft. of Mill Creek before it enters the Columbia River was in a tunnel. Heavy debris flows and log jams at the tunnel inlet coupled with reduced discharge head caused by Columbia River levels backed water up and into the downtown business area. Losses were in millions of dollars.

December 1996 – **February 1997** – Region wide flooding occurred.

Hazard Identification

Many rivers in Wasco County historically flood every few years. These include the White River, the Deschutes River and the Columbia River. Flooding on these rivers usually occurs between October and February. Long periods of heavy rainfall and mild temperatures coupled with snowmelt contribute to flooding conditions.

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Wasco County participates in the National Flood Insurance Program and has developed local ordinances to better regulate and direct development in flood plain areas. These local ordinances regulate planning, construction, operation, and maintenance of any structures, and improvements, private or public. They work to insure that these developments are properly planned, constructed, operated, and maintained to avoid adversely influencing the regimen of a stream or body of water or the security of life, health, and property against damage by flood water. Additionally, recent steps have been taken to mitigate the effects of flooding.

Two examples of these mitigation strategies are:

- The Fifteen Mile Creek Hazard Mitigation Project

  A hazard mitigation plan was developed by a local, interagency planning team and approved by Wasco County Court, Oregon Emergency Management, and FEMA. Hazard Mitigation Grant Program (HMGP) funding was approved in fall 1996 for $202,000 and work initiated in spring 1997. Work included best management practices on private lands designed to reduce runoff and erosion in areas where frequent events damage infrastructure such as roads and bridges. Work also included upgrading culverts, and other roadway systems. The purpose of the program was to reduce damage to infrastructure from future, similar events. This project was completed in the fall of 1999.

- Mill Creek Hazard Mitigation Project

  An interagency planning team identified the most feasible solution to be creation of a floodway or surface overflow outlet to carry out-of-bank flows safely to the Columbia River. Extremes from minimal land shaping to 16 x 16 ft. concrete channel were considered with considerable variation in initial cost estimates. At the last team meeting in 1997, the UPRR representative was going to investigate potential funding for a Corps of Engineers definitive study. Minimal state support has been received for this effort.

Current Status: Corps engineering / analysis scheduled; City of The Dalles assumed sponsorship for this urban public works project. The City's urban renewal efforts in 2001

included pedestrian passage under the freeway that might double as a water outlet during flood events at the mouth of Mill Creek.

Residents who live in flood plains face far greater risks than needed. These homeowners probably face greater financial liability than they realize. During a 30-year mortgage period, a home in a mapped flood plain has about a 26 percent chance of being damaged by a 100 year-flood event. The same structure has only about a one percent of being damaged by fire. Many homeowners who live in flood plains carry fire insurance, but do not carry flood insurance.

With uninsured homes located in flood plains, Wasco County homeowners are vulnerable to flood damage. Adding to this vulnerability, are increases in the percentage of households and population living in flood plains as new growth creates increasing pressure to develop more marginal land. Furthermore, as the density of development increases and permeable natural surfaces are replaced with homes and roads, the volume of storm water runoff and the area over which it floods will increase. As a result, unknown numbers of homes that were once outside mapped flood plains will face an increased threat of flooding, a threat they were never built to withstand. In fact, 35-40 percent of the National Flood Insurance claims are currently coming from outside the mapped flood plains.

Historically, flooding occurs along one or more of the County's waterways every few years, suggesting a **moderate probability of occurrence.** Because of the relative land area and population affected, the County is exposed to **moderate vulnerability**. The frequency of flooding, the potential for simultaneous flooding events, plus the historical record of recurrent flooding and cumulative costs, all suggest the assignment of a **moderate risk rating.**

Conclusions

Floods can cause loss of life and great damage to structures, crops, land resources, flood control structures, roads, and utilities of all kinds. Building in established floodplain areas must be regulated. Human-made developments within flood plains should be limited to non-structures such as parks, golf courses, farmlands, etc. These facilities have the least potential for damage, but maximize land use.

The general public should be made aware of hazardous areas and be given flood insurance and emergency preparedness information.

The National Weather Service has an extensive river and weather monitoring system and usually provides adequate and timely warning. The National Weather Service provides weather information to local jurisdictions and the public in a variety of ways, radio, teletype, and telephone.

WILDLAND FIRE

Hazard Definition

Any instance of uncontrolled burning within a forested area is a wildland fire, where as uncontrolled burning in grassland, brush, or woodlands is classified as a wildfire.

History

Large fires reported in Wasco County since the turn of the century include the following:

Year	Name	Area	Acres
1902		Columbia Gorge	170,000
1977		Wasco County	Unknown
1979	Pine Grove	Wasco County	Unknown
1985	Maupin	Wasco County	Unknown
1988	Warm Springs	Wasco County	Unknown
1994	Warm Springs	Wasco County	Unknown
1998	Rowena	Wasco County	2,208
2002	Sheldon Ridge	Wasco County	12,261
2002 –	White River	Wasco County	Unknown

Hazard Identification

Wasco County's fire season usually runs from mid-May through October. However, any prolonged period of lack of precipitation presents a potentially dangerous problem. The probability of a wildland fire in any one locality on a particular day depends on fuel conditions, topography, the time of year, the past and present weather conditions, and the activities (debris burning, land clearing, camping, etc.) which are or will be taking place.

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The effects of wildland fires vary with intensity, area, and time of year. Factors affecting the degree of risk of fires include extent of rainfall, humidity, wind speed, type of vegetation, and proximity to fire fighting agencies. The greatest short-term loss is the complete destruction of valuable resources, such as timber, wildlife habitat, scenic vistas, and watersheds. There is an immediate increase in vulnerability to flooding due to the destruction of all or part of the watershed. Long-term effects are reduced amounts of timber for commercial purposes and the reduction of travel and recreational activities in the affected area.

Home building in and near forests increases risks from forest fires. These areas of new homes are referred to as interface areas. Often, structures have been built and maintained with minimal awareness of the need for protection from exterior fire sources, or the need to minimize interior fires from spreading to forested lands.

Historically, it appears that the instance of wildfire is increasing through the region. Additionally, the existence of open range lands and large forested areas, increasing population and recreational activities, and the uncertain impact of a changing climate combine to suggest a **high probability of occurrence**. The destruction of large tracts of forest land would have immediate economic impact to the community through lost jobs, reduced taxes, and increased public support while collateral economic and social effect could impact the County for years, suggesting **moderate vulnerability**. Accordingly, a **high risk rating** is assigned.

Conclusions

The following steps should be accomplished to preclude major loss of life and reduce the actual number of fires in hazard areas:

1. Since people start the vast majority of wildland fires, fire prevention education and enforcement programs can significantly reduce the total number of wildland fires.

2. An effective early fire detection program and emergency communications systems are essential. The importance of immediately reporting any forest fire must be impressed upon local residents and persons utilizing the forest areas.

3. An effective warning system is essential to notify local inhabitants and persons in the area of the fire. An evacuation plan detailing primary and alternate escape routes is also important.

4. Fire-safe development planning and appropriate wildfire mitigation strategy should be done by local jurisdictions, such as the implementation of safety recommendations to include.

    a. Sufficient fuel-free areas around structures.
    b. Fire resistant roofing materials.
    c. Adequate two-way (ingress and egress) routes and turnarounds for emergency response units.
    d. Adequate water supplies with backup power generation equipment or other means to cost-effectively support fire fighting efforts.
    e. Development of local ordinances to control human caused fires; i.e. from debris burning, fireworks, campfires, etc.

5. Road criteria should ensure adequate escape routes for new sections of developments in forest areas.

6. Road closures should be increased during peak fire periods to reduce the access to fire-prone areas.

7. Steps the public can take to better protect lives, property, and the environment from wildfires include:

    a. Maintaining appropriate defensible space around homes.
    b. Providing adequate access routes (two-way with turnaround) to homes for emergency equipment.
    c. Minimizing “fuel hazards” adjacent to homes.

d. Using fire-resistant roofing materials
e. Maintaining adequate water supplies.
f. Ensuring home address is visible to first responders.

8. Some wildland fires are allowed to burn in limited areas as part of forest management.

LANDSLIDES

Hazard Definition

Landslides are the sliding movement of masses of loosened rock and soil down a hillside or slope. The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. It is most common for landslides to occur on water saturated slopes when the base of the slope can no longer support the weight of the soil above it. Landslides are commonly associated with heavy rain and flooding conditions but they may also be associated with earthquakes (the 1994 Northridge Earthquake caused an estimated 11,000 landslides) and with volcanic activity.

Hazard History

Landslides typically occur in Wasco County during or after periods of heavy rain and flooding. The period from December1996 to February 1997 saw a few landslides in Wasco County

Hazard Identification

Slides in Wasco County generally range in size from thin masses of soil of a few yards wide to deep-seated bedrock slides. Travel rate may range in velocity from a few inches per month to many feet per second, depending largely on slope, material, and water content. The recognition of ancient dormant slide masses is important as they can be reactivated by earthquakes or unusually wet winters. Also, because they consist of broken materials and disrupted ground water, they are more susceptible to construction-triggered sliding than adjacent undisturbed material.

Wasco County has several areas where landslides have taken place and many areas that are susceptible to landslides. The slopes above the Columbia River are particularly susceptible.

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Typical effects include damage or destruction of portions of roads and railroads, sewer lines, pipelines, and water lines, electrical and communications distribution lines, and destroyed homes and public buildings. Disruption of shipping and travel routes result in losses to commerce. Many of the losses due to landslides may go unrecorded because no claims are made to insurance companies, lack of coverage by the press, or the fact that transportation network slides may be listed in records simply as “maintenance.”

Wasco County has a history of landslides suggesting a **moderate probability of occurrence**. Landslides tend to occur in isolated, sparsely developed areas threatening individual structures and remote sections of the transportation, energy and communications infrastructure suggesting **low vulnerability**. Because of the moderate probability of occurrence, a **moderate risk rating** is assigned.

Conclusion

The most significant effect of landslides is the disruption of transportation and the destruction of private and public property. Some work has been done to prevent developments on top of or below slopes subject to sliding without geotechnical

investigations and preventative improvements. Much more needs to be done to educate the public and to prevent development in vulnerable areas.

SEVERE LOCAL STORM

Hazard Definition

Wasco County is vulnerable to a variety of severe storm hazards. Tornadoes are described separately. Ice, snow, and windstorms all have the ability to severely impact the County. Severe local storms seldom cause death and serious property damage but they can cause major utility and transportation disruptions.

Ice Storm

Ice storms or freezing rain (black ice) conditions can occur in Wasco County. Ice storms occur when rain falls from warm moist upper layers of the atmosphere into a cold, dry layer near the ground. The rain freezes on contact with the cold ground and accumulates on exposed surfaces. This has the possibility to create real havoc when the ice accumulates on tree branches, and power lines. This can cause power outages and can obstruct transportation routes.

Snow Storm or Blizzard

It is possible for moderate snowfall to occur in Wasco County. Wasco County has had accumulations that vary depending on geographic location. For example, accumulations average between 4 – 5 inches in the City of the Dalles each year. However, during December of 1884, almost 30 inches of snow fell over a 3 day period and again in 1909 more than 14 inches fell over 5 days. Accumulations of snow usually increase with distance and elevation as the terrain rises to the South of the Columbia River. January is usually the month with the greatest snowfall. Moisture and cold air are required for snow to fall. While moisture is common in the winter months, the Cascades act as a barrier to moist air coming from the west. On occasion, cold air can slip in through low points in the Cascades bringing snow to the lower elevations; however, it melts quickly when the warm air moves in. It is common for cold air to come into the County from the central basins of Washington and Oregon.

Wind Storm

Every so often the Northwest is severely impacted by strong windstorms. In the past, peak wind gusts have gone above 100 miles per hour. The strongest winds that impact Wasco County comes from two sources. Frequent and widespread strong winds come from the west and are associated with strong storms moving onto the coast from the Pacific Ocean. Strong east winds may also originate from the Eastern Washington and Oregon, when high atmospheric pressure is over the upper Columbia River Basin and low pressure is over the Pacific Ocean. The Columbia River Gorge acts as a funnel, concentrating the intensity of the winds as they flow to the West. This generates strong winds throughout the Gorge. The Beaufort Wind Scale which can be found in Appendix D measures wind speed.

History

The record snowfall in the region occurred December 20-23, 1892. In Southwest Washington and Northwest Oregon, 15 to 30 inches of fell. Portland had 27.5 inches of snow. The Columbus Day Storm on October 12, 1962 was the worst windstorm to occur in the Northwest since records have been kept. Thirty-eight people died and monetary

losses were estimated somewhere between $175 and $200 million. The Portland Airport reported a peak gust of 88 miles per hour. At the Morrison Bridge in Downtown Portland there was a peak gust of 114 mph. The strongest windstorm since the Columbus Day Storm occurred November 13-15, 1981. This storm was nearly as strong as the Columbus Day Storm but it tracked farther west. This was actually two strong windstorms, the stronger first storm arriving November 13 and early November 14 and the second storm hit on November 15.

Hazard Identification

All of the hazards described above impact communities in similar ways. Even moderate storms can bring down power lines, and tree and tree limbs obstructing roadways and falling onto houses and other structures with enough force to cause damage. Downed powerlines create widespread electrical hazards. Severe windstorms will usually cause the greatest damage to ridgelines that face into the winds. There is an additional hazard in newly developed areas that have been thinned of trees to make way for new structures. Large unprotected trees in these areas are more like to fall. Severe storms causes massive power and telephone outages. Severe storms in Wasco County have left many without power. In certain areas it may take several days for utility providers to restore power. This can create life-threatening problems for people with life support equipment such as dialysis machines, respirators, and oxygen generators.

Severe local storms create hazardous driving conditions that can slow down and completely inhibit traffic. This can hinder police, fire, and medical responses to urgent calls. These types of storms also can wreak havoc on first response operations. Law enforcement resources are often tied up in responding to welfare inquiries and in traffic control, while fire departments are tied up with electrical hazards and debris removal. The long-term challenge for severe local storms is in debris removal. Hundreds of tons of debris can pile up in residential and commercial areas.

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The entire County is vulnerable to the effects of a storm. High winds can cause widespread damage to trees and power lines and interrupt transportation, communications, and power distribution. Prolonged heavy rains cause the ground to become saturated, rivers and streams to rise, and often results in local flooding and landslides.

Ice storms occur when rain falls out of a warm atmospheric layer into a cold one near the ground. The rain freezes on contact with cold objects including the ground, trees, structures, and powerlines, causing power lines to break.

Snowstorms primarily impact the transportation system and the availability or timing of public safety services. Heavy snow accumulations can also cause roofs to collapse. Snow accompanied by high winds is a blizzard, which can affect visibility, cause large drifts and strand residents for up to several days. Melting snow adds to river loading and can turn an otherwise benign situation into a local disaster.

Each of these when in combination with any other or if accompanied by freezing temperatures can exacerbate a storm's impact. Isolated residents without power are more likely to use wood fires to stay warm or to cook, possibly resulting in an increase in the number of structural fires. Residents without food or water may attempt to use impassable roads and thereby increase the number of rescues.

The effects can vary with the intensity of the storm, the level of preparation of local jurisdictions and residents, and the equipment and staff available to perform necessary tasks to lessen the effects of severe local storms.

Storm history suggests a **high probability of occurrence**. Historical damage and cumulative costs of destructive storms suggest **high vulnerability**. Accordingly, a **high risk rating** is assigned.

Conclusion

Severe local storms seldom cause death and injury and seldom result in severe property damage. However, severe storms have caused serious disasters in Wasco County and they will do so again. Perhaps the one thing that will do the most to prevent death and injury is to ensure that people stay off roads and remain in a safe place before the brunt of a storm passes. This is best done through effective employee and student dismissal plans and event cancellation. It is also important to promptly notify the public of severe weather watches and warnings.

In the responding to a severe local storm, often a sticking point is the prioritization of phone and power restoration services. Emergency managers and first responders need to work closely with utility providers and telephone companies to ensure that power and phone service is quickly restored to essential facilities.

Once the general public has weathered a severe storm and their power and phone service is restored their highest priority is to quickly and efficiently remove the debris on their property and on the roads they drive. Debris removal planning is essential so that systems are in place to efficiently manage and finance prompt debris removal.

TORNADOES

Hazard Definition

Tornadoes are the most violent weather phenomena known. They are characterized by funnel clouds of varying sizes that generate winds as fast as 500 miles per hour. They can affect an area of ¼ to ¾ of a mile and seldom more than 16 miles long. Tornadoes normally descend from the large cumulonimbus clouds that characterize severe thunderstorms. They form when a strong crosswind (sheer) intersects with strong warm updrafts in these clouds causing a slowly spinning vortex to form within a cloud. Eventually, this vortex may develop intensity and then descend to form a funnel cloud. When this funnel cloud touches the ground or gets close enough to the ground to affect the surface it becomes a tornado. Tornadoes can come from lines of cumulonimbus clouds or from a single storm cloud. Tornadoes are measured using the Fujita Scale ranging from F0 to F6. Details on the Fujita Scale can be found in Appendix D.

History

No recorded instance of a tornado causing damage in Wasco County is available.

Hazard Identification

Tornadoes are not normal occurrence in the Northwest the way they are in the Midwest. Tornadoes require a confluence of warm surface temperatures and warm fronts coming from the south with cold fronts coming from the north. Northwest climates do not normally generate the temperature variations conducive to tornado formation. Washington is ranked 43 in the US for total number of tornadoes. Nonetheless, the tornado threat should be taken very seriously. The conditions conducive to tornado formation rarely develop in Wasco County and it is uncommon for funnel clouds to be reported in this region.

With the exception of the April 1972 disaster occurring in Clark County, Washington tornadoes in Washington and Oregon tend to be light or moderate, with winds ranging from 40 to 112 mph. There are notable minorities of tornadoes that cause significant to severe damage with winds going as high as 200 mph. The peak season for tornadoes is April through July. However, tornadoes may occur in the late summer months and, in a few rare cases, may occur in the winter months. While tornadoes are sometimes formed in association with large Pacific storms, most of them are caused by intense local thunderstorms. Tornadoes almost exclusively occur in the late afternoon and early evening.

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It has not been demonstrated that there is a likelihood of tornadoes impacting Wasco County. Typically, Pacific Northwest tornadoes are moderate but it is possible for serious tornadoes to develop causing death and serious injury.

Typically, tornadoes may cause severe damage to everything in their path. Walls collapse, roofs are ripped off, trees and power lines are destroyed. The challenge is that tornadoes, especially in the northwest, are very difficult to predict and their onset is sudden. Unlike the tornado-prone areas in the plains states, there is little awareness of the tornado threat and the forecasting and warning systems are less well developed. It is extremely rare for a tornado watch or warning to be issued anywhere in the Northwest.

As such, there is little public awareness of the warning systems, and self-protection measures common to the tornado prone states.

History suggests a **low probability of occurrence** and **low vulnerability**. A **low risk rating** is assigned.

Conclusions

While violent tornadoes are not a characteristic of the Wasco County climate, the weather systems that may generate tornadoes appear regularly. Emergency response agencies and emergency management officials should be prepared for the rapid notification of the public and for the efficient management of a mass casualty incident, and the prioritization of debris clearance.

VOLCANOES

Hazard Definition

A volcano is a vent in the earth's crust through which molten rock, rock fragments, gases or ashes are ejected from the earth's interior. Volcanoes are a deadly hazard. From 1980 to 1995 volcanoes killed approximately 29,000 people, forced the evacuation of 830,000 people, and caused economic losses in excess of $3 billion (Simkin and Siebert, 1994)

There are a wide variety of hazards related to volcanoes and volcano eruption. With volcano eruptions, the hazards are distinguished by the different ways in which volcanic materials and other debris flow from the volcano. Following is a list of the different types of hazards that exist in cascade volcanoes.

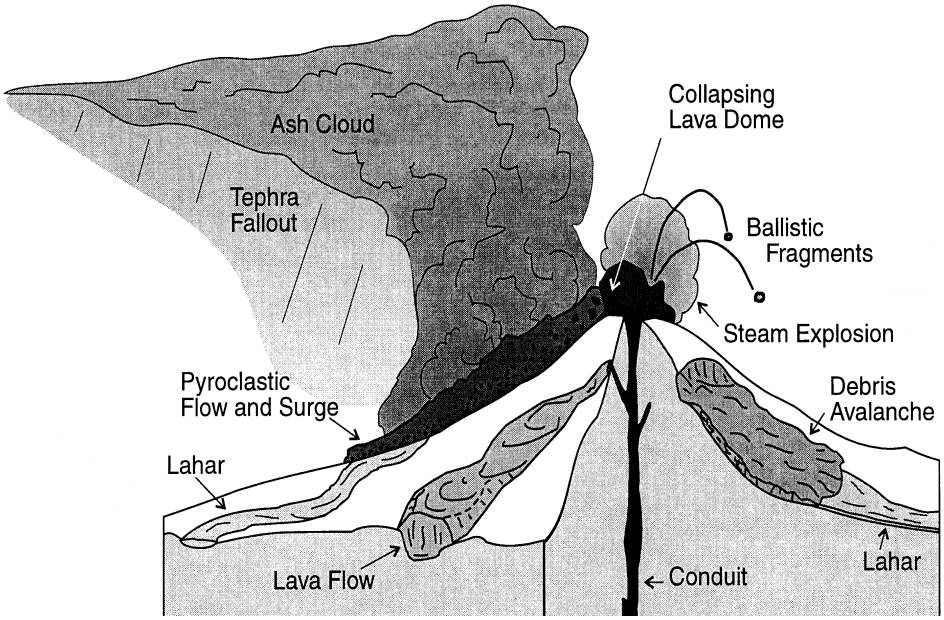

Figure A - Types of volcanic hazards[i]

Pyroclastic Flows and Surges

Pyroclastic flows are avalanches of hot (300-800°C), dry, volcanic rock fragments and gases that descend a volcano's flanks at speeds ranging from 20 to more than 200 miles per hour. They originate from the actual explosion related to an eruption. Pyroclastic flows and surges are a lethal hazard. They result in incineration, asphyxiation, burial, and impact. Because of their speed they cannot be outrun.

Pyroclastic flows are heavier than air and will seek topographically low areas. Pyroclastic surges, composed of hot mixtures of gas and rock will flow above the ground and they may go over topographical barriers such as ridges and hills.

Lava Flows

Lava flows are normally the least hazardous threat posed by volcanoes. The silica content of the lava determines the speed and viscosity of a lava flow. The higher the silica content, the more viscous (thick) the lava becomes. Low silica basalt lava can move 10 to 30 mph. High silica andesite and dacite tend to move more slowly and travel

short distances. Cascades volcanoes are normally associated with slow moving andesite or dacite lava. However, 2,000 years ago Mt. St. Helens produced a large amount of basalt.

Large lava flows may destroy property and cause forest fires but, since they are slow moving, pose little threat to human life. Perhaps the greater hazard presented by lava flows is that their extreme heat can cause snow and ice to melt very quickly, adding to lahar, debris avalanche, and flooding hazards.

Tephra

The ash and the large volcanic projectiles that erupt from a volcano into the atmosphere are called tephra. The largest fragments (bombs, >64mm) fall back to the ground fairly near the vents, as close as a few meters and as far as 10 km (6 mi.). The smallest rock fragments (ash) are composed of rock, minerals, and glass that are less than two millimeters in diameter. Tephra plume characteristics are effected by wind speed, particle size, and precipitation.

Tephra falls pose a variety of threats. Ash only 1 cm thick can impede the movement of most vehicles and disrupt transportation, communication, and utility systems. During the past 15 years about 80 commercial jets have been damaged by inadvertently flying into ash, and several have nearly crashed. Airborne tephra will seldom kill people who are a safe distance from the vent. However, tephra may cause eye and respiratory problems, particularly for those with existing medical conditions. Short-term exposure should not have any long-term health effects. Some tephra material may have acidic aerosol droplets that adhere to them. This may cause acid rain or corrosion of metal surfaces they fall on.

Ash may also clog ventilation systems and other machinery. When tephra is mixed with rain it becomes a much greater nuisance. Wet ash is much heavier and it can cause structures to collapse. Most of the 330 deaths associated with the Mt. Pinatubo eruption were caused by roofs collapsing under the weight of rain soaked ash. Wet ash may also cause electrical shorts. Ash falls also decreases visibility and may cause psychological stress and panic.

Lahars

Lahars are rapidly flowing mixtures of water and rock debris that originate from volcanoes. While lahars are most commonly associated with eruptions, heavy rains, debris accumulation, and even earthquakes may also trigger them. They may also be termed debris or mud flows. Lahars can travel over 50 miles downstream, reaching speeds between 20 and 40 mph. The highest recorded speed of a lahar during the 1980 Mt. St. Helens eruption was 88 mph. Beyond the flanks of a volcano, lahars will normally be channeled into waterways. The threat from lahars comes from their speed and from the debris they carry. Abrasion from the heavy sediment and impacts from heavy debris can destroy forests as well as human made structures including bridges, dams, roads, pipelines, buildings, and farms. Lahars may also fill in channels, obstructing shipping lanes and impact a channel's ability to handle large volumes of water.

Debris Avalanches

Volcanoes are prone to debris and mountain rock avalanches that can approach speeds of 160 kilometers per hour (100 mph). Volcanoes are characterized by steep slopes of weak rock. Volcanic rock material is weakened by the acidic ground water that seeps

through rock cracks and turns rigid rock into clay. Minor eruptions, earthquakes, or releases of built up water and debris may trigger large avalanches of this material.

Volcanic Gases

All active volcanoes emit gases. These gases may include steam, carbon dioxide, sulfur dioxide, hydrogen sulfide, hydrogen, and fluorine. Sometimes, these chemicals can be absorbed by ash and impact ground water, livestock, and metal objects. Even when a volcano is not erupting, gases can escape through small surface cracks. The greatest danger to people comes when large quantities of toxic gases are emitted from several sources or when there are topographic depressions that collect gases that are heavier than air. These gases can accumulate to the point where people or animals can suffocate. Neither of these conditions exist in Cascade volcanoes, though this could change if magma were to come close to the surface. Mt. St. Helens emitted thousands of tons of Sulfur Dioxide every day in the early 80's. These gases were easily dispersed by the wind.

History

Cascade Range volcanoes in the U.S. have erupted more than 200 times during the past 12,000 years for an average of nearly two eruptions per century. At least five eruptions have occurred during the past 150 years.

The most recent eruptions in the Cascade Range are the well-documented 1980-1986 eruptions of Mt. St. Helens, which claimed 57 lives and caused nearly a billion dollars in damage and response costs. The effects were felt throughout the northwest.

Hazard Identification

Mount Hood has erupted intermittently for hundreds of thousands of years, but historical observations are meager, so most of our information about its past behavior comes from geologic study of the deposits produced by prehistoric events. Observations of recent eruptions at other similar volcanoes around the world allow us to better understand what future eruptions of Mount Hood might be like. A brief description of the kinds of events that have occurred at Mount Hood and are likely to happen in the future follows.

Lava Eruptions, Pyroclastic Flows, and Related Lahars

Lava has erupted at Mount Hood chiefly in two modes. Numerous lava flows issued from vents on the upper flanks and traveled up to 12 kilometers (7 miles) down valleys. Erosion of new valleys along flow margins has left many of these lava flows as ridges, such as Cathedral Ridge, that radiate out from the center of the volcano. Observations of lava flows at similar volcanoes suggest that Mount Hood flows move down valleys as tongues of fluid lava a few to tens of meters thick (10 to 200 feet) encased in a cover of hardened lava rubble. Such lava flows can destroy all structures in their paths, but they advance so slowly that they seldom endanger people. Lava domes formed stubby lava masses on the upper flanks and summit of Mount Hood as lava welled out of a vent and piled up, too viscous to flow away. A recent example is the lava dome that grew in the crater of Mount St. Helens between 1980 and 1986. Past lava domes growing on the steep upper flanks of Mount Hood were typically unstable and collapsed repeatedly as they grew higher and steeper.

Collapse of a growing lava dome or the front of a thick lava flow generates landslides of hot rock called pyroclastic flows. Pyroclastic flows are fluid mixtures of hot rock fragments, ash, and gases that sweep down the flanks of volcanoes at speeds of 50 to more than 150 kilometers per hour (30 to 90 miles per hour) destroying vegetation and structures in their paths. Most are confined to valley bottoms, but pyroclastic surges, overriding clouds of hot ash and gases, are more mobile and can overwhelm even high ridge tops. At Mount Hood, pyroclastic flows have traveled at least 12 kilometers (7 miles) from lava domes; pyroclastic surges probably traveled even farther. Pyroclastic flows and surges also produce ash clouds that can rise thousands of meters (tens of thousands of feet) into the atmosphere and drift downwind for hundreds of kilometers (hundreds of miles). The consequences of this ash are discussed in a later section called Tephra Fall.

Pyroclastic flows and surges can also melt snow and ice and generate lahars (also called volcanic mudflows or debris flows). Lahars are rapidly flowing, water-saturated mixtures of mud and rock fragments, as large as truck-size boulders, that range in consistency from mixtures resembling freshly mixed concrete to very muddy water. Lahars can travel more than 100 kilometers (60 miles) down valleys. They move as fast as 80 kilometers per hour (50 miles per hour) in steep channels close to a volcano, but slow down to about 15 to 30 kilometers per hour (10-20 miles per hour) on gently sloping valley floors farther away. Past lahars at Mount Hood completely buried valley floors in the Sandy and Hood River drainages all the way to the Columbia River and in the White River drainage all the way to the Deschutes River.

Eruptive activity at Mount Hood during the past 30,000 years has been dominated by growth and collapse of lava domes. The last two episodes of eruptive activity occurred 1,500 and 200 years ago. Repeated collapse of lava domes extruded near the site of Crater Rock, Mount Hood's youngest lava dome, generated pyroclastic flows and lahars and built much of the broad smooth fan on the south and southwest flank of the volcano.

The newly formed fans of debris on the lower flanks of Mount Hood and deposits of lahars in river valleys were highly erodible, which caused additional impacts. Normal rainfall, snowmelt, and streams remobilized the sediment and continued to move it farther downstream for years after eruptions. For example, after the last eruptive period, the Sandy River became choked with sediment and within about a decade buried the preeruption valley floor over 20 meters (65 feet) deep between Sandy and Troutdale. Ultimately, much of the sediment from past eruptions entered the Columbia River. A recurrence of such events would greatly affect the Columbia River, its shipping channel, and, potentially, hydroelectric installations, such as Bonneville Dam.

Debris Avalanches and Lahars

Rapidly moving landslides, called debris avalanches, and occurred numerous times in the past when the steep upper parts of Mount Hood collapsed under the force of gravity. Warm acidic ground water that circulates in cracks and porous zones inside volcanoes alters strong rock to weak slippery clay, thereby gradually weakening them and making them more susceptible to debris avalanches than other mountains. Volcanoes are further weakened as erosion, especially by glaciers, oversteepens slopes. The destabilizing forces of magma (molten rock) pushing up into a volcanic cone prior to an eruption can trigger debris avalanches as occurred at Mount St. Helens in 1980.

Unexpected earthquakes (both smaller local ones and larger distant ones) or steam explosions can also trigger debris avalanches. A debris avalanche can attain speeds in excess of 160 kilometers per hour (100 miles per hour); the larger the avalanche, the faster and farther it can move. Small-volume debris avalanches typically move only a few kilometers (1 to 3 miles), but large-volume debris avalanches are capable of reaching tens of kilometers (tens of miles) from the volcano. Debris avalanches destroy everything in their paths and can leave deposits 10 to more than 100 meters (30 to more than 300 feet) thick on valley floors. Depending upon their water content, debris avalanches can transform into lahars, which, like lahars formed by pyroclastic flows, can move down valleys for even greater distances.

About 1,500 years ago, a moderate-size debris avalanche originating on the upper southwest flank of Mount Hood (see photograph) produced a lahar that flowed down the Zigzag and Sandy River valleys. It swept over the entire valley floor in the Zigzag-Wemme- Wildwood area, and inundated a broad area near Troutdale, where the Sandy flows into the Columbia Rivera total distance of about 90 kilometers (55 miles). More than 100,000 years ago, a much larger debris avalanche and related lahar flowed down the Hood River, crossed the Columbia River, and flowed several kilometers up the White Salmon River on the Washington side. Its deposit must have dammed the Columbia River at least temporarily.

During noneruptive periods, relatively small lahars present a hazard along channels and on floodplains on the flanks of Mount Hood. Although of modest size compared to lahars generated by eruptions or large debris avalanches, they occur much more frequently. Twenty-one lahars, including single flows as large as several hundred thousand cubic meters (cubic yards), whose effects were chiefly limited to areas within 15 kilometers (9 miles) of Mount Hoods summit, are reported in the historical record. Most occurred during autumn and early winter rains. Glacial outburst floods caused at least two and probably as many as seven others. A highly damaging lahar occurred in December 1980 when intense warm rain (with rapid snowmelt) triggered a flow in Polallie Creek that killed a camper at the creek mouth and temporarily dammed the East Fork Hood River. The ensuing dambreak flood destroyed about 10 kilometers (6 miles) of Oregon Highway 35 and other downstream facilities and caused about $13 million in damage.

Tephra Falls

Mount Hood has typically not produced thick, extensive deposits of tephra (fragmented solidified lava that rises into the air, is carried by winds, and falls back to the ground) as has nearby Mount St. Helens. Rather, relatively modest amounts of tephra were produced during past lava-flow and lava-dome eruptions. Most tephra fallout was caused by clouds of sand- and silt-size particles that rose from moving pyroclastic flows produced by lava-dome collapse. Tephra was also generated by explosions driven by volcanic gases. Both types of tephra clouds probably reached altitudes of 1,000 to 15,000 meters (3,000 to 50,000 feet) above the volcano and were then carried away by the prevailing wind, which blows toward sectors northeast, east, or southeast of Mount Hood about 70 percent of the time. Winds that would carry tephra toward the Portland metropolitan area are rather uncommon, occurring only a few percent of the time. On the flanks of the volcano, each event deposited, at most, a few centimeters (inches) of tephra. Thickness of tephra fallout decreased rapidly downwind to probably just a few

millimeters (one-tenth inch) or less at 100 to 200 kilometers (60-120 miles) from the volcano. During future explosions at Mount Hood, large, dense ballistic fragments (more than 5 cm (2 inches) in diameter) that can damage structures and kill or injure people may be thrown up to 5 kilometers (3 miles) from vents.

Tephra fallout produced by future eruptions of Mount Hood poses little threat to life or structures in nearby communities. But tephra clouds can create tens of minutes or more of darkness as they pass over a downwind area, even on sunny days, and reduce visibility on highways. Tephra ingested by vehicle engines can clog filters and increase wear. Deposits of tephra can short-circuit electric transformers and power lines, especially if the tephra is wet and thereby highly conductive, sticky, and heavy. This effect could seriously disrupt hydroelectric power generation and transmission along the Columbia River and powerline corridors north and east of the volcano. Tephra clouds often spawn lightning, which can interfere with electrical and communication systems and start fires. A serious potential danger of tephra stems from the grave effects of even small, dilute tephra clouds on jet aircraft that fly into them. Major air routes pass by Mount Hood, and tephra clouds produced repeatedly during an eruptive episode would interfere greatly with air traffic.

Lessons learned in eastern Washington during the 1980 eruption of Mount St. Helens can help prepare governments, businesses, and citizens for future tephra falls. Communities experienced significant disruptions in transportation, business activity, and services during fallout of from 0.5 to 8 centimeters (1/4 to 3 inches) of tephra and for several days thereafter. The greater the amount of tephra that fell, the longer the recovery time. As perceived by residents, tephra falls of less than 0.5 centimeter (1/ 4 inch) were a major inconvenience, whereas falls of more than 1.5 centimeters (2/3 inch) constituted a disaster. Nonetheless, all communities resumed normal activities within about two weeks. On the basis of the type and magnitude of tephra production we would expect from Mount Hood in the future, only nearby communities, such as Government Camp, Rhododendron, and Parkdale, would likely receive a tephra thickness approaching 1.5 centimeters (2/3 inch) in any one event. However, some other nearby volcanoes in the Cascade Range do produce large explosive tephra eruptions that could affect the Mount Hood region

Vulnerability Analysis 61

Wasco County may be impacted by a volcanic eruption at anytime. The above assessments of volcano hazards consider past activity to determine the most likely pattern and probability of a future eruption. It is possible that unexpected volcanic activity may occur that may significantly impact Wasco County.

The factor that most limits Wasco County's vulnerability to a major eruption of Mt. Hood is the modern capability to accurately detect eruptive activity well before an eruption occurs. The USGS constantly monitors seismic activity directly underneath Cascade volcanoes. Clusters or 'swarms' of small earthquakes underneath a volcano have proven to be a precursor to renewed volcanic activity. Mt. St. Helens and Mt. Hood are both closely monitored, in terms of ground movement and seismic activity. It is up to emergency managers and other responsible agencies to ensure an aggressive response to these warnings.

Proximal Hazard Zones

Proximal hazard zones include areas from the summit out to 24 km (15 miles) along major valleys and out to about 12 kilometers (7 miles) in between major valleys. These zones are subject to several types of rapidly moving, devastating flows. Pyroclastic flows and surges will travel out to a maximum distance of about 12 kilometers in less than 10 minutes, whereas lahars and debris avalanches can travel out to the 24- km hazard boundary in as little as 30 minutes. Areas up to 5 kilometers (3 miles) from a vent could also be subject to showers of large (more than 5 centimeters or 2 inches) ballistic fragments within a few minutes of an explosion. Owing to such high speeds, escape or survival is unlikely in proximal hazard zones. Therefore, evacuation of proximal hazard zones prior to onset of an event is realistically the only way to protect lives. Lava flows issuing from vents on the upper flanks of Mount Hood would be largely restricted to proximal hazard zones, but they would move much more slowly than these other types of flows.

During the past 1,500 years, lava-dome growth has been localized in the area around Crater Rock, the youngest lava dome on Mount Hood, which lies in a steeply sloping, breached crater south of the summit ridge. It is thought that this same area is the most likely vent location during the next eruption as well. Therefore, a proximal hazard zone A (PA), which encompasses those areas that could be affected by events accompanying dome growth at or near Crater Rock. A less likely event is the opening of a vent elsewhere on the upper east, north, or west flank. Should this occur, the corresponding hazard zone would be all or part of proximal hazard zone B (PB). Depending on vent location, especially if at the summit, all or part of zone PA also could also be at risk. On the lower south and west flanks, hazard zone PB extends beyond the limit of zone PA because a lava dome growing at the summit would be at a higher altitude than Crater Rock and would have the potential to generate farther-reaching pyroclastic flows. On the basis of past eruption frequency, we estimate the probability of an eruption impacting part of zone PA in the next 30 years (the 30-year probability) to be about 1 in 15 to 1 in 30 [4]. In contrast, the 30-year probability of part of zone PB being affected is on the order of 1 in 300 [4]. We caution that these probabilities are based solely on the long-term behavior of the volcano. Any signs of increased restlessness at Mount Hood will increase these probabilities dramatically.

Several major valleys within the proximal hazard zones are highlighted on the map by a hachured line pattern because they are more likely than others to be affected by future pyroclastic flows and lahars related to collapse of growing lava domes, especially during initial stages of dome building. These valleys, along with Polallie Creek valley, are also areas subject to frequent small lahars, floods, and debris avalanches triggered by storms or other noneruptive causes. If a lava dome grows near Crater Rock, the White and Zigzag River valleys and the valley of Zigzag Glacier and its meltwater stream, an unnamed tributary of the upper Sandy, are the most likely pyroclastic-flow and lahar paths. If an eruptive episode continues for a long enough time period that debris fills the heads of these drainages, pyroclastic flows and lahars will be able to sweep over a broader area, which could include the Little Zigzag River, Still Creek (including the area around Government Camp), and Salmon River valleys. Likewise in zone PB on the north or east flank, the main valleys below a growing lava dome would initially be the most likely flow paths. For example, dome growth on the upper northeast flank would initially affect the valleys of Newton Creek and Eliot Branch. The large area in the

proximal hazard zone between these valleys that is drained by Polallie and several other creeks does not presently head directly on the upper flanks and probably would not be affected initially. Before these drainages could be inundated by pyroclastic flows, the valley heads of Newton Creek and(or) Eliot Branch would have to be partly filled with debris.

While the subdivision of the proximal area into zones PA and PB based on vent location applies well to pyroclastic flows and lahars produced by lava dome collapse, several other types of events are not so neatly restricted by this hazard zonation. First, the earthquakes and deformation associated with future intrusion of magma into Mount Hood can trigger landslides of fractured and weakened rock from the steep upper slopes. Therefore, even though dome building is localized at one site, landslides elsewhere on the upper flanks can generate debris avalanches and related lahars in valleys not otherwise affected by dome growth. Such events, largely restricted to the hachured areas in zone PB, occurred on the east, north, and west flanks during the past 1,500 years, while dome growth and collapse affected valleys on the south and southwest flanks. Furthermore, owing to the pronounced filling of valleys on the south side by debris during the past 1,500 years, the majority of high cliffs and spurs subject to landsliding lie on other flanks. Thus, regardless of which zone a dome is growing in, potential hazards from debris avalanches and lahars exist in other parts of the proximal zones. Second, explosive eruptions driven by volcanic gases can also affect both proximal zones. Explosions can generate highly mobile pyroclastic flows as material falls back to the ground and can hurl large ballistic fragments outward up to 5 kilometers (3 miles). Such events are less constrained by topographic features than are pyroclastic flows from dome collapse, so explosions at a vent in one proximal zone could impact parts of the other proximal zone, especially with ballistics.

Distal Hazard Zones

White River Drainage

Lahars spawned by lava-dome collapses swept through the White River valley about 200 years ago and inundated large parts of Tygh Valley. Hazard zone DA encompasses these deposits as well as adjacent areas that lie up to 12 meters (40 feet) higher depending on valley width. Lahars of this magnitude would inundate the broad flood plain of White River in Tygh Valley, but probably not reach the town itself. Lahars that reach the Deschutes River probably would be diluted to muddy floods that would transport large amounts of sediment into the Columbia River upstream from The Dalles Dam. The 30-year probability of an area in zone DA along White River being inundated by a debris avalanche or lahar is about 1 in 15 to 1 in 30.

History suggests a **low probability of occurrence**. Because of potential impact to the White River and Deschutes River drainages from a lahar flow, there is **low vulnerability**. Because Mt. Hood is relatively quiet, this hazard is assigned a **low risk rating**.

Conclusions

Mount Hood is a potentially active volcano close to rapidly growing communities and recreation areas. The most likely widespread and hazardous consequence of a future eruption will be for lahars (rapidly moving mudflows) to sweep down the entire length of the Sandy (including the Zigzag) and White River valleys. Lahars can be generated by hot volcanic flows that melt snow and ice or by landslides from the steep upper flanks of the volcano. Structures close to river channels are at greatest risk of being destroyed. The degree of hazard decreases as height above a channel increases, but large lahars can affect areas more than 30 vertical meters (100 vertical feet) above river beds. The probability of eruption- generated lahars affecting the Sandy and White River valleys is 1-in-15 to 1-in-30 during the next 30 years, whereas the probability of extensive areas in the Hood River Valley being affected by lahars is about ten times less.

Volcano-hazard- zonation maps outline areas potentially at risk and shows that some areas may be too close for a reasonable chance of escape or survival during an eruption. Future eruptions of Mount Hood could seriously disrupt transportation (air, river, and highway), some municipal water supplies, and hydroelectric power generation and transmission in northwest Oregon and southwest Washington.

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. Development should avoid areas judged to have an unacceptably high risk or be planned to reduce the level of risk. For example, a real-estate development along a valley could set aside low-lying areas at greatest risk from lahars for open space or recreation, and use valley walls or high terraces for houses and businesses.

When volcanoes erupt or threaten to erupt, 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. Mount Hood has a settlement (Government Camp), major highways (US 26 and OR 35), and popular tourist and recreation areas (Timberline Lodge and Mount Hood Meadows Ski Area) on its flanks. Furthermore, several thousand people live within 35 kilometers (22 miles) of Mount Hood along the channels and flood plains of rivers that drain the volcano. Such areas are at greatest risk from lahars and debris avalanches and could be inundated within one hour of an events onset.

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 before hand. 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 threat to people living in valleys that drain Mount Hood. 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, few lahars will rise more than 30 meters (100 feet) above river level. Be aware that an approaching lahar will cause a loud roaring noise like a gradually approaching jet plane. Once audible, a lahar may be only a few minutes away.

W.E. Scott, T.C. Pierson, S.P. Schilling, J.E. Costa, C.A. Gardner, J.W. Vallance, and J.J. Major, 1997, Volcano Hazards in the Mount Hood Region, Oregon: USGS Open-File Report 97-89

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City/Special District Addendums

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Volume III:
The Dalles City Addendum

Purpose

This document serves as an update for the City of The Dalles' Addendum to the Wasco County Natural Hazard Mitigation Plan (NHMP). The county plan update is scheduled to be sent to FEMA for approval and adopted by the Wasco County Board of Commissioners in fall 2012. The City of The Dalles' original addendum to Wasco County's NHMP was completed in the spring of 2007. The City conducted an update to its original addendum in spring of 2012, which coincided with final stages of an update to the Wasco County NHMP. The City's Addendum is considered part of the county's multi-jurisdictional plan, and meets the following requirements: (1) Multi-jurisdictional Plan Adoption §201.6(c)(5), (2) Multi-jurisdictional Participation §201.6(a)(3), (3) Multi-Jurisdictional Risk Assessment §201.6(c)(2)(iii), and (4) Multi-jurisdictional Mitigation Strategy §201.6(c)(3) (iv).

A description of the city specific planning and adoption process follows, along with detailed community specific action items. Information about the city's risk relative to the county's risk to natural hazards is documented in the addendum's Hazard Analysis and Issue Identification section. The section considers how the city's risk differs from or matches that of the county's. Updates to The Dalles' city addendum are further discussed throughout the plan and in the Wasco County NHMP Planning and Public Process Appendix, which provides an overview of alterations to the document that took place during the city addendum update process.

How was the Plan Developed?

In Fall 2004, the Oregon Natural Hazards Workgroup (ONHW, now the Oregon Partnership for Disaster Resilience) at the University of Oregon's Community Service Center partnered with the Department of Geology and Mineral Industries (DOGAMI) and the Mid-Columbia Oregon Region (Gilliam, Hood River, Morrow, Sherman, Umatilla, Wheeler, and Wasco) counties to develop a Pre-Disaster Mitigation Planning Grant proposal. Each county joined the Partners for Disaster Resistance and Resilience (The Partnership) by signing (through their County Commissions) a Memorandum of Understanding for this project. FEMA awarded the Mid-Columbia Oregon Region a grant to support the development of natural hazard mitigation plans for the seven counties in the region. The City of The Dalles worked with Wasco County to develop the County's plan and also worked with ONHW (now OPDR) to complete the city-specific planning process documented in this addendum. The City of The Dalles participated in Wasco County's collaborative planning process in the following ways:

- A representative from the City of The Dalles Community Development Department (Dick Gassman) served on the Wasco County Natural Hazard Mitigation Steering

Committee and participated in developing the Wasco County Natural Hazard Mitigation Plan.

- The City of The Dalles developed a working group to help develop the City's addendum. The working group was comprised of key local government agencies and included the following representatives:
    - Fire Marshall;
    - Senior Planner; and
    - Public Works Director
- The working group participated in an issue identification work session facilitated by ONHW. During this work session the working group identified the city's level of risk to each hazard in comparison to the county's risk and identified and documented particular natural hazard issues faced by the city with regard to population, economy, critical facilities and the environment.
- In the second work session, the working group reviewed draft actions that ONHW and the RARE participant developed based on the outcomes of the first work session. If the city identified its risk as greater than the county to certain hazards, this information was included in the rationale of the appropriate action item as well as in the County's Risk Assessment.
- ONHW developed this memorandum and attachment to document the planning process, the community profile, goals and action items, and plan adoption.
- ONHW sent the draft addendum and attachments to the working group to review and provide comment. ONHW assisted the City make appropriate revisions and then the plan was sent to FEMA for review.
- The plan returned from FEMA with a pre-approval and was adopted by the City Council in August 2007.

How Were the Action Items Developed?

The City's action items were developed through a two-stage process. In stage one, ONHW facilitated a work session with the working group to discuss the city's risk and to identify potential issues. Following this work session, ONHW and Wasco County's Resource Assistance for Rural Environments (RARE) participant developed potential actions based on the hazards and the issues identified by the working group. ONHW and RARE also cross walked the city's issues with Wasco County's action items to identify opportunities to partners where issues were shared between jurisdictions. In the second stage, ONHW presented the working group with draft actions. The group discussed whether or not the action was appropriate. If it was, they also documented how the action would be implemented in the City and who would be responsible for implementing it. The City's actions are listed below. For more detailed information on each action, see the action forms at the end of this memo.

City of The Dalles Mitigation Actions

- Evaluate and Prioritize Critical Infrastructure for Hazard Resilience (e.g. Seismic Retrofit, Wildfire Protections)
- Seek Implementation Funding for Hazard Resilient Modifications to Critical Infrastructure
- Partner with the County for the Coordination of Special Needs Populations Disaster Education/Outreach & Response

- Identification and Pursuit of Implementation Funding for Mitigation Actions
- Annual Review of Natural Hazards Mitigation Plan / Complete Review/Update/Adoption by City Council Every Five Years
- Develop Long-range Water Resources Plan to Accommodate Current/Project Growth and Mitigate Drought Impact
- Encourage Critical Facilities to Secure Emergency Power
- Partner with the County to Implement Education/Outreach/Awareness Activities
- Small Business Awareness and Continuity Planning
- Partner with County on All-Hazard Emergency Preparedness
- Explore the potential for The Dalles to participate in the Community Rating System (CRS) of the National Flood Insurance Program (NFIP)
- Explore acquisition and management strategies to preserve parks, trails, and open space in the floodplain
- Update Flood Insurance Rate Maps (FIRMs)
- Ensure continued compliance with the National Flood Insurance Program
- Open up Mill Creek Tunnel between Thompson Park and the Columbia River, where the creek terminates
- Partner with the County to Implement the CWPP
- Seek Implementation Funding for E. Scenic Drive Stabilization Project

The Dalles Addendum Update

As the Wasco County NHMP update process began to unfold in 2011, plans were made to update the City of Dalles' city addendum on a complimentary timeframe. The Dalles Senior Planner, Dick Gassman, served on the Wasco County NHMP Update Steering Committee, and convened a working group meeting to update The Dalles' city addendum on June 18th, 2012. In attendance was the city's Senior Planner, Dick Gassman, the City of The Dalles Public Works Director, Dave Anderson, and a Resource Assistance for Rural Environments (RARE) participant, Will Clark, who was responsible for coordinating the update of Wasco County's NHMP. At the meeting, the working group reviewed and revised the city's addendum, with particular focus on the plan's action items and mitigation strategy.

The current version of the addendum reflects changes decided upon at the plan update meeting. The changes are highlighted with more detail throughout this document, as well as in the Planning and Public Process Appendix of the Wasco County NHMP. Other documented changes include a revision of the city's Hazard Vulnerability and Issue Identification section, Plan Goals, and Community Profile. Revisions to the plan were carried out by the RARE participant before final review by The Dalles Senior Planner and Public Works Director.

How Will the Plan be Implemented?

The City Council will be responsible for adopting the City of The Dalles Natural Hazard Mitigation Plan Addendum. This addendum designates a coordinating body and a convener to oversee the development and implementation of action items. Because the city addendum is considered part of the county plan, the city will look for opportunities to partner with the County. The City's working group will re-convene 2 ½ years after re-

adoption of The Dalles city addendum. When the County's Steering Committee meets to review actions, the City's working group will also meet to review city-specific actions. The Community Development Department will serve as the convener and will be responsible for convening the working group. The convener will also remain active in the County's planning process.

Implementation through Existing Programs

Many of the Natural Hazards Mitigation Plan's recommendations are consistent with the goals and objectives of the city's existing plans and policies. Where possible, the City of The Dalles will implement the Natural Hazard Mitigation Plan's recommended actions through existing plans and policies. Plans and policies already in existence often have support from local residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the Natural Hazard Mitigation Plan's action items through such plans and policies increases their likelihood of being supported and implemented.

The City of The Dalles currently has five plans that relate to natural hazard mitigation:

- The Dalles Comprehensive Land Use Plan, last revised in May 23, 2011, relates to natural hazard mitigation through its section that outlines The Dalles' goals, policies, and implementation measures
- The Dalles Riverfront Plan, last revised in October 1989, relates to natural hazard mitigation through its land use section, which does not plan for, but has room for natural hazard mitigation planning. The riverfront is listed as being a limited resource that needs to be enhanced and protected, which could mean protection from floods and other hazards.
- The City of The Dalles Land Use and Development Ordinance, last revised in July 2012, outlines which permits are required to develop in areas deemed to have unstable land.
- City of The Dalles Geologic Hazards Study, created in March 2011.
- The Dalles Scenic Drive Embankment Failure Report, created in August 2011.

The working group and the community's leadership have the option to add or implement action items at any time. This allows the working group to consider mitigation strategies as new opportunities arise, such as funding for action items that may not be of the highest priority. When new actions are identified, they should be documented using the action item form. Once a proposed action form has been submitted to the convener, the action will become part of the City's addendum.

Continued Public Participation

Keeping the public informed of the city's efforts to reduce the city's risk to future natural hazards events is important for successful plan implementation and maintenance. The city is committed to involving the public in the plan review and updated process. The City Addendum along with the County Plan will be posted on-line on the University of Oregon's Scholars Bank https://scholarsbank.uoregon.edu/dspace/handle/1794/1931 so that the public may view the plan and submit electronic comments to the community at any time.

In addition, Hazard and Vulnerability information is presented to the public by the City of The Dalles Public Works Department at an informational booth during the city's annual

Cherry Blossom Festival. Additional information dissemination is conducted throughout the year when opportunities present themselves.

Plan Maintenance

The Wasco County Natural Hazard Mitigation Plan will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the working group to address the questions outlined below.

- 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?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics 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?

These questions will help the working group determine what components of the mitigation plan need updating. The working group will be responsible for updating any deficiencies found in the plan.

The City of The Dalles Natural Hazard Mitigation Addendum includes three sections: 1) a Community Profile that describes community vulnerability, 2) a revised summary of the city's Hazard Vulnerability and Issue Identification, and 3) Goals and Action Items.

The Dalles
Community Profile

This section provides information on the characteristics of The Dalles, in terms of geography, environment, population, demographics, employment and economics, as well as housing and transportation. Many of these community characteristics can affect how natural hazards impact communities and how communities choose to plan for natural hazard mitigation. Considering these characteristics during the planning process can assist in identifying appropriate measures for natural hazard mitigation.

Geography and Climate

The Dalles is located in the Mid Columbia Gorge at 45° N latitude and 121° S longitude. The elevation of the city is 102 feet above sea level. The area of the city estimated by the US Census Bureau is 5.63 square miles. The Dalles is located along the Columbia River, the nation's second largest river defined by the volume of water it carries. The closest major city is Hood River, which is 21 miles away. Portland, the largest city in the state is located 83 miles to the west.

The climate in The Dalles varies throughout the seasons, each with its own dominant weather patterns. In the summer, temperatures range between 58° and 85° F. During the winter, the temperature ranges from an average low of 30° F and high of 44° F. At lower elevations, the city receives an average of 4.6 inches of snow during the winter (19.8 inches according to more widely varying 100+ year data). The annual average rainfall is approximately 14.6 inches.

Table TDA.1: Period of Record General Climate Summary, The Dalles, OR

Month	Mean Maximum Temperature (deg F)	Mean Minimum Temperature (deg F)	Mean Temperature (deg F)	Mean Precipitation (inches)	Average Snowfall (inches)
January	43.4	29	36.2	2.6	9.6
February	49.3	29.5	39.4	1.8	2.9
March	58.3	34.4	46.3	1.2	0.7
April	65.4	39.2	52.3	0.8	0
May	73.4	46.3	59.8	0.7	0
June	80	52.5	66.3	0.5	0
July	88.2	57.8	73	0.2	0
August	88.5	56.7	72.6	0.3	0
September	81.3	48.7	65	0.4	0
October	67.6	39.3	53.4	0.9	0
November	51.9	33.4	42.6	2.1	2.1
December	42.1	28.7	35.4	3.1	4.5
Annual	**65.8**	**41.4**	**53.6**	**14.6**	**19.8**

Source: Western Regional Climate Center, Western US Climate Historical Summaries, http://www.wrcc.dri.edu/CLIMATEDATA.html – Temperature and precipitation data (1981-2010), snowfall data (1893-2011)

Population and Demographics

The Dalles was initially incorporated by the Oregon Territorial Government in 1857. The name of the town is derived from the French word for flag stones – *dalle* found along the Columbia River. According to archeological evidence, the city has continuously been inhabited for the past 10,000 years. The city's location near the river allowed the city to become a hub for trade and distribution of goods to the Pacific Northwest.[1]

The population of The Dalles, according to the US Census in 2010, was 13,620. There are 5,472 households and 5,903 total housing units in the city. The average household size is 2.4 and the average family size is 2.9. The highest proportion of people in the city by age are those under 20 (26.3%), followed by people aged 40-59 (25.4%), then those aged 60 and over (24.1%), and finally those between the age of 20 and 39 (24%). Over the past decade the population of The Dalles has been slightly increasing, and the median age of the city is 39.7 years old. Table 1.2 and Figure 1.1 illustrate population and demographics of The Dalles.

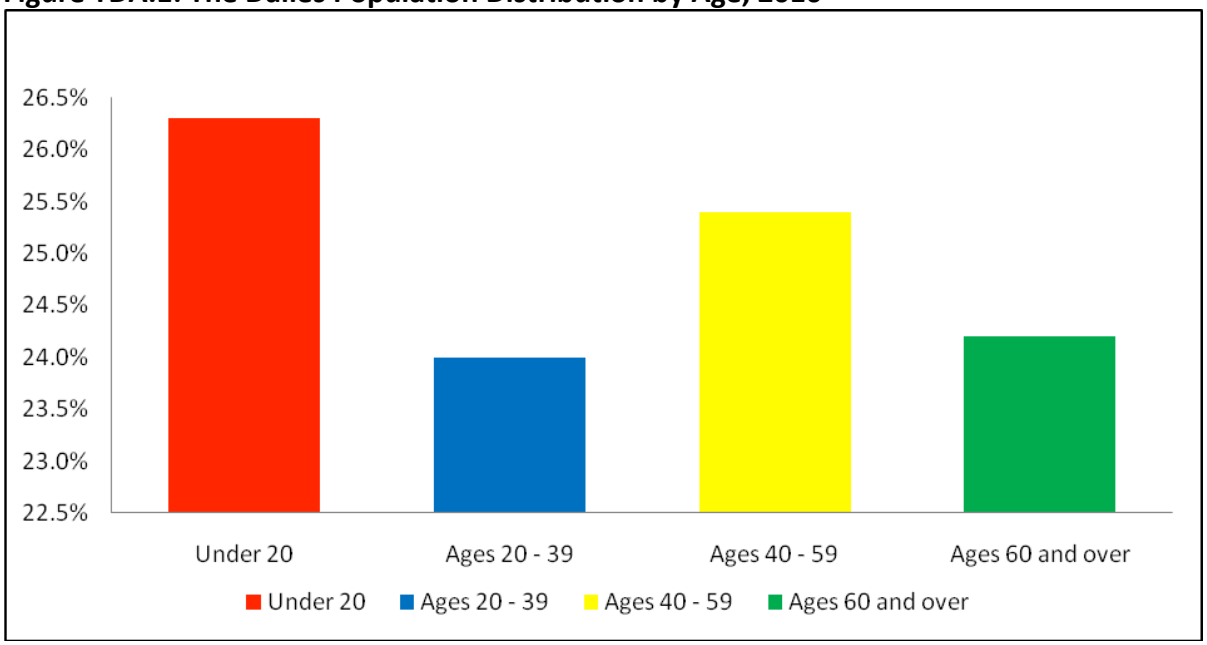
[1] City of Dalles Oregon (2005) City Website, retrieved on 6 November 2005 from http://www.ci.the-dalles.or.us/

Table TDA.2: Total Population, The Dalles, Wasco County, Oregon, 2010

Jurisdiction	Population (2010)	Population (2000)	Population Change (2000 - 2010)	Percent Change (2000 - 2010)	Average Annual Growth Rate
The Dalles	13,620	12,156	1,464	12.0%	1.1%
Wasco County	25,213	23,791	1,422	6.0%	0.6%
Oregon	3,831,074	3,421,399	409,675	12.0%	1.1%

Source: U.S. Census Bureau, 2000 Census, 2010 Census

Figure TDA.1: The Dalles Population Distribution by Age, 2010



Source: U.S. Census Bureau, 2010 Census

The impact of disasters, in terms of loss and the ability to recover from a hazard event, varies among population groups. A disproportionate burden is placed upon special needs groups, particularly minorities and the poor, who typically lack the financial resources to recover from the impact of disasters.

The City of The Dalles has a vast majority (87.9%) of people who self-identify as white, while 17% of the city's population identifies as either Hispanic or Latino. Over 16.2% of residents speak a language other than English at home.

Of the total population of the city, 12.0% or 1,634 individuals are estimated to have had an income over the past 12 months below the poverty level. Among families in the city, 10.4% or 349 are estimated to have had an income over the past 12 months below the poverty level.[2]

[2] US Census Bureau, 2010, Selected Economic Characteristics

Employment and Economics

The Dalles serves as the center of commerce for the five county area that includes Wasco, Hood River, Sherman, Skamania, and Klickitat counties. The area is known as the sweet cherry capital of the world – having cherry orchards that produce over $30 million dollars annually. Tourism is also a major economic generator for the city due to its location along the Columbia River Gorge.[3] Table 1.4 shows the range of industry in The Dalles.

Table TDA.3: Industries, The Dalles, 2010

Industry	Percent of Employment
Education, health and social services	24.2%
Retail trade	17.6%
Professional, scientific, management, administrative and waste management services	7.8%
Other services (except public administration)	6.9%
Manufacturing	6.5%
Construction	6.5%
Finance, insurance, real estate, and rental and leasing	5.8%
Arts, entertainment, recreation, accommodation, and food services	5.6%
Agriculture, forestry, fishing and hunting, and mining	5.3%
Transportation and warehousing, and utilities	4.8%
Public administration	3.9%
Wholesale trade	3.3%
Information	1.8%

Source: US Census, 2006-2010 American Community Survey 5-Year Estimates

The median household income is $42,317. The median household income per capita in 2005 was $34,430.

Housing

Housing type and year-built dates are important factors in mitigation planning. Certain housing types tend to be less disaster resistant and warrant special attention: mobile homes, for example, are generally more prone to wind and water damage than standard stick-built homes. Generally the older the home is, the greater the risk of damage from natural disasters. This is because stricter building codes have been developed following improved scientific understanding of plate tectonics and earthquake risk. For example, structures built after the late 1960s in the Northwest and California use earthquake resistant designs and construction techniques. In addition, FEMA began assisting communities with floodplain mapping during the 1970s, and communities developed

[3] Dalles Chamber of Commerce (2005) Economic Development Committee Quick Facts, retrieved on 6 November 2005 from http://www.tdedc.com/facts.htm

ordinances that required homes in the floodplain to be elevated to one foot above Base Flood Elevation.

There are 5,944 housing units in The Dalles. Of these housing units there are 2,752 single-family and owner occupied homes (Table 1.4). The median value of owner occupied housing in 2010 was $181,200. Most of the housing units were built in the 1950s and 1970s (Table 1.5) and are heated by electricity (70.2%) and gas (18.9%).

Table TDA.4: Housing Type Summary, The Dalles, 2006-2010

Housing Type	Number	Percent
1 unit	4,131	69.5%
2 to 10 units	783	13.2%
10 to 19 units	275	4.6%
20 or more units	235	4.0%
Mobile home	480	8.1%
Boat, RV, van, etc.	40	0.7%
Total	**5,944**	

U.S. Census Bureau, American Community Survey, 5 year Estimates, 2006-2010; B25024

Table TDA.5: Housing Stock by Age, The Dalles, 2010

Year Structure Built	Number	Percent
Built 2005 or later	164	2.8%
Built 2000 to 2004	176	3.0%
Built 1990 to 1999	635	10.7%
Built 1980 to 1989	461	7.8%
Built 1970 to 1979	1,085	18.3%
Built 1960 to 1969	576	9.7%
Built 1950 to 1959	1,175	19.8%
Built 1940 to 1949	452	7.6%
Built 1939 or earlier	1,220	20.5%
Total housing units	**5,944**	

Source: U.S. Census, American Community Survey, 5 Year Estimates, 2006-2010; B25034

Land and Development

Land use goals in the city are maintained in the comprehensive plan, which is consistent to the state wide land use goals set by the Department of Land and Development Conservation (DLCD). The Dalles has experienced moderate growth over the past three decades, and though there was only a 1.86% change in population in the city between 1980 and 1990 (and negative growth in Wasco County overall during the same period), the city has been

growing at larger rates over the past two decades. The city's total population increased to 12,156 in 2000 (10.3% change), and then 13,620 in 2010 (12.0% change).[4]

Transportation and Commuting Patterns

The city is located in close proximity to Interstate 84, which is the major east/west corridor, and Highway 197, which runs north and south. There is rail service, Greyhound / charter bus services, and marine service local in the area, and The Dalles Municipal Airport is located two miles northeast of the city across the Columbia River.

Transportation is an important consideration when planning for emergency service provisions. Growth within the city is likely to put pressure on both major and minor roads, especially if the main mode of travel is by single occupancy vehicles. How people travel to work is indicative of the prevalence of single occupancy vehicle travel, and can help predict the amount of traffic congestion and the potential for accidents.

The majority of the inhabitants in the city commute to work by automobile (88.5%). Just over 11% of city inhabitants commute to work via car pooling, and nearly 6% walk or ride their bike to work instead of driving.[5]

Critical Facilities and Infrastructure

Critical facilities support government and first responders' ability to take action in an emergency. They are a top priority in any comprehensive hazard mitigation plan. Individual communities should inventory their critical facilities to include locally designated shelters and other essential assets, such as fire stations, and water and waste treatment facilities.

The City of The Dalles has 2 fire stations, 1 hospital, 3 elementary schools, one middle school, one high school, one ninth grade school, and one alternative school. Other critical facilities and infrastructure for the city and region more generally are described with further detail in Section 2: Risk Assessment and Appendix C: Community Profile of the Wasco County NHMP.

Historic and Cultural Resources

Historic and cultural resources such as historic structures and landmarks can help define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important.

The Dalles has many historic buildings and landmarks. Table 1.6 lists the city's historic landmarks according to the National Register of Historic Places.

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[4] US Census Bureau, 2000 and 2010, American Community Survey
[5] US Census Bureau, 2010, S0801

Table TDA.6: Historic Landmarks, The Dalles 2012

Building/Landmark
Anderson, Lewis, House, Barn and Granary
Bennit, Williams, House
Dalles Carnegie Library
Five Mile Rapids Site
Fort Dalles Surgeons Quarters
French, Edward, House
Fulton Taylor House
Glenn, Hugh House
Heimrich, Seafert, House
Humanon, Orlando, House
Indian Shaker Church and Gulick Homestead
Kelly, Joseph D. and Margaret House
Moody, Malcom A, House
Reuter, Dr. J.A. House
Rock Fort Campsite
Sharp, Edward, F. Residential Ensemble
St. Peters Roman Catholic Church
The Dalles Civic Auditorium
The Dalles Commercial Historic District
Thompson, John L, House
Trevitts Addition Historic District
US Post Office
Van Dellen, John and Murta House

Source: National Register of Historic Places, 2012

Hazard Analysis and Issue Identification

Initial Work Session Overview

On Tuesday, July 18th, 2006, the City of The Dalles held an issue identification work session in order to develop community-specific action items for the city's addendum to the Wasco County Natural Hazard Mitigation Plan. This work session was co-facilitated by the Oregon Natural Hazards Workgroup (ONHW, now the Oregon Partnership for Disaster Resilience) at the University of Oregon's Community Service Center and by Wasco County's Resource Assistance for Rural Environments (RARE) Participant.

ONHW followed up with work session participants to gather additional information about the hazards and vulnerabilities that the City of The Dalles faces. Furthermore, in order to assess the city's risk to natural hazards, a presentation on the risk assessment from the Wasco County plan was made by the RARE Participant. The working group was then asked to provide comments on the city's risk and to identify specific hazard related issues.

City Participants

The following individuals participated in the work session:

- Dick Gassman, Community Development Department
- Stuart Nagel, Mid-Columbia Fire & Rescue
- Brian Stahl, Public Works
- Dave Anderson, Public Works

Hazard Analysis & Issue Identification Update

On June 18, 2012, The Dalles city addendum update working group reviewed and revised the plan's Hazard Analysis and Issue Identification section. Changes were made where appropriate to reflect changes in perception of risk from natural hazards to the City of The Dalles, which are discussed throughout this plan as well as in the Planning and Public Process Appendix of the Wasco County NHMP. Furthermore, a description of the city's risk to tornado was added, reflecting deliberations and analysis from the Wasco County NHMP. The following is a summary of input from the original city addendum working group, along with revisions and additions from the 2012 working group.

Drought

The working group determined that the city's risk to drought is high, which is the same as the county's risk. In addition to information found in the county's plan, the working group identified other issues specific to The Dalles. The city's water supply is contingent on the snow pack (particularly from the forested Cascade foothills east of Mt. Hood), which may fluctuate greatly from year to year. Contingency plans may need to be developed to meet

water needs. From a statewide 18-month drought in 1904 to the second worst drought year in the state's history in 2005, Oregon has been impacted by many droughts. Droughts impact individual farm owners, the agricultural industry as a whole, and other agricultural related sectors. The Dalles, being a regional hub for shipping and receiving agricultural products, may be particularly impacted by droughts in the region. Additionally, during drought years, Mid-Columbia Fire and Rescue (The Dalles fire prevention and response public service) must draw water from greater distances to fight fires, resulting in slower response times.

Earthquake

The working group determined that the city's risk to earthquake is high, which is higher than the county's risk. There's no past "recent" history of Earthquakes in Wasco County or The Dalles. However, the 2007 County mitigation plan indicated that, "It is difficult to identify a part of the community that is not vulnerable to an earthquake. People, buildings, emergency services, hospitals, transportation lifelines, and water and wastewater utilities are susceptible to the effects of an earthquake." In the event of an earthquake, the city hall building may be threatened. Aside from city hall, many other buildings in downtown are constructed of un-reinforced masonry. The City's drinking water treatment plant, treated water storage reservoirs, pipelines, sewage collection system, and sewage treatment plant have not been upgraded to withstand a seismic event and may be susceptible to significant damage. Although The Dalles is currently working towards the construction of a new transmission pipeline for its water supply, if an earthquake were to happen before the project is completed (approximately within the next four years), the current wooden pipeline may be damaged.

According to a Department of Geology and Mineral Industries report on relative earthquake hazards maps, the City of The Dalles:

- Amplification hazard is generally low, with a small area of moderate hazard at the east end of the urban area
- Liquefaction hazard is nil throughout most of the urban area and low to moderate to the east
- Earthquake-induced landslide hazard is generally low on the valley floors, with some areas of moderate hazard on steeper slopes in the hills.[6]

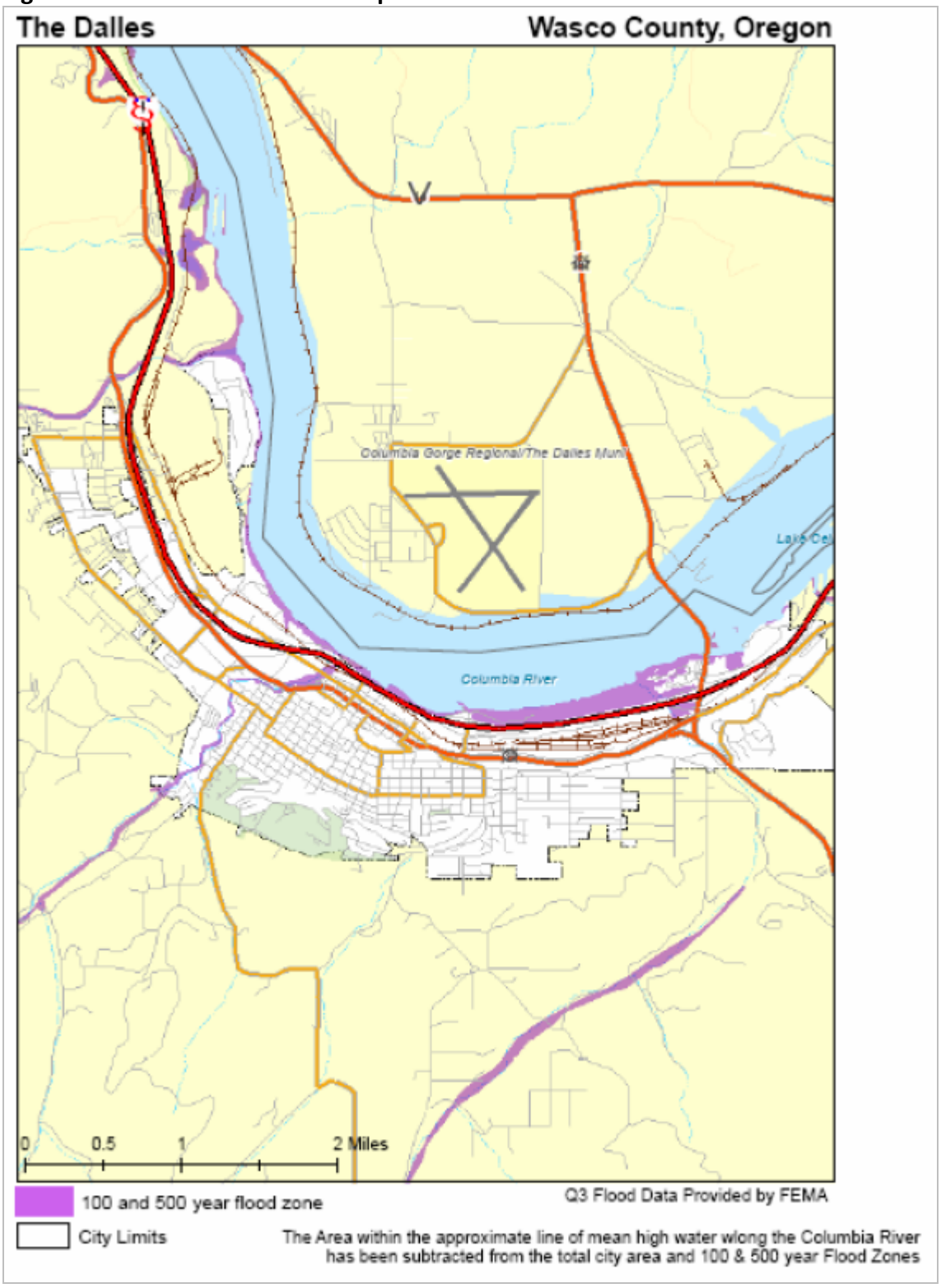
Flood

The working group determined that the city's risk to flood is high, which is the same as the county's risk. In addition to information found in the county's plan, the working group identified other issues specific to The Dalles. During the Mill Creek flood from February 6-8, 1996, the city was flooded through much of downtown, particularly between Fourth St. and Second St., due to record rains and melting from a heavy snow pack. The flood caused over $2 million in damages to downtown businesses. Streets and culverts were also damaged. The same pattern of flooding could occur again from Mill Creek, which passes directly west of The Dalles downtown. Such floods could impact water transmission lines while also impacting city hall and the police station. The city's floodplain ordinance, updated most

[6] Department of Geology and Mineral Industries. 1999. Interpretive Map Series 7 – Relative Earthquake Hazard Maps

recently in 1998, tries to mitigate the impact flooding may have on the city. The city is currently considering opening up the section of Mill Creek between Thompson Park and the Columbia River, where the creek terminates. During the floods in 1996, the water volume overwhelmed the pipe on the side of Thompson Park, forcing the water eastward, which caused the severe downtown flooding. In addition, the flood damaged the city's water treatment plant and finished water pipelines, making the systems as the city's primary water supply unavailable for 30 days. While the City has no repetitive flood loss properties, it does have 3 single loss properties with losses valued at $35,847. In addition, the City of The Dalles has 23 flood policies in affect valued at $4,953,400.

Figure TDA.2: The Dalles Flood Map



Source: Department of Geology and Mineral Industries

Landslide

The working group determined that the city's risk to landslide is moderate, which is higher than the county's risk. While in general the risk of landslide in The Dalles is moderate, there are areas in the city where the risk is high (See Proposed Action Item Landslide Hazard #1 for more detailed information). A 1991 study conducted by the Portland based geotechnical consulting firm, Fujitani Hilts & Associates, delineated areas of town according to the three categories of high, somewhat high, and low risks of sliding, which may have led to a noted decrease in property values. Documented slides in the city, which damaged homes, also likely contributed to decreases in property values. Two very important community businesses, The Columbia Gorge Community College and the Mid-Columbia Medical Center, are located in a portion of the The Dalles that is susceptible to landslides. According to a Department of Geology and Mineral Industries study conducted in 1977, "mass movement in The Dalles includes active sliding in the Scenic Drive – Kelly Avenue area, in-active deep bedrock slides along parts of the cliffs overlooking the Chenoweth district, and in the east parts of town, talus at the base of cliffs, and rockfall and rockslides. A geotechnical study completed for the City in 2006 by the firm of Shannon and Wilson Inc. confirmed a significant rockfall hazard along Brewery Grade, the primary route to the Mid-Columbia Medical Center, and developed a conceptual mitigation plan. The potential for sliding is produced by geologic factors and aggravated by acts of man which increase the amount of water in the ground, such as lawn watering, extensive irrigation of upslope orchards, and blocking of springs by the construction of houses and roads. Deep bedrock failures are evident east of Dry Hollow in terrain analogous to that of the Scenic Drive – Kelly Avenue slide. The slides are located in the Dalles Formation immediately above the contact with the Columbia River Basalt."[7] Roughly 5% of The Dalles may be directly impacted in the event of a landslide.

Volcanic Event

The working group determined that the city's risk to a volcanic event is low, even lower than the county's low risk. In addition to information found in the county's plan, the working group identified other issues specific to The Dalles. The Dalles may be subject to tephra fallout and the secondary impacts of lahar flows along river and stream channels. The city's primary water supply from The Dalles municipal water shed is also directly at risk.

Wildfire

The working group determined that the city's risk to wildfire is moderate to low, which is the same as the county's risk. In addition to information found in the county's plan, the working group identified other issues specific to The Dalles. The city's greatest risk of fire is not from wildfire, but fires triggered by other hazard events. However, the City of The Dalles is a high priority area for wildfire protection in Wasco County because of its high population density, high economic value to the County (numerous businesses and agriculture), and the fact that the fuel loading and weather conditions there are conducive to large and fast moving fires.

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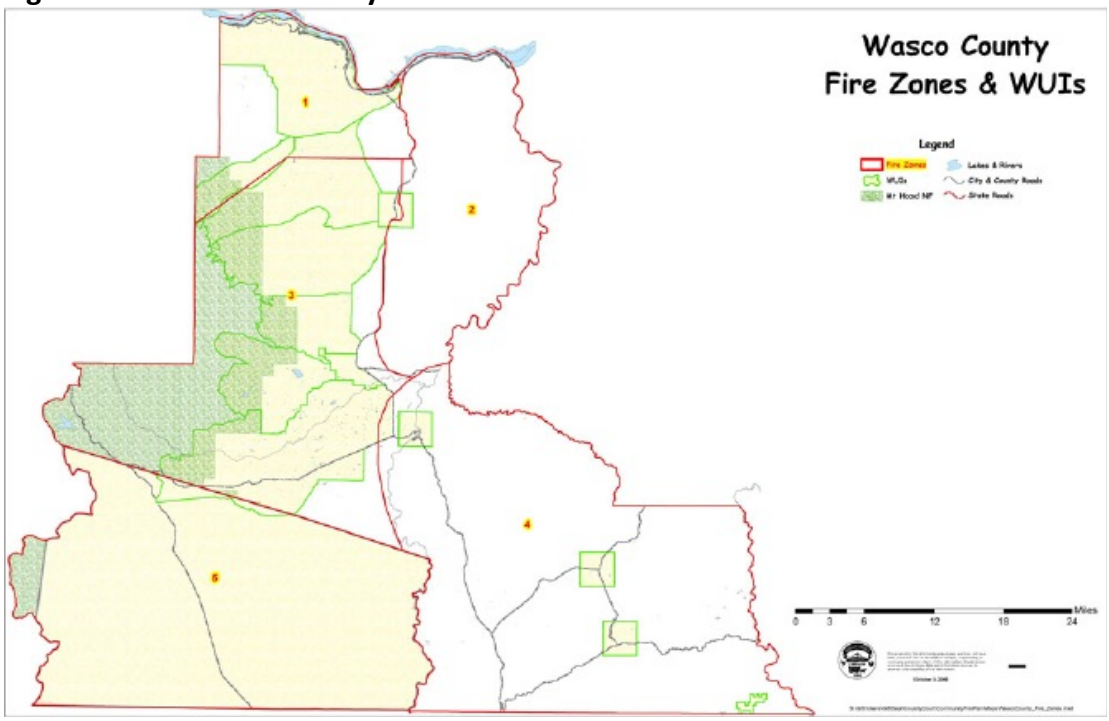
[7] Department of Geology and Mineral Industries. 1977. Geological Hazards of Parts of Northern Hood River, Wasco,

- Wasco County is divided into five zones for the purpose of evaluating the threat of wildfire. The Dalles is in Zone 1, which, although small, has very complex wildfire hazards. Additionally, The Dalles is in the Wildland Urban Interface (WUI).
- The lightning-caused Sheldon Ridge wildfire of 2002 near The Dalles burned 12,681 acres and eight structures, all of which were buildings. Around 250 homes and a major power line were threatened by the flames. Oregon National Guard Troops assisted in battling the flames. The cost of the event was estimated at nearly $4,000,000.[8]
- The Mill Creek Watershed (City of The Dalles Municipal Watershed) is a high priority area for the Oregon Department of Forestry. No one lives in the area, but it is highly valued because it supplies water to the city. The risk of fires starting in the area is low because there are no homes and the incidence of fire is low in the last decade. However, the hazard rating is high because there is a lot of heavy forest fuel in the area. Ongoing efforts to reduce the amount of fire fuels by the forest service and city may reduce this risk over time.
- The community of Chenoweth, which makes up a wild-land urban interface with The Dalles, is also at risk, mostly because there are a number of homes there. The risk for fire starts is high based on the area's history. Additionally, fuel loads vary from moderate to heavy as you move from less-forested to more-forested areas.
- The railroad tie plant in The Dalles is a potential source of fire because of the large number of railroad ties onsite.
- People living in subdivisions on the urban fringe are getting a good education about the unique risks to wildfire they may face.

[8] Oregon Department of Forestry, Suppression Cost Summary - http://cms.oregon.egov.com/ODF/FIRE/FPFC/500.pdf

Figure TDA.3: Wasco County Fire Zones and WUIs



Source: Wasco CWPP

Winter Storm

The working group determined that the city's risk to a winter storm is high, which is the same as the county's risk. In addition to information found in the county's plan, the working group identified other issues specific to The Dalles. Death rarely results from winter storms, but roadways that are damaged or made temporarily inaccessible can hinder police, fire, and medical responses to urgent calls. The Dalles is severed from other communities to the East and West when I-84 is closed due to ice or other severe winter weather. It is not uncommon for The Dalles to be isolated for a two or three day period during a winter season because of impassible, icy roads. During November of 2002, I-84 was closed for nearly a week, preventing any access to the Portland metropolitan area west of The Dalles. Additionally, winter storms can damage property and disrupt utilities. For instance, falling frozen tree branches and power lines sometimes disrupt transportation routes and cause power outages, such as occurred in 2012.

Windstorm

The working group determined that the city's risk to a windstorm is high, which is the same as the county's risk. The County's plan adequately addresses the windstorm risks that the city faces. Strong winds originating from the Pacific Ocean and the Columbia River Gorge, which at times have had gusts over 100 mph, periodically impact all of Wasco County.

On June 2, 1998, a thunderstorm that moved through The Dalles dumped up to 0.67 inches of rain in 20 minutes, knocked out power, and caused some flooding problems. The wind blew trees and tree limbs onto power lines causing power outages to much of the east side of town. Heavy rain caused minor street flooding, flooding of basements and businesses,

and caused manhole covers to come loose. Rock slides were reported along hillsides. Pea sized hail was also reported (National Climatic Data Center).

Tornado

Tornadoes are the most violent weather phenomena known. They are characterized by funnel clouds of varying sizes that generate winds as fast as 500 miles per hour. They can affect an area of ¼ to ¾ of a mile though seldom more than 16 miles long. Tornadoes normally descend from the large cumulonimbus clouds that characterize severe thunderstorms. They form when a strong crosswind intersects with strong warm updrafts in these clouds causing a slowly spinning vortex to form within a cloud. No recorded instance of a tornado causing damage in The Dalles or Wasco County more generally is available.

Goals and Action Items

What are the Plan Goals?

The plan goals help to guide the direction of future activities aimed at reducing risk and preventing loss from future natural hazard events. In order to align with the Wasco County Natural Hazard Mitigation Plan, The City of The Dalles is adopting Wasco County's goals, with a few minor city-specific revisions.

Table TDA.7. Wasco County NHMP Goals

Goal	Statement
Protection of Life & Property	Develop and implement activities to protect human life, commerce, property and natural resource systems
	Reduce insurance losses and prevent repetitive claims for chronic hazard events while promoting insurance for catastrophic hazards
	Evaluate guideline/codes, and permitting processes in addressing hazard mitigation; emphasize non-structural means of mitigating hazard impact
	Utilize mitigation activities to minimize risks associated with hazard events
Emergency Services Enhancement	Evaluate performance of critical facilities during a natural hazard event
	Minimize threat to life safety issues
	Ensure resources, staffing and volunteer base keeps pace with city growth and needs
Education & Outreach	Develop and implement education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, businesses, and industry
	Develop and conduct outreach programs to increase the number of local activities implemented by public and private sector organizations
	Build community consensus through outreach, education and activities
Facilitate Partnerships & Coordination	Strengthen communication and coordination of public/private partnerships and emergency services among local, county and regional governments and the private sector
	Incorporate hazard mitigation into the greater social, economic and natural resource goal framework
Disaster Resilient Economy	Foster a diverse economy to reduce the impacts of a hazard event on any one sector
	Create the conditions for a transitional economy that welcomes new development and innovative ideas that are sensitive to potential hazard risks faced by the city
	Protect recreation and tourism industries by raising awareness of potential hazard impacts
	Provide support for agricultural and forest industries to help them prepare for hazardous events
Natural Resource Systems Protection	Link watershed planning, natural resource management, and land use planning with natural hazard mitigation activities
	Preserve and rehabilitate natural systems to serve natural hazard mitigation functions and protect recreation resources
Acknowledge Responsibility	Coordinate programs to increase natural hazard knowledge base and use technology to better record events and model vulnerability
	Actively acknowledge amount of loss the city is susceptible to and develop efforts to overcome that loss without significant reliance on outside resources
	Incorporate hazard mitigation as part of the city leadership's routine decision making process

Wasco County NHMP

What are the Plan Action Items?

Short and long-term action items identified through the planning process, including the issues identification process, risk assessment, and community profile, are an important part of the mitigation plan. Action items are detailed recommendations for activities that local departments, citizens and others can engage in to reduce risk. The action items identified by the plan are intended to help the city move toward achieving the plan goals. Action items address both multi-hazard and hazard-specific issues for the hazards addressed in this plan.

Each action item is described briefly for quick reference in the City of The Dalles Action Item Matrix, and with more detail in 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. To facilitate implementation, worksheets have been filled out describing each action item with most of the following information.

Rationale or Key Issues Addressed

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items 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. The rationale for proposed action items is based on the information documented in the Hazard Analysis and Issue Identification section of the plan.

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 action item 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.

Implementation through Existing Programs

The Dalles City Addendum includes a range of action items that, when implemented, will reduce loss from hazard events in the city. Within the plan, FEMA requires the identification of existing programs that might be used to implement these action items. To the extent possible, the City of The Dalles will work to incorporate the recommended mitigation action items into existing programs and procedures.

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 Working Group 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 city or other participating jurisdiction 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 action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

Timeline:

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

City of The Dalles NHMP Action Item Matrix

Action Item	Priority	Proposed Action Title	Coordinating Organization	Partner Organizations	Timeline	Alignment with Plan Goals						
						Education & Outreach	Disaster Resilient Economy	Protection of Life & Property	Acknowledge Responsibility	Facilitate Partnerships & Coordination	Natural Resource Systems Protection	Emergency Services Enhancement
Multi-Hazard (MH)												
MH #1	M	Evaluate and Prioritize Critical Infrastructure for Hazard Resilience (e.g. Seismic Retrofit, Wildfire Protections)	Public Works	City Council, Engineering Firms, DOGAMI, OEM, FEMA				X				
MH#2	M	Seek Implementation Funding for Hazard Resilient Modifications to Critical Infrastructure	Public Works	City Council, Engineering Firm, DOGAMI, OEM, FEMA				X				
MH#3	M	Partner with the County for the Coordination of Special Needs Populations Disaster Education/Outreach & Response	County BOC	City Council, Oregon Department of Health and Human Services, Red Cross, Mid-Columbia Medical Center		X						
MH#4	M	Identification and Pursuit of Implementation Funding for Mitigation Actions	Planning	City Council, Wasco County						X		
MH#5	M	Annual Review of Natural Hazards Mitigation Plan /Complete Review/Update/Adoption by City Council Every Five Years	Planning	City Council, Oregon Emergency Management Federal Emergency Management Agency								X
MH#6	M	Develop Long-range Water Resources Plan to Accommodate Current/Project Growth and Mitigate Drought Impact	City Council	Public Works, Fire, Chenowith Water District, Watermaster, DEQ							X	
MH#7	M	Encourage Critical Facilities to Secure Emergency Power	City Council	Planning, Fire, Police, Public Works, State Fire Marshal, Northern Wasco County PUD								X
MH#8	M	Partner with the County to Implement Education/Outreach/Awareness Activities	City Council	Engineering Firm, OEM, FEMA		X						
MH#9	M	"Small Business Awareness and Continuity Planning"	Chamber of Commerce	Planning, Oregon Continuity Planner Association Wasco County, The Dalles Main Street Program			X					

City of The Dalles NHMP Action Item Matrix

Action Item	Priority	Proposed Action Title	Coordinating Organization	Partner Organizations	Timeline	Alignment with Plan Goals						
						Education & Outreach	Disaster Resilient Economy	Protection of Life & Property	Acknowledge Responsibility	Facilitate Partnerships & Coordination	Natural Resource Systems Protection	Emergency Services Enhancement
MH#10	M	Partner with County on All-Hazard Emergency Preparedness	City Council	Planning, Wasco County Emergency Management						X		
Flood Hazard (FH)												
FH#1	M	Explore the potential for The Dalles to participate in the Community Rating System (CRS) of the National Flood Insurance Program (NFIP).	Planning	City Council, Public Works, Wasco County Emergency Management		X		X				X
FH#2	M	Explore acquisition and management strategies to preserve parks, trails, and open space in the floodplain	Planning	City Council, Wasco County Emergency Management, DLCD, OEM, FEMA				X			X	
FH#3	M	Update Flood Insurance Rate Maps (FIRMs)	Planning	City Council, Wasco County Emergency Management, DLCD, OEM, FEMA				X				
FH#4	M	Ensure continued compliance with the National Flood Insurance Program	Planning	City Council, Wasco County Emergency Management, DLCD, OEM, FEMA		X		X				
FH#5	H	Open up Mill Creek tunnel between Thompson Park and the Columbia River, where the creek terminates	Public Works	City Council, Planning, ODOT, Union Pacific, OEM, DLCD, FEMA				X				
Wildfire Hazard (WH)												
WH#1	M	Partner with the County to Implement the CWPP	City Council	Fire, Planning, Public Works, Oregon Department of Forestry, USFS						X		
Landslide Hazard (LH)												
LH#1	H	Seek Implementation Funding for E. Scenic Drive Stabilization Project	Public Works	City Council, Engineering Firm, OEM, FEMA	Short Term			X				

Action Item Proposal Forms

Proposed Action Item:	Alignment with Plan Goals:
MH #1 – Evaluate and Prioritize Critical Infrastructure for Hazard Resilience (e.g. Seismic Retrofit, Wildfire Protections)	Protection of Life and Property

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The City's working group identified that their risk to earthquakes and landslide were greater than that of the County. This is due in part to the number of buildings and infrastructure within the city as it is the major population center and the County seat.

• The working group also acknowledged that many critical facilities in the city are old and that better information about their vulnerabilities is required for the best use of limited mitigation dollars

• According to the Mid-Columbia Household Survey, conducted by the Oregon Natural Hazards Workgroup in the spring of 2006, 96% of respondents indicated that it is very important or somewhat important for the community to protect critical facilities. In addition, over 91% indicated that it is very important or somewhat important to protect and reduce damage to utilities and strengthen emergency services.

• During a flooding event in 1996, Mill Creek caused flood damage in the city's downtown, impacting critical infrastructure. Assessing flood risks to critical infrastructure will assist in identifying potential mitigation strategies that will reduce future flood damages.

Ideas for Implementation:

• Potential facilities to evaluate include: EOC, Dalles Municipal Watershed, Water Treatment Plant, Communications Center, Public Works, Mill Creek Road, Bridges: 197; 6, 9, 10th St., Transmission Lines, Dispatch, and Sewage Plant, Drinking Water Storage Reservoirs, Crow Creek Dam

• The City could utilize Rapid Visual Screening techniques to quickly assess structures in terms of seismic vulnerability.

• Prioritize facilities for retrofit or reconstruction

Coordinating Organization:	Public Works

Internal Partners:	External Partners:
City Council	Engineering Firms, DOGAMI, OEM, FEMA

Potential Funding Sources:	Estimated cost:	Timeline:
FEMA, State and Federal Grants/Loans, City Bond		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2006 – Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
MH#2 - Seek Implementation Funding for Hazard Resilient Modifications to Critical Infrastructure	Protection of Life and Property

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The City's working group identified that their risk to earthquakes and landslide were greater than that of the County. This is due in part to the number of buildings and infrastructure within the city as it is the major population center and the County seat.

• According to the Mid-Columbia Household Survey, conducted by the Oregon Natural Hazards Workgroup in the spring of 2006, 96% of respondents indicated that it is very important or somewhat important for the community to protect critical facilities. In addition, over 91% indicated that it is very important or somewhat important to protect and reduce damage to utilities and strengthen emergency services.

Ideas for Implementation:

• Evaluate funding opportunities

• Complete benefit cost analysis as applicable

• Identify funding partners or other jurisdictions interested in similar retrofits

• Write grant application for funding

• Seek Flood Mitigation Assistance dollars for flood related mitigation actions addressing flood risk to critical facilities.

Coordinating Organization:	Public Works

Internal Partners:	**External Partners:**
City Council	Engineering Firm, DOGAMI, OEM, FEMA

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
FEMA, State and Federal Grants/Loans, City Bond		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2006 -- Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
MH#3 - Partner with the County for the Coordination of Special Needs Populations Disaster Education/Outreach & Response	Education and Outreach

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The City's working group identified that their risk to earthquakes and landslide were greater than that of the County. This is due in part to the number of buildings and infrastructure within the city as it is the major population center and the County seat.

• The Community Profile indicates that the community includes several special needs populations

• According to the Mid-Columbia Household Survey, conducted by the Oregon Natural Hazards Workgroup in the spring of 2006, television news (53%), mail (49%), and newspaper stories (48%) were the most effective ways of receiving information about how to mitigate the impact of natural hazards. In terms of identifying specific news sources that are trusted by the public, 40% of respondents cited the Red Cross as the most trusted source of news. The second most trusted source were utility companies, cited by 38% of respondents.

• This action was identified in the Wasco County plan

Ideas for Implementation:

• Efforts should focus on the following populations: Elderly, Low income, Non-English speakers, Mobile Homes, Incarcerated persons, and Schools/day care

• For improving effectiveness of outreach, partner with the Red Cross and utility providers to create informative mailings about natural hazard mitigation. Also, work with the Red Cross and utility providers to create news stories about natural hazard mitigation, and work with local news media to have the stories run both in print and on television.

Coordinating Organization:	County BOC

Internal Partners:	**External Partners:**
City Council	Oregon Department of Health and Human Services, Red Cross, Mid-Columbia Medical Center

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2006 – Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
MH#4 - Identification and Pursuit of Implementation Funding for Mitigation Actions	Facilitate Partnerships and Coordination

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The City's working group identified that their risk to earthquakes and landslide were greater than that of the County. This is due in part to the number of buildings and infrastructure within the city as it is the major population center and the County seat.

• The reduction of risk in a community typically requires identifying and seeking external funding to implement identified actions.

• Creating an action focusing on identifying and pursuing funding will assist the city follow through on the actions identified in the plan

• This action was identified in the Wasco County plan.

Ideas for Implementation:

• Ensure the City remains an active participant of the County planning efforts.

• Identify opportunities to partner with the County or other jurisdictions to submit grant applications to leverage limited resources

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
City Council	Wasco County

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
FEMA, State and Federal Grants/Loans		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2006 – Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
MH#5 - Annual Review of Natural Hazards Mitigation Plan / Complete Review/Update/Adoption by City Council Every Five Years	Emergency Service Enhancement

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• FEMA requires NHMP update every 5 years to maintain HMGP funding eligibility

• Annual review/update ensures operability of plans and makes 5 year update easier

Ideas for Implementation:

• Designate a convener to be responsible for ensuring that the review and update process take place.

• Include review and update on departmental work plans.

Coordinating Organization:	Planning	
Internal Partners:	**External Partners:**	
City Council	Oregon Emergency Management Federal Emergency Management Agency	
Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing
Form Submitted by:		
Action Item Status:	Submitted July 2006 – Revised 2012	

Proposed Action Item:	**Alignment with Plan Goals:**
MH#6 - Develop Long-range Water Resources Plan to Accommodate Current/Project Growth and Mitigate Drought Impact	Natural Resource Systems Protection

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The City's working group identified that their risk to drought and wildfire were equal to that of the County, however, changing community characteristics indicate the need for long-range water resource planning.

• The issue identification indicated that when the Urban Growth Boundary expands, more businesses, industry and people will need access to water sources.

• The Fire Department also indicated the need for access to water for fire suppression efforts related to the wildfire hazard.

Ideas for Implementation:

• Identify funding to complete the study

• Complete the study/plan

• Develop a work plan to address infrastructure needs

• Identify and seek project funding

• Begin project implementation

Coordinating Organization:	City Council

Internal Partners:	**External Partners:**
Public Works, Fire, Chenowith Water District	Watermaster, DEQ

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
State and Federal Grants		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2006 – Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
MH#7 - Encourage Critical Facilities to Secure Emergency Power	Emergency Services Enhancement

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The City's working group identified that their risk to earthquakes and landslide were greater than that of the County. This is due in part to the number of buildings and infrastructure within the city as it is the major population center and the County seat.

• According to the Mid-Columbia Household Survey, conducted by the Oregon Natural Hazards Workgroup in the spring of 2006, 96% of respondents indicated that it is very important or somewhat important for the community to protect critical facilities. In addition, over 91% indicated that it is very important or somewhat important to protect and reduce damage to utilities and strengthen emergency services. Ensuring that critical facilities have emergency power stores is part of protecting critical facilities, because without power, emergency facilities are severely compromised.

• Critical facilities typically require emergency back-up power to be able to function during and after a disaster.

• The working group identified the lack of emergency backup power at critical facilities

Ideas for Implementation:

• Prioritize facilities that require emergency power

• Identify funding sources

• Apply for funding and implement acquisition of back-up power as prioritized.

Coordinating Organization:	City Council

Internal Partners:	**External Partners:**
Planning, Fire, Police, Public Works	State Fire Marshal, Northern Wasco County PUD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
FEMA, State and Federal Grants/Loans, City Bond		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2006 – Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
MH#8 - Partner with the County to Implement Education/Outreach/Awareness Activities	Education and Outreach

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The City's working group identified that their risk to earthquakes and landslide were greater than that of the County. This is due in part to the number of buildings and infrastructure within the city as it is the major population center and the County seat.
• The working group identified the need to conduct education and outreach activities for the residents of the city.
• According to the Mid-Columbia Household Survey, conducted by the Oregon Natural Hazards Workgroup in the spring of 2006, television news (53%), mail (49%), and newspaper stories (48%) were the most effective ways of receiving information about how to mitigate the impact of natural hazards. In terms of identifying specific news sources that are trusted by the public, 40% of respondents cited the Red Cross as the most trusted source of news. The second most trusted source were utility companies, cited by 38% of respondents.

Ideas for Implementation:

• For improving effectiveness of outreach, partner with the Red Cross and utility providers to create informative mailings about natural hazard mitigation. Also, work with the Red Cross and utility providers to create news stories about natural hazard mitigation, and work with local news media to have the stories run both in print and on television.
• Specific information for Spanish speakers and tourists
• Utilize RARE program to fund placement to implement awareness campaign
• Partner with County on information website
• Fire resistant plants brochures for people pulling building permits
• Wildland Urban Interface homeowner retrofit guides for people pulling building permits
• Educate private property owners on limitations of infrastructure in an emergency (e.g. county cannot plow private driveways).
• Encourage private property owners to upgrade private roadways to accommodate emergency vehicles.
• Utilize communication technology and equipment to provide the public with emergency/natural hazards information during events
• Utilize recognized "National Weeks" for fire protection, public works, and other such events
• Utilize county fairs and other similar events to distribute materials
• Invite the public to participate in annual natural hazard disaster drills
• Present hazard specific information at public workshops
• Distribute preparedness and mitigation info. At community fairs and events
• Maintain a natural hazard display at a local museum (Hood River County Historical Museum)
• Develop a hazard information website that contains scientific facts about natural hazards information on building codes, lists of companies that provide insurance for specific hazards, and education information on damage prevention

Coordinating Organization:	City Council

Internal Partners:	**External Partners:**
	Engineering Firm, OEM, FEMA

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
Planning, Fire, Public Health, Public Works		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2006 – Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
MH#9 - "Small Business Awareness and Continuity Planning"	Disaster Resilient Economy

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• During the issues identification work session, the working group identified that the majority of businesses are small 'mom and pop' shops that may lack resources to recover from a disaster

• Continuity planning would assist business get back on their feet quicker

• Businesses that are prepared will help keep the local economy going

• According to the Institute for Business & Home Safety, more than 1/4 of businesses that close due to a natural hazard never reopen.

• The City's working group identified that their risk to earthquakes and landslides were greater than that of the County. This is due in part to the number of buildings and infrastructure within the city as it is the major population center and the County seat.

Ideas for Implementation:

• Potential partners – Chamber, Downtown Business Association, Rotary

• Utilize existing resources such as the Institute for Business & Home Safety's Open for Business Toolkit

• Work with the Oregon Continuity Planners Association to hold a continuity planning workshop for local businesses

Coordinating Organization:	Chamber of Commerce

Internal Partners:	**External Partners:**
Planning	Oregon Continuity Planner Association Wasco County, The Dalles Main Street Program

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2006 – Revised 2012

Proposed Action Item:	Alignment with Plan Goals:
MH#10 - Partner with County on All-Hazard Emergency Preparedness	Facilitation of Partnerships and Coordination

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The City's working group identified that their risk to earthquakes and landslides were greater than that of the County. This is due in part to the number of buildings and infrastructure within the city as it is the major population center and the County seat.

• The working group identified a lack of human resources available to undertake preparedness activities.

Ideas for Implementation:

• Partner with County when possible to leverage limited human and financial resources

Coordinating Organization:	City Council

Internal Partners:	External Partners:
Planning	Wasco County Emergency Management

Potential Funding Sources:	Estimated cost:	Timeline:
		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	The Dalles Public Works
Action Item Status:	Submitted 2006

Proposed Action Item:	**Alignment with Plan Goals:**
FH#1 - Explore the potential for The Dalles to participate in the Community Rating System (CRS) of the National Flood Insurance Program (NFIP).	Education & Outreach Protection of Life & Property Emergency Services Enhancement

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community flood plain 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 Wasco County to enhance mitigation efforts and decrease the vulnerability to floods.

Ideas for Implementation:

• Determine CRS eligibility requirements

• 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:	Planning

Internal Partners:	**External Partners:**
City Council, Public Works	Wasco County Emergency Management

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
FEMA, State and Federal Grants		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2007 – Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
FH#2 - Explore acquisition and management strategies to preserve parks, trails, and open space in the floodplain	Protection of Life & Property Natural Resource Systems Protection

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address future development [201.6(c)(3)(ii)]. Developing acquisition and management strategies to preserve open spaces in the floodplain will prevent flood hazards by limiting or prohibiting development in these areas.

• Goal 7 of Oregon's Land Use Planning Goals requires that local governments "adopt or amend, as necessary, based on the evaluation of risk, plan policies and implementing measures...[that prohibit] the siting of essential facilities, major structures, hazardous facilities and special occupancy structures, as defined in the state building code (ORS 455.447(1) (a)(b)(c) and (e)), in identified hazard areas..." Developing acquisition and management strategies to preserve open spaces in the floodplain will fulfill goal 7 by preventing the siting of major facilities in a flood-hazard area.

Ideas for Implementation:

• Identify potential opportunities to acquire lands in the floodplain for use as parks, trail, or open space.

• Work with the Department of Land Conservation and Development, Oregon Emergency Management and FEMA to identify potential funding sources.

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
City Council	Wasco County Emergency Management, DLCD, OEM, FEMA

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
FEMA, State and Federal Grants/Loans, City Bond		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2007

Proposed Action Item:	**Alignment with Plan Goals:**
FH#3 - Update Flood Insurance Rate Maps (FIRMs)	Protection of Life and Property

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address future development [201.6(c)(3)(ii)]. Updating the city's FIRM will allow for a better understanding of the flood risk, which can lead to better land use and future development decisions.

• Goal 7 of Oregon's Land Use Planning Goals requires that local governments "adopt or amend, as necessary, based on the evaluation of risk, plan policies and implementing measures...[that prohibit] the siting of essential facilities, major structures, hazardous facilities and special occupancy structures, as defined in

Ideas for Implementation:

• Work with FEMA and DLCD on specific areas to update as funding becomes available.

• Explore opportunities to update floodplain ordinances based on new hazard knowledge provided by new FIRM.

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
City Council	Wasco County Emergency Management, DLCD, OEM, FEMA

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
FEMA, State and Federal Grants		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2007 – Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
FH#4 - Ensure continued compliance with the National Flood Insurance Program	Education & Outreach Protection of Life & Property

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The Disaster Mitigation Act of 2000 requires communities to identify a comprehensive range of mitigation actions

• Ensuring that the city remains in compliance with the National Flood Insurance Program will assist the community in continuing to maintain eligibility for the Flood Mitigation Assistance Program.

• At this time, the City has no repetitive loss properties, keeping up on participation in the National Flood Insurance Program may help ensure that repetitive loss properties are mitigated and that future development does not become repetitive loss property.

Ideas for Implementation:

• Partner with Wasco County on continuing compliance activities.

• Explore opportunities to update floodplain ordinances based on new hazard knowledge provided by new FIRM.

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
City Council	Wasco County Emergency Management, DLCD, OEM, FEMA

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2007

Proposed Action Item:	**Alignment with Plan Goals:**
FH#5 - Open up Mill Creek tunnel between Thompson Park and the Columbia River, where the creek terminates	Protection of Life and Property

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• During the floods in 1996, the water volume overwhelmed the pipe on the side of Thompson Park, forcing water eastward, which caused severe downtown flooding.

• The City has already taken some steps towards implementing this action including a study completed by the Army Corps of Engineers

Ideas for Implementation:

• Get the project listed on Capital Improvement Plans for the Oregon Department of Transportation and Union Pacific Railroad

• Explore funding opportunities.

Coordinating Organization:	Public Works

Internal Partners:	**External Partners:**
City Council, Planning	ODOT, Union Pacific, OEM, DLCD, FEMA

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
FEMA, State and Federal Grants/Loans, City Bond		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	The Dalles Planning Department
Action Item Status:	Submitted July 2007 – Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
WH#1 - Partner with the County to Implement the CWPP	Facilitation of Partnerships and Coordination

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

• The City's working group identified that their risk to wildfire is equal to that of the County.

• The city participated in the development of a County Community Wildfire Protection Plan. In the plan the City is tasked with at least one action under the Strategies By Zone section of the plan.

• The working group identified the need to continue to work with the County, ODF, and USFS on wildfire issues.

Ideas for Implementation:

• Participate in further planning and project activities with the County

• Partner with the County on education and outreach related activities

• Explore potential to distribute wildfire brochures (available through Institute for Business & Home Safety) to residents pulling building permits, who are located in the urban fringe.

• Pursue forest fire fuels reduction opportunities within The Dalles municipal watershed

Coordinating Organization:	City Council

Internal Partners:	**External Partners:**
Fire, Planning, Public Works	Oregon Department of Forestry, USFS

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
FEMA, State and Federal Grants		€ Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	
Action Item Status:	Submitted July 2006 – Revised 2012

Proposed Action Item:	**Alignment with Plan Goals:**
LH #1 – Seek Implementation Funding for E. Scenic Drive Stabilization Project	Protection of Life and Property

Alignment with Existing Plans/Policies:

The Dalles Scenic Drive Embankment Failure Report (2011)
City of The Dalles Geologic Hazards Study (2011)

Rationale for Proposed Action Item:

•The City's working group identified that their risk to earthquakes and landslide were greater than that of the County. This is due in part to the number of buildings and infrastructure within the city as it is the major population center and the County seat.

• The city has identified the potential for catastrophic failure of portions of E. Scenic Drive that pose a risk to life, property, and city infrastructure.

Ideas for Implementation:

• Evaluate funding opportunities

• Write grant application for funding

• Complete a final design

Coordinating Organization:	Public Works

Internal Partners:	**External Partners:**
City Council	Engineering Firm, OEM, FEMA

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
FEMA, State and Federal Grants/Loans, City Bond		X Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	The Dalles Public Works
Action Item Status:	Submitted 2012

Appendix A: Action Items

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
MH #1 - Pursue regional funding for mitigation actions and coordination of efforts	• *Acknowledge Responsibility* • *Facilitate Partnerships and Coordination* • *Emergency Services Enhancement*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- The switch from planning to implementation is the step that begins the reduction of risk
- Current County agencies do not have the staffing to oversee the NHMP or CWPP recommendations and actions; Emergency Manager is only a half-time position
- There are many agencies and organizations involved with hazard protection efforts in Wasco County and there is a need to have a county employee who will represent the county at various meetings and activities associated with hazard issues.
- CWPP Specific
  - Coordination of, and assistance to, rural fire districts.
  - Assistance with grant writing efforts.
  - A close link between the County Court and fire departments.
  - Implementation of SB-360.
  - Need to keep the Wasco County CWPP current and to help implement it.

Ideas for Implementation:

- Form partnerships with cities, other counties, and state agencies. Use these partnerships to apply for federal and local (local bonds, measures) mitigation grants
- Create a part-time position to assist Emergency Manager and coordinate wildfire / other hazard mitigation efforts
- **Create a regional position to oversee plan implementation, education & outreach for the region. The position could be placed under the jurisdiction of the Mid-Columbia Council of Governments though MOU with the participating counties.**
- Quarterly meeting of NHMP Steering Committee (renamed NHM Task Force) to address plan implementation until a position can be filled

Coordinating Organization:	MCCED, MCCOG

Internal Partners:	**External Partners:**
Emergency Management, Planning, Public Works	Cities, State Agencies, Non-Government/Quasi-governmental Organizations, Public, SWCD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Steering Committee
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
MH#2 - Develop Public Outreach / Educational Programs	• *Education and Outreach* • *Acknowledge Responsibility* • *Facilitate Partnerships and Coordination*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Developing education programs aimed at mitigating the risk posed by hazards are sometimes the best way to reduce the risk

Ideas for Implementation:

- Use internet websites, local fairs, news articles, brochures, etc to get the data to the public.
- Create Natural Hazard display to place at library, planning department, court house, and other public buildings
- Create a hazard information page as part of the EM website
- Use public service radio announcements to educate public on emergency procedures
- Sustain education/outreach program for local jurisdictions
  - Coordinate county wide EM training & exercises
  - Train local jurisdictions
  - Inform local jurisdictions of available resources, grants, opportunities and other assistance
  - Disseminate OEM and FEMA information

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
County Agencies (Planning, SWCD, Building, Public Works specifically)	Cities, State Agencies, Non-Government/Quasi-governmental Organizations, Public, Media, Schools

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI / NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
MH#3 - Annual Review and Update of the County Emergency Operations Plan , Community Wildfire Protection Plan, and Natural Hazards Mitigation Plan; Re-Adoption is required	• *Acknowledge Responsibility* • *Facilitate Partnerships and Coordination*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- FEMA requires NHMP update every 5 years to maintain HMGP funding eligibility
- Annual review/update ensures operability of plans and makes 5 year update easier

Ideas for Implementation:

- County Emergency Management will coordinate plan updates annually and complete reviews at least every five years. During the complete reviews, the plans will be evaluated with respect to the county's Zoning Ordinance and Comprehensive Land Use Plan.
- Consider the goals and action items from the County Natural Hazard Mitigation Plan for implementation in other county documents and programs, where appropriate.
- Review the Natural Hazards Mitigation Plan for opportunities to update the county's Comprehensive Land Use Plan and supporting plans and documents. Statewide Planning Goal 7 is designed to protect life and property from natural disasters and hazards through planning strategies.
- Consider how components of the county's Natural Hazards Mitigation Plan might be used in updating current and future capital improvement plans.
- Integrate goals and action items into the county's storm water management program.

Coordinating Organization:	Wasco County Hazard Resilience Committee

Internal Partners:	**External Partners:**
Planning, BOC, Emergency Management, Public Works	OEM, OPDR

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
MH#4 - Create Systems to Support and Maintain at-risk Populations	• *Acknowledge Responsibility* • *Facilitate Partnerships and Coordination* • *Emergency Services Enhancement*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Special needs populations (elderly, disabled, low income, non-English speaking) are at greatest risk during a hazard event.

Ideas for Implementation:

- Database system to 911 EMO Centers showing location of disabled persons
- Database allows for information sharing by assisting agencies
- Website w/ assistance information
- Media campaign
- Establish a neighbor to neighbor network of voluntary organizations

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
Public Health, Planning, Records and Assessment	Red Cross, Hospitals, OR Senior Advisory Council

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
MH#5 - Update County Comprehensive Plan	• *Disaster Resilient Economy* • *Protection of Life & Property* • *Acknowledge Responsibility* • *Natural Resource Systems Protection*
Alignment with Existing Plans/Policies:	
Rationale for Proposed Action Item:	
• Comp. Plan has not been officially updated & adopted by the County Court since the 1980's • Goal 7 is out of date	
Ideas for Implementation:	
• Use updated hazard information for county ordinances and regulations that govern site specific land use decisions	

Coordinating Organization:	Planning		
Internal Partners:		**External Partners:**	
BOC		DLCD	
Potential Funding Sources:		**Estimated cost:**	**Timeline:**
		N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) € Ongoing
Form Submitted by:	NHMP Coordinator		
Action Item Status:	**Deferred / Modified**		

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
MH#6 - Create Emergency Disaster Fund	• *Disaster Resilient Economy* • *Acknowledge Responsibility* • *Facilitate Partnerships and Coordination*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- A fund at the local level can be used to pay for mitigation efforts or leverage state and federal assistance in grants
- Communities willing to actively fund mitigation projects are more likely to receive grant money to make up the difference

Ideas for Implementation:

- Contract third party to perform need analysis
- Partner with local banks

Coordinating Organization:	BOC

Internal Partners:	**External Partners:**
Emergency Response, Emergency Management, Public Works	OEM, FEMA

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) € Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
MH#7 – Develop Small Business Awareness & Continuity Planning Campaign	• *Education and Outreach* • *Disaster Resilient Economy* • *Facilitate Partnerships and Coordination*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Majority of businesses are small "mom & pop" shops or farms/ranches which may lack resources to recover from a disaster
- Continuity planning would assist businesses get back on their feet quicker
- Business that are prepared will help keep the local economy going

Ideas for Implementation:

- Use OPDR business continuity planning materials & methods
- Hold workshops
- Partner with the City of The Dalles

Coordinating Organization:	Emergency Management / BOC

Internal Partners:	**External Partners:**
	Chamber of Commerce

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	OPDR
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
DH#1 - Ensure Long-range Water Resources Development and Quality	• *Disaster Resilient Economy* • *Protection of Life & Property* • *Facilitate Partnerships and Coordination* • *Natural Resource Systems Protection*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Potential and projected growth within the County could place serious burden on water supply for domestic and agricultural use
- Certain areas of the County like the City of Mosier are already feeling the impact of growth and reduced water levels in aquifers
- Studying alternative sources may reveal under-utilized water resources and other information useful to water managers

Ideas for Implementation:

- Assist in the determination of which alternative water sources in or near Hood River County would benefit by detailed studies and also assist in the determination of how these studies can be funded
- **County Adoption of Stricter Water Conservation Policies**

o Establish stronger economic incentives for private investment in water conservation
o Encourage voluntary water conservation
o Improve water use and conveyance efficiencies
o Implement water metering and leak detection programs
o Imposing excess-use charges during times of water shortage
o Imposing mandatory water-use restrictions during times of water shortage
o Conduct water-conservation education of the public and of school children, including special emphasis during times of water shortage

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
BOC	Watermaster, SWCD, OSU Extension, DEQ, ODFW, OECDD, DOGAMI, DLCD, City of The Dalles

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
DH#2 - Support Local Agencies Training on Water Conservation Measures and Drought Management Practices	• *Education & Outreach* • *Disaster Resilient Economy* • *Facilitate Partnerships and Coordination* • *Natural Resource Systems Protection*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Agricultural economy- crops and livestock- susceptive to drought
  - Loss of income for farmers and ranchers during drought season
- Need for raised awareness of the impacts of drought
- Need for coordinated water conservation efforts
- Need for County-wide effort to reduce drought impact

Ideas for Implementation:

- In cooperation with OSU Extension Service and agricultural organizations prominent and respected within the farming and ranching community, build on existing outreach methods with the goal of providing water conservation/drought management training to farmers and ranchers

o Establish a public advisory committee
o Include public participation in drought planning
o Organize drought information meetings for the public and the media
o Implement water conservation awareness programs
o Publish and distribute pamphlets on water conservation techniques / drought management
o Organize workshops on special drought-related topics
o Prepare sample ordinances on water conservation
o Establish a drought information center
o Set up a demonstration of on-site treatment technology at visitor center
o Establish tuition assistance so farmers can enroll in farm management classes
o Develop training materials in several languages
o Provide education on different cultural perspectives of water resources
o Employ public participation and public information

Coordinating Organization:	Soil and Water Conservation District

Internal Partners:	**External Partners:**
Planning	OSU Extension Service, Cherry Growers, Cattlemen's Association, NRCS

Potential Funding Sources:	Estimated cost:	Timeline:
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing
Form Submitted by:	NHMP Coordinator	
Action Item Status:	**Deferred**	

Natural Hazard Action Item Proposal Form

Proposed Action Item:	Alignment with Plan Goals:
FH#1 - Mitigate Flood Event Resulting from Naturally Induced Dam Failure	• *Protection of Life & Property* • *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Acquire or prepare detailed dam failure inundation maps:
  - Identifying the hazard is necessary prior to identifying public notification areas and evacuation routes
- Improve understanding of vulnerability and risk to life and property from natural hazard induced dam failure:
  - If we can understand the risk from dam failure closer to reality, we can plan and use resources more appropriately to prepare against this hazard
- Rehabilitate identified vulnerable dams:
  - Reduce or eliminate the risk to life, property and infrastructure
- Evaluate emergency response plan and identify areas of public notification and evacuation routes:
  - Ensure the plan is adequate to cope with a hazard event

Ideas for Implementation:

- Prepare maps with FEMA 100 and 500-year flood inundation maps along with the dam failure inundation zone. Complete inventory of critical facilities including
- After the improvement of the hazard layers and the vulnerability inventory, the risk analysis should be reevaluated. Provide educational media to identified vulnerable communities.
- Provide support to assist in obtaining funding to perform rehabilitation
- Evaluate existing plan and revise notification and evacuation routes based on vulnerability inventory.

Coordinating Organization:	SWCD

Internal Partners:	External Partners:
Public Works, GIS, Fire Department, Emergency Management	Army Corps of Engineers, BPA, DEQ, WRD

Potential Funding Sources:	Estimated cost:	Timeline:
	N/A	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
FH#2 - Retain NFIP Community Rating System / CRS Rating System	• *Education and Outreach* • *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- CRS Rating System reduces community flood insurance premiums
- Minimize community response and recovery costs
- Provide flood insurance coverage not generally available in private market
- Stimulate floodplain management to guide future development
- Emphasize less costly non-structural flood control measures
- Reduce costs to federal government/taxpayers by shifting burden to floodplain occupants

Ideas for Implementation:

- Implement the steps needed for County to become a participant in the NFIP Community Rating System
- Determine CRS eligibility requirements
- Research and document current activities that County is already conducting.
- Complete and submit CRS participation application
- Update code to reflect requirements of the CRS
- Establish outreach projects to provide education flood hazards to County Residents
- Implement reasonable higher regulatory standards
- Obtain digital floodplain maps

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
BOC	Cities, LCDC, FEMA, OEM, OECDD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
FH#3 - Address Repetitive Loss	• *Education and Outreach* • *Protection of Life & Property* • *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- If County becomes a participant in the CRS, it will be required to develop a Flood Mitigation Assistance Program. FEMA requires that communities developing Flood Mitigation Assistance Programs work with homeowners within the community who have had repetitive loss due to flooding. Implementing this action item will assist the County in meeting Federal Requirements for CRS and the Flood Mitigation Assistance Program.
- County will receive additional points for the CRS program if the County addresses repetitive flood loss properties through NFIP.
- The State of Oregon's Natural Hazard Mitigation Plan indicates County's probability for a future flood event is high (that the county would be likely to have a major flooding event in the next 10-35 years) and the county's vulnerability to a future flood event is moderate. Improved collaboration with owners of at-risk properties can help the County to better identify ways to reduce its flood risk.
- One of the National Flood Insurance Program's primary objectives is to reduce the number of properties subject to repetitive loss. This can be accomplished by first identifying those properties that have been impacted by more than one flood event and then elevating or relocating the home, or acquiring the home for demolition and returning the vacant land to open space in perpetuity.

Ideas for Implementation:

- Consult with property owners and explore mitigation actions for the 12 County properties on FEMA's national repetitive loss list
- For locations with repetitive flooding and significant damages or road closures, determine and implement mitigation measures such as upsizing culverts or storm water drainage ditches

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
BOC	Cities, LCDC, FEMA, OEM, OECDD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
FH#4 - Update FIRM Maps	• *Protection of Life & Property* • *Natural Resource Systems Protection*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- FIRM maps are out of date

Ideas for Implementation:

- Work with FEMA on specific areas to update as funding becomes available; and
- Suggest to FEMA to incorporate 'ground-truthing' models with updates to FIRM

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
GIS, Public Works	FEMA

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		x Short Term (0-2 years) € Long Term (2-4+ years) € Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
FH#5 - Continue to Update County Flood Ordinances as Required	• *Disaster Resilient Economy* • *Protection of Life & Property* • *Acknowledge Responsibility* • *Natural Resource Systems Protection*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Flood ordinances out of date
- Required form NFIP & CRS programs

Ideas for Implementation:

- Assign County Planning staff to research and draft ordinance update
- Hire consultant

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
County Surveyor	DLCD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	County Planning
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
FH#6 - Removal of Passage Barriers along Fifteen Mile Subbasin	• *Protection of Life & Property* • *Natural Resource Systems Protection*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- These activities improve fish passage, minimize stream bank and roadbed erosion, facilitate natural sediment and wood movement, and—during flood events—eliminate or reduce excess sediment loading and dynamic changes in stream flow that cause stream bank erosion, undermining of roadbeds, and the washout of culverts.

- Proper road drainage upgrades, culvert replacements, etc., are likely to diminish the potential adverse effects of roads, including turbidity, sedimentation, and channel extension, by allowing the drainage design features to work properly and erosion to be minimized.

Ideas for Implementation:

- Culvert removal, where possible, and natural channel cross section reestablishment.
- Replacement of undersized culverts that present a barrier to fish movement with appropriately-sized culverts, bottomless arches or bridges.
- Replacement of perched culverts to meet the natural bed of the stream.
- Excavation and realignment of misaligned culverts.
- Modification of culverts replacement or lowering is not feasible.
- Redesign of stream crossings determined to be inappropriate for culvert installations to steel/concrete reinforced bridge installations or fords;
- Repair, upgrade or replacement of bridges and culverts, except that bridge replacements will be full-span, i.e., no bents, piers, or other support structures below bank-full elevation.

Coordinating Organization:	SWCD

Internal Partners:	**External Partners:**
Planning, Public Works	ODF&W

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	Wasco County Soil and Water Conservation District
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
FH#7 - Develop Flood Education & Outreach Programs	• *Education and Outreach* • *Disaster Resilient Economy* • *Protection of Life & Property* • *Facilitate Partnerships and Coordination* • *Natural Resource Systems Protection*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Provide flood event education and outreach to households and businesses; education is often the most effective way to reduce community risk.

Ideas for Implementation:

- Identify and map vulnerable populations;
- Create a flood education curriculum, a speaker-training program, and outreach aimed at specific populations i.e., schools, households, businesses, etc;
- Collaborate with existing program managers to develop a flood education component that supports fish habitat and water quality education curricula;
- Identify existing watershed education programs and determine which programs would support a flood education component;
- Identify and provide mitigation guidance to owners of properties at risk from flooding;
- Encourage development of outreach programs to business organizations that must manage for flood protection;
- Raise awareness level of property owners and developers that impacts upstream result in impacts downstream, and lack of storm water best management practices can result in an increase in flooding events;
- Consider implementing tax incentives for property owner maintaining their private facilities;
- Educate private property owners on restoring natural systems within the floodplain to manage riparian areas and wetlands for flood abatement;
- Erect "monuments" over piped creeks throughout the county and floodplain elevation markers to bring flood awareness to home and business owners who live near them;
- Develop a "Clean Stream" sponsorship program, using the "Friends of Fanno Creek" model. Erect signage recognizing individuals, households, businesses, and organizations committed to the ongoing care of a waterway section. Develop a brochure as an educational tool
- Conduct workshops

Coordinating Organization:	BOC

Internal Partners:	**External Partners:**
Emergency Management, Planning, Building	SWCD, OPDR, FEMA, OEM

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
EH#1 - Rehabilitate Identified Vulnerable Schools, Emergency Facilities, and Public Buildings/Lifelines	• *Protection of Life & Property* • *Emergency Services Enhancement*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:
• Performing the rehabilitation of vulnerable buildings is one of the final steps that actually reduces the risk

Ideas for Implementation:
• Provide scientific basis in effort to obtain local state, federal, and private funding

Coordinating Organization:	Facility Managers

Internal Partners:	**External Partners:**
Emergency Management, BOC, Planning, GIS, Public Works	DOGAMI, OEM, DLCD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) € Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
EH#2 - Improve Knowledge of Earthquake Sources / Improve Earthquake Hazard Zone Maps	• *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- The source and location of an earthquake is a critical component of the expected damage to a particular site
- The current earthquake hazard maps are frequently a compilation of the existing maps, and were not necessarily the result of a systematic approach. These maps were compiled at widely varying scales and therefore have similarly varying levels of detail. The coarse-scale maps may mislead people to believe that certain areas have no hazard, whereas those areas have simply not been evaluated in detail. Systematic upgrading of these maps will lead to greater understanding of hazard locales. This will improve land use planning and provide for more efficient and cost effective development

Ideas for Implementation:

- Improve the existing crustal fault database by expanding LIDAR survey coverage and interpreting the results. After the potentially active faults are identified, trenching should be conducted to associated data such as recurrence intervals and maximum magnitude. Expand the seismic instrument network
- Systematically utilize the new Oregon Geologic Digital Data Compilation project output. Use new digital elevation models including those derived from LIDAR surveys to significantly enhance the accuracy of hazard classification. Collect and compile engineering properties of the geologic units. Incorporate improved spatial (vertical and horizontal) engineering properties data of the geologic rock units (shear wave velocities, strength, grain size, density, etc). Include hydrologic database characteristics such as groundwater depth

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
GIS, Public Works	DOGAMI, OEM, DLCD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
EH#3 - Improve Understanding of Vulnerability and Risk	• *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:
• If we can understand the risk from earthquakes closer to reality, we can plan and use resources more appropriately to prepare against this hazard. Better data provides for better decisions to minimize loss. In the case of lifelines, minimizing direct losses also minimizes the "snowball effect" or indirect losses also.

Ideas for Implementation:
• Complete an inventory of critical public facilities, including schools, emergency facilities, first responder buildings, other key public use structures, and infrastructure lifelines. This is particularly important for critical structures (schools and emergency facilities) and lifelines. After the improvement of the hazard layers and the vulnerability inventory, the risk analysis should be reevaluated.

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
GIS, Public Works	DOGAMI, OEM, DLCD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
EH#4 - Educate Those at Risk	• *Education & Outreach* • *Protection of Life & Property* • *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:
• Those at risk need to be made aware to effect change

Ideas for Implementation:
• Provide education media to identified vulnerable residential and commercial building owners and occupants. Explain structural and non-structural rehabilitation techniques and encourage rehabilitation

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
Public Works, GIS	DOGAMI, OEM, DLCD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
LH#1 - Update County Landslide Ordinance	• *Disaster Resilient Economy* • *Protection of Life & Property* • *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Drafting and adopting landslide ordinances would reduce risk especially within areas marked for future growth

Ideas for Implementation:

- Use financial incentive and disincentives to promote development outside of identified risk Areas
- Oregon Technical Resource Guide has many examples of how other communities have drafted these types of ordinances

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
Planning Commission	OPDR, OEM

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) € Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
LH#2 - Improve Understanding of Landslide Risk Inside Hazard Areas and Improve Warning Systems	• *Disaster Resilient Economy* • *Protection of Life & Property* • *Acknowledge Responsibility* • *Emergency Services Enhancement*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Better data provide for better decisions to minimize loss. Incorporating indirect economic loss better depicts the cost from natural hazard events.
- Once DOGAMI has identified "further review areas" the County can overlay those areas with utility system and tax assessor information to identify potential risk
- Debris flow landslides are rapidly moving and have caused the loss of life in Oregon. The current debris flow hazard maps are based mostly on computer modeling and could be improved through the incorporation of better topographic survey, geologic field data, and human impact data.
- The coordination of a warning alert to the local level is as important as the alert itself.

Ideas for Implementation:

- Complete inventory of critical facilities including: schools and emergency facilities, vulnerable public and commercial buildings, vulnerable residential buildings, and lifelines (including roads). Evaluate risk to life and property, including indirect economic loss. After the improvement of the hazard layers and the vulnerability inventory, the risk analysis should be reevaluated.
- Incorporation and interpretation of new base geologic maps including the Oregon Geologic Data Compilation. Use new slope maps including LIDAR-derived DEM and improvement through future mapping. Collect data related to human impact. Improve rainfall thresholds.
- Improvements to the instrumentation network (real time rainfall monitoring, active debris flow trip instruments, etc) should be installed and implemented. Follow-through improvements to the warning alert can be done through improvements in the chain of warning system down to the local level.

Coordinating Organization:	GIS

Internal Partners:	**External Partners:**
Planning, Emergency Management	DOGAMI, ODF, DLCD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
LH#3 - Update Landslide Hazard Area Maps	• *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- The current landslide hazard maps are a compilation of the existing maps. These maps are a work in progress" and have been compiled at widely varying scales and sometimes only depict risk for certain types of landslides. These various scales and levels of detail may lead to people to believe that some areas have no slope hazard, when the case is that those areas just have not been evaluated yet. Systematic upgrading of these maps will lead to greater understanding of hazard locales. This will improve land use planning and provide for more efficient and cost effective development.

Ideas for Implementation:

- Incorporate new Oregon Geologic Digital Data Model. Sponsor and collect LIDAR surveys to inexpensively vastly improve the landslide hazard model. Continue field-based science research by detailed mapping of existing landslide-prone areas. Once sufficient data is collected, perform modeling to predict areas of future higher to lower instability potential.

Coordinating Organization:	GIS

Internal Partners:	**External Partners:**
Planning, Emergency Management	DOGAMI, ODF, DLCD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
LH#4 - Provide Education/Awareness for Those at Risk	• *Education and Outreach* • *Protection of Life & Property*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- With continued urban and near-urban development, areas with significant hazard risk will face development pressures. Land use development should provide for mitigating potential losses from landslide hazards
- Educate identified vulnerable residential and commercial building owners, occupants, and developers helps those with the greatest risk and streamlines use of County resources

Ideas for Implementation:

- Provide educational media to identified vulnerable residential and commercial building owners, occupants, and developers, which explain structural and non-structural reduction techniques such as local drainage improvements
- Distribute DOGAMI landslide brochure (pick up at Planning office)

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
GIS, Emergency Management	DOGAMI, ODF, DLCD

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
SH#1 - Develop Partnership Programs to Reduce Vulnerability of Public Infrastructure from Severe Winter Storms	• *Disaster Resilient Economy* • *Protection of Life & Property* • *Facilitate Partnerships and Coordination*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Partnerships between County, communities, and utilities distributes burdens of risk and cost
- Partnerships facilitate participation in risk reduction activities in communities with little government resources

Ideas for Implementation:

- Partner with responsible agencies and organizations to design and implement programs that reduce risk to life, property, and utility systems;
- Develop partnerships between utility providers and county and local public works agencies to document known hazard areas and minimize risk

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
Planning, Public Works	Cities, Utilities

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
SH#2 - Encourage Critical Facilities to Secure Emergency Power	• *Emergency Services Enhancement*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Severe storms have the ability to knock down power lines and disrupt the electrical grid
- Critical facilities are crucial to emergency response and all rely on electrical power to provide services; eliminating the possibility of a cut off power supply out of the equation makes those facilities more robust in the event of a hazard

Ideas for Implementation:

- Seek funding and capital improvements for emergency power supplies for all identified critical facilities.

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
Planning, Public Works	Cities, Utilities

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
SH#3 - Support/Encourage Electrical Utilities to Use Underground Construction Methods	• *Disaster Resilient Economy*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Underground construction of electrical utilities where possible through public incentives and partnerships helps to reduce power outages from severe storms
- There is potential for significant growth within the County within the next 50 years; adopting risk reducing building methods such as underground utilities in newly built areas now lessons the risk burden on future generations

Ideas for Implementation:

- Continue support of utility under-grounding program in newly developed areas to minimize future conflicts with utilities;
- Increase the use of underground utilities where possible in redevelopment areas;
- Coordinate with local utility companies and contractors to install underground utilities;
- Partner with utilities to investigate under-grounding utilities in sections of the county that are prone to hazards related to overhead utilities; and
- Identify underground utilities projects as a part of future Capital Improvement Projects (CIP).

Coordinating Organization:	Planning

Internal Partners:	**External Partners:**
Emergency Management, GIS	Cities, Utilities, Building Contractors, Real Estate

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
SH#4 - Increase and Maintain Public Awareness of Severe Storms.	• *Education and Outreach* • *Disaster Resilient Economy*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Education and awareness is often the most efficient and cost effective way to reduce a community's risk
- Focusing on the benefits of mitigation activities through education aimed at households and businesses and targeting of special needs populations ensures community wide coverage

Ideas for Implementation:

- Collect additional information and add to existing informational sources on public education materials for protecting life, property, and the environment from storm events
- Distribute educational materials to County residents and public and private sector organizations regarding evacuation routes during road closures
- Distribute audience-specific educational materials to schools, churches, and other public and private sector organizations
- Develop methods of improving emergency warning system
- Distribute educational materials to County residents and public and private sector organizations regarding preparedness for no-power situations

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
Planning, Public Works	Utilities, Cities, American Red Cross, St. Vincent DePaul, Churches, Fire, FEMA

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	NHMP Coordinator
Action Item Status:	**Deferred**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
WH#1 - Assessment of Non-County Roads for Response to Wildfire Hazards	• *Protection of Life & Property* • *Acknowledge Responsibility* • *Emergency Services Enhancement*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- There are some roads in Wasco County which would limit the ability of fire fighting vehicles to safely access structures during a wildfire event. Some homes may not be saved as fire fighters choose to not defend them because of safety concerns.
- With some situations, substandard roads may not allow residents to evacuate the area during a wildfire.

Ideas for Implementation:

- Complete an inventory showing the condition of roads serving the wildland urban interface. Identify roads which need improvement to allow safe and efficient access for fire fighting vehicles.
- Use information collected as part of the county home survey (NFPA 1141 criteria) to help identify problem roads.
- Prioritize roads as follows: A. Road is adequate and needs no improvement, B. Road needs minor improvement, C. Road needs significant improvement.
- Concentrate inventory efforts on the following communities: Pine Grove, Sportsman's Park, Tayorville/Sportman's Paradise, Mosier/Seven Mile Hill, Shady Brook area, Pine Hollow.

Coordinating Organization:	Wasco County Road Department

Internal Partners:	**External Partners:**
Planning	Rural Fire Departments, Oregon's Fire Marshall's Office, ODF

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	Unknown
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
WH#2 - Increase Wildfire Prevention Awareness and Encourage WUI Areas to Conduct Firewise Workshops	• *Education and Outreach* • *Protection of Life & Property* • *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- More people are locating in the Wildland Urban Interface and many of them need to be made aware of the need to, and what they can do to, prevent wildfires.
- Preventing wildfires is much more cost effective than suppressing them once they get started.

Ideas for Implementation:

- Distribution of fire prevention literature and material to home owners in WUI areas.
- Placement of fire prevention signs at strategic locations. Develop a county-wide fire prevention sign plan in cooperation with ODF, Forest Service and the BLM to identify type of signs, locations, maintenance schedule, etc.
- Place public service announcements about fire prevention on local and regional mass media outlets including the radio, TV and newspapers. Work with local media to produce public service announcements using local fire personnel and community members.
- Conduct fire prevention programs in county schools
- Do one on one landowner contacts to discuss fire prevention, provide on site assessments, suggestions and assistance.
- Assist communities to become "Firewise Communities".
- Help communities to get organized and form neighborhood-type associations. Work with them help identify fire prevention programs for their areas of concern.

Coordinating Organization:	Fire Districts

Internal Partners:	**External Partners:**
Planning	

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	Unknown
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
WH#3 - Provide Parcel/Lot Identification Signage	• *Protection of Life & Property* • *Emergency Services Enhancement*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Easy to read addresses aid fire departments in responding to incidents
- A significant portion of homeowners in Wasco County do not have good signage for identifying their property.

Ideas for Implementation:

- Seek grant funding to provide signs for all homeowners in the Wildland Urban Interface.
- Include up-to-date information to indicate the level of wildfire risk rating for the homes which will help responders determine the appropriate level of response.

Coordinating Organization:	Fire Districts

Internal Partners:	**External Partners:**
Planning	

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	Unknown	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	CWPP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
WH#4 - Accomplish Defensible Space Around Structures	• *Protection of Life & Property* • *Emergency Services Enhancement*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Many homes within Wildland Urban Interface areas do not have adequate defensible space to allow fire fighters to safely defend their property.
- Creation of defensible space is the best measure a landowner can undertake to protect their property during a wildfire situation.

Ideas for Implementation:

- Seek grant funding from the National Fire Plan and other programs to assist landowners in accomplishing defensible space work.
- Encourage landowners to undertake defensible apace work even if grant funding is not available.
- Have volunteer firemen visit homeowners and encourage them to do defensible space work. Have volunteers do surveys of properties and prescribe measures to take to create defensible space.
- Place information on the county web site which explains the need for defensible space and measures which homeowners can take to accomplish it.

Coordinating Organization:	Rural Fire Districts / Planning

Internal Partners:	**External Partners:**
Emergency Management	Landowners, ODF, USFS, Oregon Fire Marshall's Office

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	Unknown	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	CWPP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
WH#5 - Treat Hazard Fuels in the Wildland Urban Interface Including in The Dalles Municipal Watershed	• *Protection of Life & Property* • *Natural Resource Systems Protection* • *Emergency Services Enhancement*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- There is a large area with heavy fuel loads in Wasco County. Wildfires occurring in these areas have the potential to become large in size and difficult to control. Many of these areas are in close proximity to residential developments
- Reducing hazard fuels will reduce the potential for large and intense wildfires. The application of forest thinning, prescribed fires, and brush reduction will allow fire fighters to better attack wildfires as flame lengths will be lower.

Ideas for Implementation:

- Seek grant funding from the National Fire Plan and other programs to assist landowners in accomplishing hazard fuel reduction work.
- Encourage landowners to undertake hazard fuel reduction work, even if grant funding is not available.
- Have volunteer firemen visit homeowners and encourage them to do hazard fuel reduction work. Have volunteers do surveys of properties and prescribe measures to take to create hazard fuel reduction.
- Place information on the county web site which explains the need for hazard fuel reduction and measures which homeowners can take to accomplish it.
- Coordinate hazard fuel reduction projects on private lands with those on National Forest lands to increase the effectiveness of both.
- Consider the following communities as high priority for hazard fuel reduction: Zone 1 – Mosier/Seven Mile Hill, Mill Creek, Chenoweth, Rowena, Cherry Heights. Zone 2 – Celilo Village. Zone 3 - Pine Hollow/Wamic/Sportsman's Park, Pine Grove, Taylorville/Sportsman's Paradise, Tygh Valley.

Coordinating Organization:	Rural Fire Districts

Internal Partners:	**External Partners:**
Emergency Management	Landowners, ODF, USFS, Oregon Fire Marshall's Office

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	Unknown	x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	CWPP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
WH#6 - Map Fire Regimes and Condition Classes	• *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Areas outside of National Forest lands in Wasco County have not been mapped for Fire Regimes and Condition Class.
- A Fire Regime Condition Class map for the county would help determine where the highest priorities are for doing hazard fuel reduction work.

Ideas for Implementation:

- Seek assistance and training from the Forest Service which has experience in mapping Fire Regime Condition Class.
- Utilize county GIS mapping technology to incorporate Fire Regime Condition Class data.
- Place high priority on completing Wildland Urban Interface areas adjacent to National Forest lands.

Coordinating Organization:	GIS

Internal Partners:	**External Partners:**
BOC	Rural Fire Districts, ODF, USFS, Oregon Fire Marshall's Office

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	Unknown	€ Short Term (0-2 years) x Long Term (2-4+ years) € Ongoing

Form Submitted by:	CWPP Coordinator
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
VH#1 - Acquire Detailed Volcanic Hazard Maps	• *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- Review volcanic hazard reports including Crater Lake, Mt. Hood, Mt. Jefferson, Newberry Volcano, and the Sisters Region. The many smaller volcanoes along the Cascade Mountains have not been evaluated for hazards. These smaller volcanoes may not pose far-reaching hazards, but are a hazard to local communities and travelers.

Ideas for Implementation:

- Prepare maps of hazards related to these smaller, yet important, volcanoes.

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
GIS	OEM, DOGAMI, USGS

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
		x Short Term (0-2 years) € Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
VH#2 - Improve Knowledge Base of Volcanic Risk and Vulnerability	• *Acknowledge Responsibility*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- If we can understand the risk from volcanic hazards closer to reality, we can plan and use resources more appropriately to prepare against this hazard

Ideas for Implementation:

- This is particularly important for critical structures (schools and emergency facilities) and lifelines. After the improvement of the hazard layers and the vulnerability, the understanding of vulnerability and risk should be reevaluated

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
GIS	DOGAMI, OEM, USGS

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Natural Hazard Action Item Proposal Form

Proposed Action Item:	**Alignment with Plan Goals:**
VH#3 - Evaluate Emergency Response Plan and Identify Areas of Public Notification and Evacuation Routes	• *Protection of Life & Property* • *Acknowledge Responsibility* • *Facilitate Partnerships and Coordination* • *Emergency Services Enhancement*

Alignment with Existing Plans/Policies:

Rationale for Proposed Action Item:

- The coordination of a warning alert to the local level is as important is the alert itself.

Ideas for Implementation:

- Evaluate existing plan and revise notification and evacuation routes based on vulnerability inventory.

Coordinating Organization:	Emergency Management

Internal Partners:	**External Partners:**
Emergency Response	Cities, ODF, BLM, Warm Springs

Potential Funding Sources:	**Estimated cost:**	**Timeline:**
	N/A	€ Short Term (0-2 years) x Long Term (2-4+ years) x Ongoing

Form Submitted by:	DOGAMI
Action Item Status:	**Deferred / Modified**

Appendix B:
Planning and Public Process

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Memo

To: Federal Emergency Management Agency

From: **Oregon Partnership for Disaster Resilience**

Date: August XX, 2012

Re: **List of changes to the 2007 Wasco County NHMP for the 2012 Plan Update**

Purpose

This memo describes the changes made to the 2007 Wasco County Natural Hazards Mitigation Plan (NHMP) during the 2012 plan update process. Major changes are documented by plan section.

Project Background

In August 2011, Wasco County partnered with the Oregon Partnership for Disaster Resilience (OPDR) to update the 2007 Wasco County Natural Hazards Mitigation Plan (NHMP). The Disaster Mitigation Act of 2000 requires communities to update their mitigation plans every five years to remain eligible for Pre-Disaster Mitigation (PDM) program funding, Flood Mitigation Assistance (FMA) program funding, and Hazard Grant Mitigation Program (HMGP) funding. Members of OPDR and the plan coordinator met with members of the Wasco County steering committee in November (2011), February, May, and June (2012) to update all content within the county's NHMP. OPDR and the committee made several changes to the 2007 NHMP. Major changes are documented and summarized in this memo.

2012 Plan Update Changes

The sections below only discuss *major* changes made to the 2007 Wasco County NHMP during the 2012 plan update process. Major changes include replacement or deletion of large portions of text, changes to the plan's organization, and new additions to the plan. If a section is not addressed in this memo, then it can be assumed that no significant changes occurred.

The plan's format and organization have been altered to fit within OPDR's plan templates. Table B.1 below lists the 2007 plan section names and the corresponding 2012 section names, as updated. This memo will use the 2012 plan update section names to reference any changes, additions, or deletions within the plan.

Table B.1: Changes to Plan Sections

2007 Wasco County NHMP	2012 Wasco County NHMP
Table of Contents	Table of Contents
Executive Summary	Executive Summary
Section I: Introduction	Section 1: Introduction
Section II: Community Profile	Section 2: Risk Assessment
Section III: Risk Assessment Summary	Section 3: Mission, Goals, and Action Items
Section IV: Goals & Action Items	Section 4: Plan Implementation and Maintenance
Section V: Plan Implementation & Maintenance	Hazard Annexes
Hazard Annex	The Dalles City Addendum
Appendix A: Public Process	Appendix A: Action Item Forms
Appendix B: Resource Directory	Appendix B: Planning and Public Process
Appendix C: Household Natural Hazards Preparedness Survey	Appendix C: Community Profile
Appendix D: Economic Analysis	Appendix D: Economic Analysis
Appendix E: Existing Plans & Programs	Appendix E: Mid-Columbia Region Natural Hazard Mitigation Public Opinion Survey
Appendix F: Mitigation Tools	Appendix F: Grant Programs
Appendix G: Acronyms	

Aside from substantial changes to plan section content, the most visible changes to the plan's organization from the update process are the inclusion of the updated The Dalles City Addendum, the reclassification of the community profile from a section to an appendix, the replacement of the plan's hazard annex with the natural hazard section of Wasco County's Threat and Hazard Identification and Risk Assessment (THIRA) document, the addition of an appendix that provides grant program information, and the removal of Appendix G: Acronyms as well as Appendix B: Resource Directory.

Front Pages

1. The plan's cover has been updated.
2. Acknowledgements have been updated to include the 2012 project partners and planning participants.

Volume I

Volume I provides the overall plan framework for the 2012 NHMP update. Volume I contains the following sections: 1) Introduction; 2) Risk Assessment 3) Mission, Goals, and Action Items; and 4) Plan Implementation and Maintenance.

Section 1: Introduction
Section 1 introduces the concept of natural hazards mitigation planning and answers the question, "Why develop a mitigation plan?" Additionally, Section 1 summarizes the 2012 plan update process, and provides an overview of how the plan is organized. Major changes to Section 1 include the following:

1. Most of Section 1 includes new information that replaces out of date text found in the 2007 NHMP. The new text defines mitigation, gives examples of mitigation strategies, and describes the federal mitigation funding programs for which Wasco County is eligible to apply (i.e., the Pre-Disaster Mitigation (PDM) Program, the Flood Mitigation Assistance (FMA) Program, and the Hazard Mitigation Grant Program (HMGP)).

2. Section 1 of the 2007 NHMP discussed the methodology for developing a plan and how the plan was organized. OPDR and the plan update coordinator replaced this information with text that summarized the development of the 2007 NHMP and added new text to describe the 2012 plan update process, including plan update meetings, public outreach efforts, and final plan review and adoption processes.

Section 2: Risk Assessment
Section 2 describes Wasco County's vulnerability to natural hazards in the region. This section highlights the hazards themselves in terms of probability and incidence, and identifies community assets. Major changes to Section 2 include the following:

1. Development of Relative Risk scores to more accurately define hazard risks in the county, and to supplement previously developed Total Threat Scores.

2. An overview of Wasco County hazards was developed that summarizes information from the plan's Hazard Annex.

3. Community Vulnerability has been added to the section including a listing of community assets and issues that fall under Populations, Economies, Land Use and Development, Critical Infrastructure, and Environment categories.

4. Additional tables address NFIP participation information and general risk assessment scoring.

Section 3: Mitigation Strategy
This section provides the basis and justification for the mission, goals, and mitigation actions identified in the NHMP. Major changes to Section 3 include the following:

1. Wasco County's steering committee reviewed the 2007 plan's goals and modified them with the goals currently identified in Section 3. One goal (Intergenerational Equity) was deleted from the plan entirely, and four others (Disaster Resilient Economy, Protection of Life and Property, Natural Resource Systems Protection, and Emergency Services Enhancement) were modified slightly in terms of language. The 2007 NHMP goals previously read as follows:

Goal #1: Education & Outreach

Goal Statement 1: Develop and implement education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, businesses, and industry.
Goal Statement 2: Develop and conduct outreach programs to increase the number of local activities implemented by public and private sector organizations.
Goal Statement 3: Build community consensus through outreach, education and activities

Goal #2: Disaster Resilient Economy

Goal Statement 1: Foster a diverse economy to reduce the debilitation impacts of a hazard event on any one sector.
Goal Statement 2: Create the conditions for a transitional economy that welcomes new industry and innovative ideas that are sensitive to potential hazard risks faced by the county.
Goal Statement 3: Protect recreation and tourist industries by raising awareness of potential hazard impacts.
Goal Statement 4: Provide support for agricultural industries to help them prepare for hazardous events.

Goal #3: Protection of Life and Property

Goal Statement 1: Develop and implement activities to protect human life, commerce, property and natural resource systems.
Goal Statement 2: Reduce insurance losses and repetitive claims for chronic hazard events while promoting insurance for catastrophic hazards.
Goals Statement 3: Evaluate county guideline/codes, and permitting processes in addressing hazard mitigation; emphasize non-structural means of mitigating hazard impact.
Goal Statement 4: When applicable, utilize structural mitigation activities to minimize risks associated with hazard events.

Goal #4: Intergenerational Equity

Goal Statement 1: Encourage growth and development that meets the needs of the present without compromising future generations.
Goal Statement 2: Preserve the "small town" character of the county.

Goal #5: Acknowledge Responsibility

Goal Statement 1: Coordinate programs to increase natural hazard knowledge base and use technology to better record events and model vulnerability.
Goal Statement 2: Actively acknowledge amount of loss the county is susceptible to and develop efforts to overcome that loss without significant reliance on outside resources.
Goal Statement 3: Incorporate hazard mitigation as part of county leadership's routine decision making process.

Goal #6: Facilitate Partnerships and Coordination

Goal Statement 1: Strengthen communication and coordination of public/private partnerships and emergency services among local, county and regional governments and the private sector.
Goal Statement 2: Incorporate hazard mitigation into the greater social economic and natural resource goal framework.

Goal #7: Natural Resource Systems Protection

Goal Statement 1: Link watershed planning, natural resource management, and land use planning with natural hazard mitigation activities to protect vital habitat and water quality.
Goal Statement 2: Preserve and rehabilitate natural systems to serve natural hazard mitigation functions and protect recreation and tourist resources.

Goal #8: Emergency Services Enhancement

Goal Statement 1: Evaluate performance of critical facilities during a natural hazard event.
Goal Statement 2: Minimize life safety issues.
Goal Statement 3: Ensure resources, staffing and volunteer base keeps pace with county growth.

2. The county's goals were also re-prioritized by members of the 2012 steering committee during a committee meeting activity, where they were re-prioritized to the way they currently appear in Section 3. The goals were previously prioritized as follows:

Priority 1:
Protection of Life and Property
Facilitate Partnerships and Coordination

Priority 2:
Acknowledge Responsibility

Priority 3:
Emergency Services Enhancement

3. Several other tables and figures in the section were modified during the plan update. Several new plans were added to Table 3.1: Wasco County Existing Plans and Policies, and several organizations were eliminated or modified in Table 3.2: Wasco County Community Organizations and Programs. Figure 3.2: Wasco County Action Item Framework, a flow chart that outlined the plan's action item framework in terms of coordinating organizations, was also modified to reflect changes and updates to the plan's action items. The Wasco County Action Item Matrix, a set of summary tables describing the county's action items, was also changed to reflect updates to the plan by the steering committee.

On May 23, 2012, the Wasco County steering committee met to review the 2007 NHMP action items. The Wasco County steering committee reviewed and identified which of the 2007 NHMP's 48 action items had been completed or not, or whether they should be deleted or deferred. Action items were deleted for a number of reasons, including not meeting basic action item criteria such as being measurable, assignable, or achievable. Action items that were deferred had not yet been addressed or were only partially addressed over the previous five years, but the steering committee decided they were still worthy of being continued through the 2012 update. Most of the Action items that were deferred (34) were modified in some way to make them more achievable, accurate, or actionable. The 48 action items from the 2007 NHMP and their statuses are discussed in Table B.2 below.

Table B.2: 2007 Wasco County NHMP Action Items

Action Item	Status	Comment	Description
Multi-Hazard (MH)			
Mutli-Hazard (ST ongoing)	Deferred / Modified	Lack of sufficient funding	Pursue regional funding for mitigation actions and coordination of efforts
Mutli-Hazard (ST ongoing)	Deferred / Modified	Ongoing	Develop Public Outreach / Educational Programs
Mutli-Hazard (ST ongoing)	Deferred / Modified	Ongoing	Annual Review and Update of the County Emergency Operations Plan , Community Wildfire Protection Plan, and Natural Hazards Mitigation Plan; Re-Adoption is required
Mutli-Hazard (LT ongoing)	Deleted	Duplicative / redundant	Pursue Funding to Increase Hazard Knowledge Base & Develop & Maintain Comprehensive Impact Database
Mutli-Hazard (ST ongoing)	Deferred / Modified	Created at-risk population registry - ongoing	Create Systems to Support and Maintain at-risk Populations
Multi-Hazard (LT)	Deleted	Coordination unrealistic, occuring under different tracks in other organizations	Create County Position for volunteer Coordination and Planning
Multi-Hazard (LT)	Deferred / Modified	Work in progress (currently being updated)	Update County Comprehensive Plan
Multi-Hazard (LT)	Deferred / Modified	Lack of sufficient funding, has not been proposed	Create Emergency Disaster Fund
Multi-Hazard (LT)	Completed	Part of the county Emergency Operation Plan	Develop Post-Disaster Recovery Plan
Multi-Hazard (ST)	Completed	County-wide communication strategy developed with fireside grant in 2006. Increased radio coverage.	Create Emergency Communication Systems that are Interoperable
Mutli-Hazard (LT ongoing)	Deferred / Modified	Limited resources and communication	Develop Small Business Awareness & Continuity Planning Campaign

Action Item	Status	Comment	Description
Drought Hazard (DH)			
Drought (ST ongoing)	Deferred / Modified	The City of The Dalles built a new resevoir, and improved well/river water sources	Ensure Long-range Water Resources Development and Quality
Drought (LT	Deferred	Ongoing	Support Local Agencies Training
Flood Hazard (FH)			
Flood (ST ongoing)	Deferred / Modified	Ongoing	Mitigate Flood Event Resulting from Naturally Induced Dam Failure
Flood (ST ongoing)	Deferred / Modified	Ongoing	Retain NFIP Community Rating System / CRS Rating System
Flood (ST ongoing)	Deferred / Modified	Haven't had repetetive flood issues, ongoing	Address Repetitive Loss
Flood (ST)	Deferred	Lack of FEMA priority	Update FIRM Maps
Flood (ST ongoing)	Deferred / Modified	Most recent update by county Planning Department in 2008/2009	Continue to Update County Flood Ordinances as Required
Flood (LT ongoing)	Deferred / Modified	Ongoing	Removal of Passage Barriers along Fifteen Mile Subbasin
Flood (LT	Deferred /	Ongoing	Develop Flood Education &
Earthquake Hazard (EH)			
Earthquake (LT)	Deferred / Modified	Lack of FEMA / State priority	Rehabilitate Identified Vulnerable Schools, Emergency Facilities, and Public Buildings/Lifelines
Earthquake (LT ongoing)	Deferred / Modified	Ongoing	Improve Knowledge of Earthquake Sources / Improve Earthquake Hazard Zone Maps
Earthquake (LT ongoing)	Deferred / Modified	Ongoing	Improve Understanding of Vulnerability and Risk
Earthquake	Deferred /	Ongoing	Educate Those at Risk
Landslide Hazard (LH)			
Landslide (LT)	Deferred	Limited Staff	Update County Landslide Ordinance
Landslide (LT ongoing)	Deferred / Modified	Ongoing	Improve Understanding of Landslide Risk Inside Hazard Areas and Improve Warning Systems
Landslide (LT ongoing)	Deferred / Modified	DOGAMI recently updated the county's SLIDO maps	Update Landslide Hazard Area Maps
Landslide	Deferred /	Ongoing	Provide Education/Awareness for

Action Item	Status	Comment	Description
Severe Storm Hazard (SH)			
Severe Storm (LT ongoing)	Deferred / Modified	Ongoing	Develop Partnership Programs to Reduce Vulnerability of Public Infrastructure from Severe Winter Storms
Severe Storm (ST ongoing)	Deferred / Modified	Installed emergency generators to several critical county facilities. The City of The Dalles services still need emergency power.	Encourage Critical Facilities to Secure Emergency Power
Landslide Hazard (LH)			
Landslide (LT)	Deferred	Limited Staff	Update County Landslide Ordinance
Landslide	Deferred /	Ongoing	Improve Understanding of
Landslide (LT ongoing)	Deferred / Modified	DOGAMI recently updated the county's SLIDO maps	Update Landslide Hazard Area Maps
Landslide (LT ongoing)	Deferred / Modified	Ongoing	Provide Education/Awareness for Those at Risk
Severe Storm Hazard (SH)			
Severe Storm (LT ongoing)	Deferred / Modified	Ongoing	Develop Partnership Programs to Reduce Vulnerability of Public Infrastructure from Severe Winter Storms
Severe	Deferred /	Installed emergency	Encourage Critical Facilities to
Severe Storm (ST ongoing)	Deferred / Modified	Ongoing	Support/Encourage Electrical Utilities to Use Underground Construction Methods
Severe Storm (LT ongoing)	Deferred	Ongoing	Increase and Maintain Public Awareness of Severe Storms.
Wildfire Hazard (WH)			
Wildfire (ST ongoing)	Deferred / Modified	Ongoing	Assessment of Non-County Roads for Response to Wildfire Hazards
Wildfire (LT)	Completed	Tygh Valley and Wamic fire districts formed	Bring All Unprotected Lands Under Some Form of Wildfire Protection Coverage
Wildfire (LT)	Deleted	Unrealistic task	Complete Surveys and Evaluations of Homesites Using NFPA 1141 Criteria

Action Item	Status	Comment	Description
Wildfire (ST)	Deleted	Outside of scope of the Wasco County's Natural Hazard Mitigation Plan	Assist Fire District in Upgrading Equipment/Facilities and in Providing Training
Wildfire (ST ongoing)	Deferred / Modified	Ongoing	Increase Wildfire Prevention Awareness and Encourage WUI Areas to Conduct Firewise Workshops
Wildfire (ST ongoing)	Deferred / Modified	Program is currently being administered	Provide Parcel/Lot Identification Signage
Wildfire (ST ongoing)	Deferred / Modified	Ongoing	Accomplish Defensible Space Around Structures
Wildfire (ST ongoing)	Deferred / Modified	Ongoing	Treat Hazard Fuels in the Wildland Urban Interface Including in The Dalles Municipal Watershed
Wildfire (ST ongoing)	Deleted		Conduct Firewise Workshops
Wildfire	Deferred /	Lack of staff / funding	Map Fire Regimes and Condition
Wildfire (LT)	Completed	Tygh Valley and Wamic fire districts formed	Assist Pine Hollow, Sportsman's Park and Wamic Communities to Form a Tax Base Fire District
Wildfire (LT)	Completed	Bark piles have been cleaned up	Clean Up Brownfields Bark Piles in Maupin
Wildfire	Deleted	Not practical	Create Fuel Breaks Around CRP
Volcano Hazard (VH)			
Volcano (ST ongoing)	Deferred / Modified	Ongoing	Acquire Detailed Volcanic Hazard Maps
Volcano (LT ongoing)	Deferred / Modified	Ongoing	Improve Knowledge Base of Volcanic Risk and Vulnerability
Volcano (LT ongoing)	Deferred / Modified	Ongoing	Evaluate Emergency Response Plan and Identify Areas of Public Notification and Evacuation Routes

Section 4: Plan Implementation and Maintenance

This section details the formal process that will ensure that the Wasco County Natural Hazards Mitigation Plan remains an active and relevant document. Major developments from the Planning Implementation and Maintenance update steering committee meeting involved the following:

1. The committee agreed to maintain its current co-convener structure, in which NHMP duties are split between Wasco County Emergency Management and the Wasco County Planning Department.

2. The committee agreed to maintain its current structure, and to keep its semi-annual meeting schedule

3. Minor changes and revisions were made to the plan's public involvement strategy.

Volume II Hazard Annexes

Volume II is comprised of Wasco County's recently updated Threat and Hazard Identification and Vulnerability Analysis (THIRA). The document was updated in 2012 by Wasco County Emergency Management, and defines hazards and vulnerabilities in Wasco County and each of its cities. The document contains an introduction that describes risk assessment processes, as well as the methodology used to develop the plan's hazard analysis. The hazard annexes provide detailed risk assessments for drought, earthquake, flood, wildland fire, landslide, severe local storms, tornado, and volcano.

The Hazard Annex from the 2007 Wasco County NHMP divided each hazard into four section headings:

(1) Best Available Local Data
(2) State of Oregon NHMP Mid-Columbia (Region 5) Risk Assessment
(3) Wasco County Hazard Identification and Vulnerability Assessment (HIVA)
(4) Oregon Technical Resource Guide

For all essential purposes of the update process, best available local data was incorporated into the update of the county's THIRA, which itself is an update of the county's HIVA. Information from the Mid-Columbia (Region 5) Risk Assessment was used and referenced during most stages of the 2012 county update process, however references to the Oregon Technical Resource Guide have been removed from the plan.

Volume III City/Special District Addendums

The Dalles City Addendum

The City of The Dalles did not finish and approve a full city addendum before Wasco County originally submitted its completed NHMP to FEMA for approval in January, 2007. However the city did submit an addendum to FEMA in July, 2007, that was approved and successfully utilized to acquire a FEMA Pre-disaster Mitigation Grant for a city rock scaling project conducted by The Dalles Public Works.

On June 18, 2012, The Dalles NHMP Working Group met to revise and update the city addendum. In attendance was the Wasco County NHMP update coordinator, along with the director of The Dalles City Planning, and the director of The Dalles Public Works. All sections of the city addendum were reviewed at the meeting, and the working group agreed to the following revisions and plan updates:

1) Mitigation and Plan Implementation
   - The working group agreed to maintain their current implementation strategy
   - Two new plans were added to the "Implementation through Existing Programs" section
   - The working group agreed to maintain their current public participation strategy and plan maintenance schedule.
2) Community Profile
   - It was agreed that the Wasco County NHMP update coordinator would update the US Census data and tables in the city addendum's community profile.
3) Goals
   - The working group adopted the updated Wasco County NHMP Goals, with a few edits to language in several goal statements
4) Hazard Analysis and Issue Identification
   - Minor changes and additions were made to the hazard summaries of drought, earthquake, flood, landslide, volcanic event, wildfire and winter storm
   - The working group agreed to adopt the hazard analysis and issue identification for tornado from the Wasco County plan
5) Action Items
   - An Action Item Matrix was developed that lists and summarizes each of the city's action items for easier reference and utilization
   - A new action item was developed at the update meeting, "LH #1 – Seek Implementation Funding for E. Scenic Drive Stabilization Project"
   - Of the city's 18 action items, one action item (MH #4) was marked as completed, another (MH #7) was deleted, and the other sixteen action items were deferred with eleven receiving minor modifications
   - It was agreed that action items FH #5 and LH #1 would have the highest priority rating, while all of the other actions items would have a "moderate" rating.

Volume IV Resource Appendices

Appendix A: Action Item Forms

Appendix A is new to the Wasco County NHMP and lists the plan's action items. Action items are detailed recommendations for activities that local departments, citizens and others could engage in to reduce risk. This appendix contains detailed action item forms for each of the mitigation strategies identified in this plan.

The 2007 NHMP included action items, but the detailed action item proposal forms were included at the end of the Mitigation Strategy section. The 2012 Appendix A action items include most of the 2007 action items, though most action items were deleted, completed or modified during the 2012 NHMP update process.

Appendix B: Planning and Public Process

Appendix B includes documentation of all the countywide public processes utilized to develop the plan. It includes invitation lists, agendas, sign-in sheets, and summaries of steering committee

meetings, and public involvement meetings or outreach strategies. The 2007 NHMP's public process is also fully documented in Appendix B.

Appendix C: Community Profile
Appendix C describes the community in a variety of ways. This section highlights geographic, demographic, employment, housing, transportation, and land use characteristics. The community profile was included in the 2007 NHMP as the section II Community Profile. Though the theme of the 2012 community profile is consistent with the Section II Community Profile from the 2007 NHMP, the entire section has been updated and modified in terms of scope and information, expanding from 14 to 51 pages.

Appendix D: Economic Analysis of Natural Hazard Mitigation Projects
Appendix D describes the Federal Emergency Management Agency's (FEMA) requirements for benefit cost analyses in natural hazards mitigation, as well as various approaches for conducting economic analyses of proposed mitigation activities. This appendix replaces the 2007 NHMP's information about benefit cost analyses.

Appendix E: Mid-Columbia Region Natural Hazard Mitigation Public Opinion Survey
Appendix E provides a summary report of the survey administered to community stakeholders in the fall of 2011 during the early stages of the Wasco County NHMP Update. The Oregon Partnership for Disaster Resilience (OPDR) distributed a mailed survey to 7,500 random households throughout an eight county region in Northern Oregon. The counties surveyed included: Clackamas, Hood River, Gilliam, Morrow, Sherman, Umatilla, Wasco, and Wheeler. OPDR developed and distributed the survey in partnership with the University of Oregon's Resource Assistance for Rural Environments (RARE) program. This appendix replaces the 2007 NHMP's tables and summaries from the previous regional survey.

Appendix F: Grant Programs
This appendix lists state and federal resources as well as grant opportunities by agency and program. Appendix F essentially replaces the 2007 NHMP's Appendix B.

November 10, 2011 Plan Update Meeting #1 Materials

Wasco County Planning Department

"Service, Sustainability & Solutions"

2705 East Second St. • The Dalles, OR 97058
Phone: (541) 506-2560 • wcplanning@co.wasco.or.us
www.co.wasco.or.us/planning/planhome.html

Meeting: Natural Hazards Mitigation Plan Update – Kickoff Meeting

Date: Thursday, November 10th

Time: 1:00 – 3:30 p.m.

Location: Wasco County Planning Department Conference Room
2705 East Second Street (Public Works Building)

MEETING AGENDA

I. Introductions and Background (30 minutes)

- Welcome & Introductions
- Primary Goals/Anticipated Outcomes
- Process Overview
- Who is Involved & Why

II. Natural Hazards Mitigation Overview/Update Process (60 minutes)

- What is Natural Hazards Mitigation Planning
- Grant Opportunities
- Plan Update Process & Timeline
- Steering Committees & Expectations

III. Discussion Items (30 Minutes)

- Previous NHMP Action Items
- Public Involvement Strategies

IV. Next Steps (15 Minutes)

- Work to be Completed Before Next Meeting
- Identify Meeting Dates for Remaining Three Meetings

IV. Questions/Comments/Other (15 minutes)

× News C = Cost

Meeting Sign-In

11-10-11 1:00

Wasco
[~~NAME~~] County NHMP UPDATE
[~~Meeting Name~~] [~~DATE MO/DAY/YEAR~~]
Wasco Steering Comittee Kickoff Thursday 11/10/11

Name	Representing	Email	Roundtrip mileage (if applicable)
John Roberts	Wasco County Planning Dept.	johnr@co.wasco.or.us	
Will Clark	RARE / MCCOG		
GARRETT JENSEN	RARE / MCCOG		
JOSH BRUCE	OPDR		
MARTY MATHERLY	WASCO COUNTY PUBLIC WORKS	martym@co.wasco.or.us	
TYCHO GRANVILLE	WASCO COUNTY GIS	TYCHOG@CO.WASCO.OR.US	
Mike Davidson	Wasco County Emergency Manager	miked@co.wasco.or.us	mike: (Count ½ Time) 1 Hr Review Plan → Report ½ Hour!
Ryan Bessette	Wasco County Soil & Water Conservation District	ryan.bessett@or.nacdnet.net	

Rod Runyon BOC Wasco County
Dennis Whitehouse NWASCO County SD21 whitehoused@nwasco.k12.or.us

Memo

To: John Roberts

From: William Clark, RARE-MCCOG / Josh Bruce, OPDR

Date: September 2_, 2011

Re: **Wasco County 2011-2012 Natural Hazard Mitigation Plan Update, Phase I – Getting Started**

Purpose

This memorandum outlines the components of Phase I (Getting Started) of the 2011 Wasco County Natural Hazard Mitigation Plan Update, including a preliminary schedule, initial data needs and next steps for the Oregon Partnership for Disaster Resilience (OPDR) as well as the Wasco County Project Lead and Steering Committee.

Background

A Natural Hazard Mitigation Plan (NHMP) forms the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster impacts, reconstruction and repeated damage. It creates a framework for risk-based decision making to reduce damages to lives, property and the economy from future disasters. Jurisdictions with Federal Emergency Management Agency (FEMA) approved mitigation plans are eligible for federal grant funding to implement those mitigation items identified in the plan. Jurisdictions are required to review, update and re-seek FEMA approval of their plans every five years in order to maintain grant eligibility. Wasco County adopted its Natural Hazard Mitigation Plan in February 2007 making it due for its 5-year update early 2012.

The NHMPs of Clackamas, Hood River, Sherman, Gilliam, Morrow, Wheeler and Umatilla Counties are also nearing expiration. In an effort to streamline the update process, OPDR will facilitate a regional planning approach with training sessions, technical assistance and plan updates occurring for each county simultaneously. We anticipate holding up to four regional training sessions, and appreciate your cooperation as we attempt to facilitate this process as efficiently as possible.

Preliminary Fall and Winter 2011-2012 Schedule

Between now and January 2012, OPDR will work with the Wasco County Project Lead and Steering Committee to:

Develop a Work Plan (October 2011)

- Establish a viable work plan with the intention of submitting the Wasco County NHMP Update for FEMA approval in the summer of 2012
- Review the OPDR Plan Update Training Manual (available on Basecamp)

Conduct Project Initiation Meeting Between OPDR and County Project Leads (October 2011)

- Review scope of work and overall project schedule
- Review roles and responsibilities
- Coordinate plan update training schedule and locations

In order to maintain momentum and complete the plan update on schedule OPDR suggests that Wasco County complete the following during this same period:

Reconvene Mitigation Plan Steering Committee (October 2011)

- Convene 2007 Wasco County NHMP Steering Committee*
- Identify and invite new participants or jurisdictions
  - External Partners (e.g. CGCC, School Districts, Port of the Dalles, Oregon Department of Forestry, US Army Corps of Engineers, Oregon Department of Agriculture, Hospitals, Soil and Water Conservation Districts, etc.)
  - Incorporated Jurisdictions (e.g. Mosier, Dufur, Maupin)

Develop a Public Involvement Strategy (October/November 2011)

- Review and update strategy identified in the 2007 Wasco County NHMP
- Outreach strategies may include stakeholder surveys, public information workshops and press releases

Collect Data (November/December 2011)

- Collect mitigation plan maintenance meeting agendas and minutes from the previous five years
- Collect documentation related to any hazard occurrences or emergency declarations in Wasco County since 2007
- Identify and document plan implementation activities, including completed projects and other "success stories"
- Collect any local, state, or federal studies or reports completed since 2007
  - Local development ordinances, flood maps, HAZUS studies, DOGAMI studies, USGS reports, etc.

Identify necessary updates to the 2007 Wasco County NHMP (November/December 2011)

- Mitigation Item Analysis (completed, pending, and un-initiated)
- Previously identified data limitations

Next Steps for OPDR

Grant Administration

Finalize specific scope of work for Wasco County

Project Initiation

Schedule and hold kickoff meeting with regional project leads

Next Steps for Hood River County

- Convene NHMP Steering Committee
- Provide county assessment and taxation data
- Brief county administration on project
- Notify public?? PSA – we can help write it and get it to local news outlets
- Identify potential stakeholder groups

Should you have any questions or concerns, please do not hesitate to contact Will Clark at (541) 298-4101 x206 or via email at William.Clark@mccog.com or Josh Bruce at (541) 346-7326 or via email at jdbruce@uoregon.edu.

*** Previous 2007 steering committee members included:**

- Dan Boldt, *Wasco County Public Works*
- Dan Hammel, *Mid-Columbia Fire and Rescue*
- Mike Davidson, *Wasco County Emergency Management*
- Todd Cornett, *Wasco County Planning and Development*
- Ryan Bassette, *Wasco County Soil and Water Conservation District*
- Richard Gassman, *City of The Dalles*
- Sherry Holliday, *Wasco County Court*
- Hanna Settje, *American Red Cross*
- Tycho Granville, *Wasco County GIS*

February 15, 2012 Plan Update Meeting # 2 Materials

Wasco County Planning Department

"Service, Sustainability & Solutions"

2705 East Second St. • The Dalles, OR 97058
Phone: (541) 506-2560 • wcplanning@co.wasco.or.us
www.co.wasco.or.us/planning/planhome.html

Meeting: Natural Hazards Mitigation Plan Update – Risk Assessment

Date: Wednesday, February 15th

Time: 1:00 – 3:30 p.m.

Location: Wasco County Planning Department Conference Room
2705 East Second Street (Public Works Building)

MEETING AGENDA

I. Welcome and Introductions (5 minutes)

II. Community Profile Discussion (10 minutes)

III. Overview of Risk Assessment Process (20 minutes)

IV. Review of Hazard Identification (30 minutes)

- Update on Hazard Inventories

V. Review Existing Vulnerability Information (30 Minutes)

- Update the list of Community Critical/Essential Facilities and Infrastructure (Review of Asset Worksheet)

VI. Relative Risk Overview (45 Minutes)

- Outline potential severity/impact of identified hazards (Review of Relative Risk Questionnaire)

VII. Next Steps (10 Minutes)

- Identify date for the next meeting

Meeting Sign-In

Wasco County NHMP UPDATE
Steering Committee Meeting – Risk Assessment – Thursday, 02/15/2012

Name	Representing	Email	Roundtrip mileage (if applicable)
Mike Davidson	Co. Emergency Mgt.	mikal@co.wasco.or.us	—
Dennis Whitehouse	North Wasco School Dist.	whitehoused@nwasco.k12.or.us	—
TYCHO GRANVILLE	WASCO COUNTY GIS	tychog@co.wasco.or.us	—
Will Clark	RARE/MCLOG/OPDR	william.clark@mclog.com	
MARTY MATHERLY	WASCO COUNTY PUBLIC WORKS	martym@co.wasco.or.us	
Dan Spatz	Col. Gorge Comm. College Cty on the Dalles	dspatz@cgcc.cc.or.us	—
Ryan Bessette	Wasco County Soil & Water Conservation District	ryan.bessette@or.nacdnet.net	—

Meeting Sign-In

Wasco County NHMP UPDATE
Steering Committee Meeting – Risk Assessment – Thursday, 02/15/2012

Name	Representing	Email	Roundtrip mileage (if applicable)
Josh Bruce	OPDR	JOBRUCE@UOREGON.EDU	—
John Roberts	Wasco County Planning Dept.	johnr@co.wasco.or.us	—

May 23, 2012 Plan Update Meeting # 3 Materials

Wasco County Planning Department

"Service, Sustainability & Solutions"

2705 East Second St. • The Dalles, OR 97058
Phone: (541) 506-2560 • wcplanning@co.wasco.or.us
www.co.wasco.or.us/planning

Meeting: Natural Hazards Mitigation Plan Update: "Mitigation Strategy" Steering Committee Meeting #3

Date: Wednesday, May 23rd

Time: 1:00 – 3:50 p.m.

Location: Wasco County Planning Department Conference Room
2705 East Second Street (Public Works Building)

MEETING AGENDA

I.	**Welcome & Introductions**	(5 minutes)
II.	**Survey & Risk Assessment Discussion**	(10 minutes)
III.	**Timeline & Process for Adoption of Updated Plan**	(5 minutes)
IV.	**Overview of Mitigation Strategy Process**	(30 minutes)
V.	**Review and Update Current Mitigation Strategy**	(60 minutes)

- Update goals and mission statement
- Review previously approved action items

VI.	**Action Item Development**	(55 Minutes)

- Review Risk Assessment vs. overall Relative Risk
- Develop new action items

VII.	**Next Steps**	(5 Minutes)

- Identify date for the next meeting

Meeting Sign-In

Wasco County NHMP UPDATE

Steering Committee Meeting – Mitigation Strategy/Plan Implementation and Maintenance – Wednesday, 05/23/2012

Name	Representing	Email	Roundtrip mileage (if applicable)
Dick Gassman	City of The Dalles Planning	rgassman@ci.the-dalles.or.us	
TYCHO GRANVILLE	WASCO COUNTY GIS	TYCHOG@CO.WASCO.OR.US	
John Roberts	Wasco County Planning Dept.	johnr@co.wasco.or.us	N/A
Bill Fashing	MCCOG	bill.fashing@mccog.com	
Mike Davidson	Wasco County Emergency Management	miked@co.wasco.or.us	N/A
Don Spatz	CGCC, & City of The Dalles	dspatz@cgcc.cc.or.us	N/A
Kristy A Beachamp (Kristy Beachamp)	North Central Public Health District	Kristyt@co.wasco.or.us	N/A

Meeting Sign-In

Wasco County NHMP UPDATE

Steering Committee Meeting – Mitigation Strategy/Plan Implementation and Maintenance – Wednesday, 05/23/2012

Name	Representing	Email	Roundtrip mileage (if applicable)
Will Clark	RARE / MCCOG		
Josh Bruce Phone-In	OPDR		
DANIEL HAMMEL	MCFR	dhammel@mcfr.org	N/A

June 18, 2012 City of The Dalles Plan Update Meeting Materials

City of The Dalles

The Dalles City Hall 313 Court Street The Dalles, Oregon 97058
Phone: (541) 296-5481
http://www.ci.the-dalles.or.us/

Meeting: Natural Hazards Mitigation Plan Update: City of The Dalles Addendum Update

Date: Monday, June 18, 2012

Time: 1:00 p.m. – 3:00 p.m.

Location: The Dalles City Hall

Meeting Agenda

I.	**Welcome and Introductions**	(5 minutes)
II.	**Review of Community Profile**	(20 minutes)
III.	**Review and Update Risk Assessment**	(30 Minutes)
	• Hazard Analysis Matrix	
	• Relative Risk Assessment	
IV.	**Review Existing Vulnerability Information**	(25 Minutes)
	• Update the list of Community Critical/Essential Facilities and Infrastructure	
V.	**Review Current Mitigation Strategy**	(20 Minutes)
	• Action Items	
	• Plan Goals	
VI.	**Review Maintenance and Implementation Strategy**	(15 Minutes)
VII.	**Next Steps**	(5 Minutes)

Meeting Sign-In

Wasco County NHMP UPDATE

Steering Committee Meeting – City of The Dalles Addendum Update– Monday, 06/18/2012

Name	Representing	Email	Roundtrip mileage (if applicable)
Will Clark	RARE	William.Clark@MCOG.com	
Dick Gassman	City of The Dalles	rgassman@ci.the-dalles.or.us	
Dave Anderson	The Dalles Public Wks.	danderson@ci.the-dalles.or.us	

June 27, 2012 Plan Update Meeting # 4 Materials

Wasco County Planning Department

"Service, Sustainability & Solutions"

2705 East Second St. • The Dalles, OR 97058
Phone: (541) 506-2560 • wcplanning@co.wasco.or.us
www.co.wasco.or.us/planning

Meeting: Natural Hazards Mitigation Plan Update: "Plan Implementation and Maintenance"

Steering Committee Meeting #4

Date: Wednesday, June 27th

Time: 1:00 – 3:00 p.m.

Location: Wasco County Planning Department Conference Room
2705 East Second Street (Public Works Building)

MEETING AGENDA

I.	**Welcome & Introductions**	(5 minutes)
II.	**Mitigation Strategy Review**	(25 minutes)

- Address Mitigation Strategy section questions/concerns
- Finalize new action items

III.	**Overview of Plan Implementation and Maintenance**	(30 minutes)
IV.	**Review and Update Wasco County Plan Implementation and Maintenance Strategy**	(45 minutes)
V.	**Next Steps and Final Steering Committee Business**	(15 Minutes)

Meeting Sign-In

Wasco County NHMP UPDATE

Steering Committee Meeting – Plan Implementation and Maintenance – Wednesday, 06/27/2012

Name	Representing	Email	Roundtrip mileage (if applicable)
TYCHO GRANVILLE	WASCO COUNTY GIS	TYCHOG@CO.WASCO.OR.US	N/A
Mike Davidson	Wasco Co. Sheriff Emergency Management	mikeD@co.wasco.or.us	N/A
Will Clark	RARE / MCCOG	william.clark@mccog.com	
Don Spatz	Columbia Gorge Community College & The Dalles City Council	dspatz@cgcc.cc.or.us	N/A
MARTY MATHERLY	WASCO COUNTY PUBLIC WORKS	martym@co.wasco.or.us	N/A
Ryan Bessette	Wasco County SWCD	ryan.bessette@or.nacdnet.net	N/A
John Roberts	Planning Dept.	johnr@co.wasco.or.us	N/A

NHMP Press/Public Outreach Documentation

The Dalles Chronicle

Thursday, September 6, 2012 Publishing Sunday and Tuesday through Friday 1 section, 12 pages, 75 cents

Plan aims at hazard protection

By Mike Couch
The Dalles Chronicle

Wasco County may not see a Hurricane Isaac anytime soon, but it has seen floods, fires, volcano fallout, drought, earthquakes and other natural disasters, and an updated plan is designed to help the county prepare for such hazards.

Wasco is one of several counties in Oregon in the process of updating its Natural Hazard Mitigation Plan with the cooperation of Oregon Partnership for Disaster Resilience, Resource Assistance to Rural Environments and Oregon Emergency Management.

The plan is designed to set goals, identify action items, and provide resources within the community that can minimize the risks of natural hazard damages.

It ranks natural disasters by severity. Floods are the most likely disaster to occur in this area, but also mentioned in the plan are droughts, earthquakes, volcanoes, and more.

The plan is scheduled to be updated every five years, and makes the county eligible to receive funds from federal grant programs for prevention and pre-hazard mitigation.

It is important to have a plan in place in case a hazardous event ever took place, according to John Roberts, planning director for Wasco County.

"Let's say we had a Hurricane Isaac here," said Roberts. "If we didn't have this plan in place, we wouldn't be able to get any money for relief."

See HAZARD, A5

Hazard

Continued from Page A1

The hazards plan has been guided by a steering committee, which meets twice a year, comprised of members representing several organizations around the county, including Columbia Gorge Community College, Northern Wasco County School District 21, Mid-Columbia Council of Governments, and others.

"Wasco County has never had a tornado," said Roberts. "So that was number seven. We don't have to worry much about that one."

Actually, one tornado in Wasco County is on record, dating back to 1970.

Many of the prevention strategies outlined in the plan are things that are already done on a routine basis, but some action items still need to be performed such as the creation of a public outreach program to educate the community about the risks of natural hazards.

"Things we do anyway sometimes accomplish the action items we have in here," said Mike Davidson of Wasco County Emergency Management.

In the past when the plan has been implemented, the funds have paid for projects like mitigating rockslides on Brewery Grade and updating the communications infrastructure for Public Safety Radio.

"This is not a real exciting deal," said Davidson about the planning process. "Most emergency planning isn't — until you need it."

The plan has been approved by the county, and is awaiting final approval by the Federal Emergency Management Agency.

A copy of the plan can be found and comments can still be made on the web at: http://csc.uoregon.edu/opdr/current/gorge/wasco.

2007 Plan Development Public Process

People tend to support what they help build. To engage public support of this plan, and to involve the residents in the process, the University of Oregon RARE participant assigned to coordinate this projected reached out to the Wasco County community in three primary ways. First, a steering committee was formed to guide the NHMP Coordinator through the process of developing the plan. Secondly, The Coordinator sent out invitations to key stakeholders and an open invitation to the public for a NHMP Community Stakeholder Forum to raise awareness about natural hazard events and solicit input from community. Lastly, stakeholder interviews were conducted to retrieve local community knowledge of hazard events and how to best address the community's risk. Secondary methods of outreach were also conducted in posting the final draft of the mitigation plan for public comment on the County Planning & Development website and the printing and distribution of the International Business & Home Safety Protect Your Home From Wildfire brochure at the Wasco County Planning & Development service counter. Lastly, ONHW conducted region-wide outreach and training efforts in the form of a regional household preparedness survey and IBHS Open for Business training.

Steering Committee

The Wasco County Steering Committee was comprised of individuals best suited to guide the county through the planning process and ensure that the mitigation plan is fully implemented once adopted.

Its mission is to ensure proper development and implementation of the county natural hazards mitigation plan by:

- setting goals;
- establishing subcommittee work groups to address specific needs;
- ensuring public, private and federal participation;
- distributing and presenting the plan;
- facilitating public discussion/involvement;
- developing implementation activities; and
- coordinating plan maintenance and implementation strategies.

Through raising awareness and citizen involvement, the Committee's end goal is to make hazard mitigation a part of the community's routine decision-making process.

Methodology

Three Steering Committee sessions were held over the course of the 2006 calendar year:

1) Introduction & Overview: 17 January 2006
2) Hazard Risk Assessment: 3rd March 2006
3) Goals & Action Items: 13 July 2006

These sessions set the tone and structure for the plan's development. Through these meetings the NHMP Coordinator was able to collect valuable information regarding hazard events and impacts within the County, as well as contacts for additional stakeholders to involve in the process. The Steering Committee also played an integral part in the development of the mitigation plan vision, mission, goals and action items. The Committee revised the drafted vision, mission and goals, and selected and prioritized the action items documented in this plan.

Participants

The steering committee was formed by Michael Pasternak, NHMP Coordinator under the guidance of Todd Cornett, Wasco County Planning & Development. Additional input provided by the Oregon Natural Hazards Workgroup. Participants included:

Table A.1 NHMP Steering Committee

Name	Title	Organization
Dan Boldt	Director	Wasco County Public Works
Mike Davidson	Emergency Manager	Wasco County Emergency Management
Todd Cornett	Director	Wasco County Planning & Development
Jennifer Clark	Project Coordinator	Wasco County SWCD
Richard Gassman	Senior Planner	City of The Dalles
Sherry Holliday	County Commissioner	Wasco County Court
Stu Nagle	Fire Marshall	Mid-Columbia Fire & Rescue
Hannah Settje	District Manager	Red Cross

Community Stakeholder Forum

The County-wide Stakeholder Forum held was designed to solicit input from individuals and community organizations with resources or property that may be severely impacted by natural disasters. The Forums was held on April 10th 2006 at the Columbia Gorge Discovery Center in The Dalles, OR. Roughly 50 people from the County were invited to attend the Forum. The invitees consisted of business leaders, utility providers, government workers (state and county), service providers, transportation & communication workers, health providers, and representatives of vulnerable populations (e.g. elderly, migrant workers).

The purpose of the Forum was three-fold:

1) To spread awareness of potential disasters impacting the County by soliciting a large cross-section of the active public to participate in the hazard mitigation process;

2) To provide a factual basis for potential hazard mitigation measures by public input into critical County infrastructure and resources, and known hazard zones, through the critical asset and hazard identification mapping exercise; and

3) To plant the seeds for potential mitigation measures by introduction and discussion of action item concept and creating personal relationships (i.e. face-toface introduction) for stakeholder interview and action item follow-ups.

Unfortunately attendance for the Forum was quite poor. Though nearly 50% RSVP'd, roughly 10% of invitees actually attended. Factors attributing to poor attendance were:

1) Forum was scheduled in the middle of government budget season;

2) Methods of outreach- emails, phone calls- proved inadequate;

3) General attitudes to hazards in the community and mitigation in particular (the floods of 1996 were the last major disaster) gave the Forum an air of little importance.

Those that participated in the Forum were actively responsive to the mapping exercise and the concepts and importance of hazard mitigation. The identification of critical assets and infrastructure re-enforced much of what had already been identified in steering committee meetings and coordinator research, and also provided some previously overlooked assets. All Forum participants have been willing participants in the stakeholder interview follow-ups.

Methodology & Outcomes

The method and outcomes of the Community Stakeholder Forum are described below:

(1) DOGAMI Hazard Impact Overview

Bill Burns, DOGAMI Engineering Geologist presented and dissected local and state natural hazards data, and informed participants on how communities are impacted by natural hazard events.

> Outcome: Documented community stakeholder knowledge/input with respect to local hazard events.

(2) Community Asset Identification Exercise

Participants were asked to fill out a worksheet identifying the County's critical infrastructure and assets.

> Outcome: (a) Identified and discussed key elements of the region and individual communities within it; and (b) Identified main assets, resources and functions of region within the themes of People, Dollars (economy, cultural & historic assets, environmental assets), and Infrastructure (critical physical facilities).

- Participants identified many of the same critical assets identified in the Steering Committee meeting and NHMP Coordinator research. This that assured that data collected for mitigation plan purposes was relevant.

(3) Community Mapping Exercise

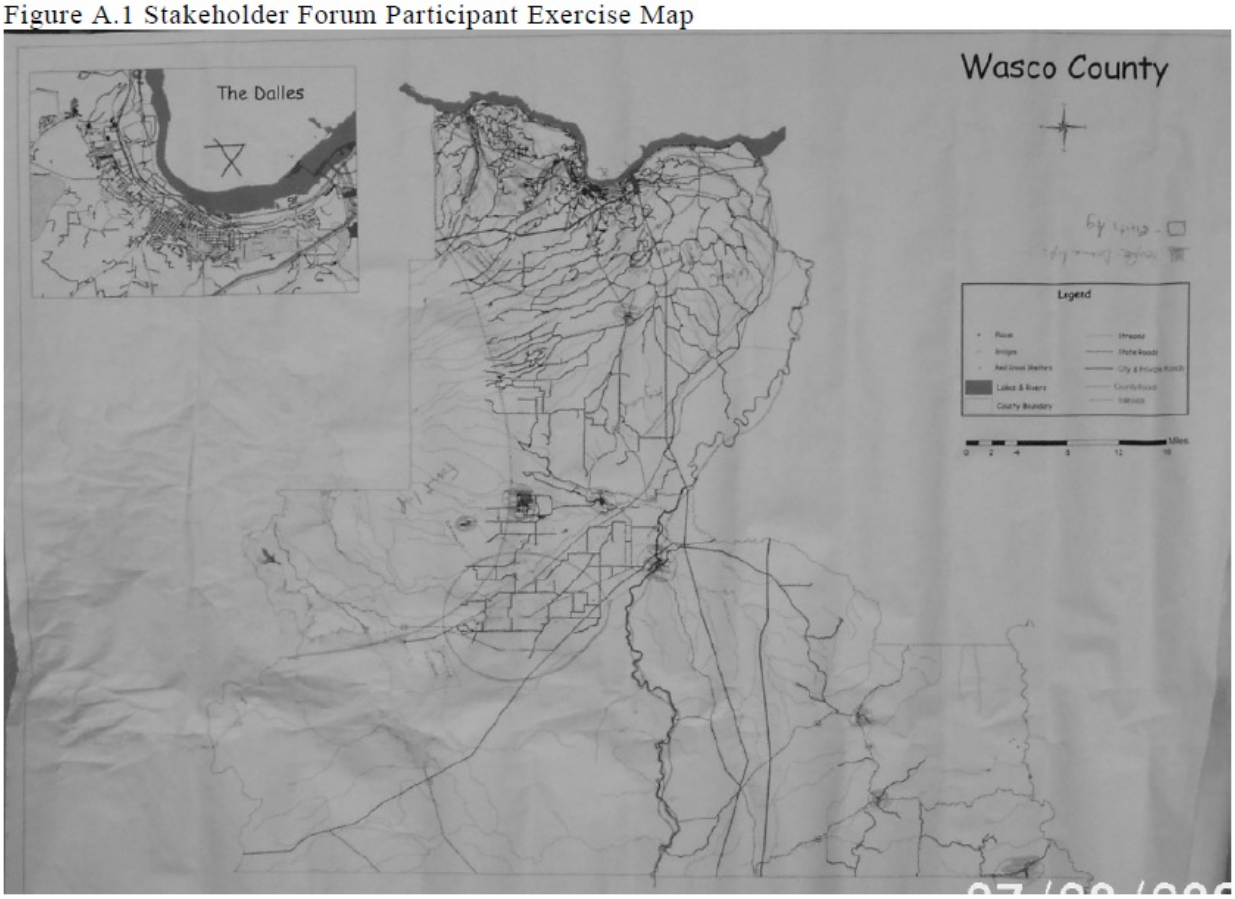
Participants were asked to map assets & infrastructure from previous exercise

> Outcome: (a) Discussed and documented implications with regards to asset loss/damage to community; (b) Provided mechanism to focus planning efforts; (c) Provided a fact base

for subsequent action item identification, and (d) Provided physical document (map) of community input.

- Participants identified previously un-documented storm water drainage issues along County Hwy 216, the main east-west access route for the southwestern portion of the County.

Figure A.1 Stakeholder Forum Participant Exercise Map



(4) Action Items & Follow-up Stakeholder Interviews
Discussed importance mitigation and the development of action items; passed out action item forms to participants

Outcome: Documented potential action items discussed in forum, and distributed action item worksheets to participants. Set up stakeholder interview.

Invitees
The following the individuals and organizations were contacted to participate in the Forum:

Table A.2 Community Stakeholder Forum Invitees

Name	Organization
Susan Huntington	Dalles Area Chamber of Commerce
Katie MacKendrick*	MCCED
Robert Durham	Oregon Cattlemen's Association
Dan Ericksen	Cherry Growers Association
Kim MucCullough	OSU Extension
Bob Cole	Economic Development Commission
David S. Meyer	Bonneville Power Association
Andrea Klass	Port of The Dalles
Mel Gard	Oregon Department of Forestry
	Oregon Department of Transportation
Tom Yates	Sprint
Roger Nichols	The Dalles Chronicle
	Mid Columbia Medical Center
	Warm Springs
	Senior Advisory Council
Eugene Walters	Juniper Flat Fire District
	Mid Columbia Association of Realtors
Ben Beseda	Tenneson Engineering
Frank Toda	Columbia Gorge Community College
	Army Corp of Engineers
Leo Sidebotham	Bureau of Land Management
Leo Segovia	USDA Forest Service
Rod French	Oregon Department of Fish &Wildlife
Marty Matherly*	Wasco County Roads
	KACI Radio
	Wasco Public Health Department
Bill Burns*	DOGAMI
	Wasco County Schools
	Wasco County Building Codes
	Union Pacific Railroad
	Wasco County Public Works

*Participant

Stakeholder Interviews

Due to poor community participation in the Stakeholder Forum, the stakeholder interviews became a crucial component of the public process. Many of the Forum invitees were contacted and their input included in the plan. The individuals contacted ranged from city, state, and federal government employees to business owners and farmers. These individuals provided insight into how hazard events have impacted the community in the past, how growth and development could collide with future hazard events, and how the community can best work together to reduce collective risk. Many of the action items documented in this plan were spawned from ideas discussed during the stakeholder interview process.

Methodology

Stakeholder interviews were conducted May through July 2006. The NHMP Coordinator telephoned stakeholders individually and asked a series of questions. The questions are as follows:

- What is the history of natural hazard events in Wasco County?
- How does growth and development in the community, both current and projected, contribute to natural hazard events?
- Does your organization/industry currently work in natural hazard mitigation? If so, how?
- How can your organization/industry contribute to strengthen regional coordination and cooperation in reducing risk from natural hazards?
- What activities will assist Wasco County in reducing risk and preventing loss from future natural hazard events? (e.g. If you had the money, how would you spend it?)
- How does your organization/industry view the County government's role in reducing risk from natural hazard events?
- What are the ways you would like to see agencies, organizations or individuals participating and coordinating to reduce risk from natural hazards?
- How does hazard mitigation fit into Wasco County's land-use, environmental, social, and economic goals?
- What goals should the County set to reduce risk from natural hazard events, and how would we measure whether our mitigation efforts are successful?
- Can you think of anyone else that should be contacted as part of this process?

The information recorded from the stakeholder interviews was primarily incorporated into three sections of this plan: Community Profile, Risk Assessment, and Goals & Action items.

Contacts

The following the individuals and organizations were contacted to participate in the stakeholder interview process:

Table A.3 Community Stakeholder Interview Contacts

Name	Organization
Susan Huntington*	Dalles Area Chamber of Commerce
Katie MacKendrick	MCCED
Robert Durham*	Oregon Cattlemen's Association
Dan Ericksen*	Cherry Growers Association
	OSU Extension
Bob Cole*	Economic Development Commission
David S. Meyer*	BPA
Andrea Klass*	Port of The Dalles
Mel Gard*	ODF
	ODOT
Tom Yates*	Sprint
Roger Nichols*	The Dalles Chronicle
	Mid Columbia Medical Center
	Warm Springs
	Senior Advisory Council
Eugene Walters*	Juniper Flat Fire District
John Helquiest*	Maupin Fire
Marty Matherly*	Wasco County Public Works
Bill Burns*	DOGAMI

*Participant

Secondary Outreach Methods

Additional methods of outreach involved in the public process included:

Public Comment of Wasco County NHMP Draft

The mitigation plan draft was sent to steering committee members for review, comment, and approval before the final draft was shipped off the OEM for State review. Additionally, the plan was posted on the Wasco County Planning & Development website for public review and comment.

IBHS Wildfire Brochure

While the final draft of the NHMP was under review by the Steering Committee and public, the NHMP Coordinator oversaw the printing and distribution of the International Business & Home Safety Protect Your Home From Wildfire brochure at the Wasco County Planning & Development service counter.

ONHW Region-wide Outreach

The Oregon Natural Hazards Workgroup conducted region-wide outreach activities which included:

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. The results of the survey are documented in the plan's Appendix C: Regional Household Survey.

IBHS Open for Business Training

ONHW, with commitment from the Institute for Business & Home Safety (IBHS), provided individuals in the Mid-Columbia region with access to, and use of, the IBHS interactive, web-based Open for Business property protection and disaster recovery planning tool. The access was provided in two classes, one located in Hermiston, Oregon on May 24th, 2006 and the second in The Dalles, Oregon on May 25th, 2006. The following agencies and organizations were invited to attend: agencies providing start-up and ongoing counseling services to micro and small businesses in low-income areas, such as the Statewide Small Business Development Center; agencies providing housing services to hundreds of low-income residents, such as County Housing Authorities, which also employs low-income people; and disaster assistance agencies serving at-risk populations, such as food banks and the American Red Cross. Any remaining spaces were made available to: micro- or small business start-up companies; and established micro- or small businesses.

The classes were organized as train-the-trainer classes, so that the agency personnel and the business people could: 1. Understand the importance of disaster planning; 2. Learn how to navigate the interactive, web-based Open for Business property protection and disaster recovery planning tool; 3. Start to develop their own plans during the training; 4. Learn how to communicate the importance of developing and utilizing plans for property protection and recovery from business interruption to their constituencies and/or colleagues, in order to institutionalize disaster safety into every day decision making.

Recruitment Process

The Oregon Natural Hazards Workgroup assembled a list of social service providers from basic internet searches and representative small businesses from Chamber of Commerce Membership databases for the seven counties in the region. E-mail and/or mailed invitations were sent to over 200 agencies, organizations and businesses in the region. Recruitment materials can be found on the following page. The following agencies and organizations attended the workshop:

- Umatilla/Morrow County Housing Authority
- Irrigon Chamber of Commerce
- Pendleton Chamber of Commerce
- Small Business Development Center – Blue Mountain Community College
- Small Business Development Center – Columbia Gorge Community College
- Wasco County Human Services Department

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Appendix C: Community Profile

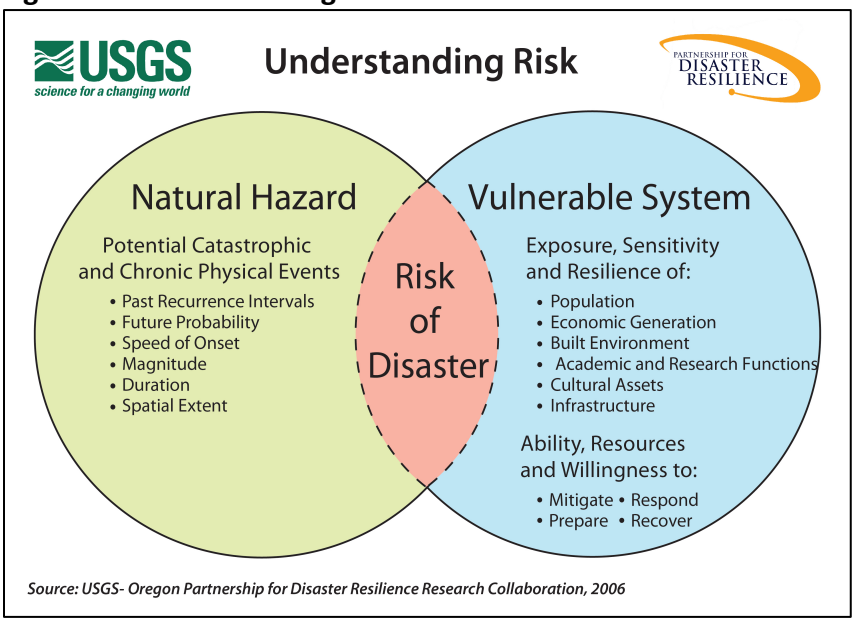
The following section describes Wasco County from a number of perspectives in order to help define and understand its sensitivity and resilience to natural hazards. Sensitivity and resilience indicators are identified through the examination of community capitals which include natural environment, socio-demographic capacity, regional economy, physical infrastructure, community connectivity and political capital. The most fundamental definition of capital is a resource or asset that can be used, invested, or exchanged to create new resources. The concept of community capitals provides a useful framework for identifying the diverse resources and activities that make up a local economy. 1

Sensitivity factors can be defined as those community assets and characteristics that may be impacted by natural hazards (e.g., special populations, economic factors and historic and cultural resources). Community resilience factors can be defined as the community's ability to manage risk and adapt to hazard event impacts by way of the governmental structure, agency missions and directives, as well as through plans, policies, and programs.

The information in this section represents a snapshot in time of the sensitivity and resilience factors in the county during the plan's most recent update. The information documented below, along with the hazard assessments located in *Section 2: Risk Assessment*, should be used as the local level rationale for the risk reduction action items identified in *AppendixAB*. The identification of actions that reduce Wasco County's sensitivity, increase its resilience, and assist in reducing overall risk, are represented by the overlap in Figure C.1 below.

[1] Cornelia Flora, Jan Flora, Susan Fey and Mary Emery, "Community Capitals Framework," English Language Learners Symposium.

Figure C.1 Understanding Risk



Why Plan for Natural Hazards in Wasco County?

Natural hazards impact citizens, property, the environment and the economy of affected communities. Wasco County residents and businesses could be exposed to incredible financial and emotional costs in the event of a natural disaster, whether from droughts, earthquakes, flooding, landslides, volcanoes, wildfires, or seasonal storms. The risk associated with natural hazards increases as more people move to areas that are subject to a higher rate of natural hazard incidence or probability. The inevitability of natural hazards and activity within the county create an urgent need to develop strategies, coordinate resources and increase public awareness to reduce risk and prevent loss from future natural hazard events. Identifying risks posed by natural hazards and developing strategies to reduce the impact of a hazard event can assist in protecting life and property of citizens and communities. Local residents and businesses should therefore work together with the county to keep the natural hazards mitigation plan updated. The Natural Hazards Mitigation Plan addresses the potential impacts of hazard events and allows the county to apply for certain funding from FEMA for pre and post disaster mitigation projects that would otherwise not be available if the county did not have an up to date Natural Hazards Mitigation Plan.

Natural Environment Capacity

Geography

The County of Wasco was organized by the territorial legislature in 1854. This 250,000 square mile county, the largest ever established in the United States, has since been pared to its current size of 2,387 square miles. The county lies east of the Cascade Range along the Columbia River, and is bounded on the west by the forests of Mt. Hood National

Forest, on the north by the Columbia River, and on the east by the Deschutes and John Day Rivers.

Oregon, like most of the Western States, is largely owned by the federal government with a vast majority of federal lands administered by the Bureau of Land Management (BLM) and the U.S. Forest Service.[2] In Wasco County 57% of the land is privately owned (roughly 881,000 acres), whereas 5% of the land is owned by BLM (roughly 84,000 acres), 10% by the US Forest Service (roughly 160,000 acres) and twenty 6% by other entities (roughly 398,000 acres), primarily the Indian Trust.[3] Most of the land owned by BLM is adjacent to the Deschutes and John Day rivers, while US Forest Service land is limited to the Mt Hood National Forest. A majority of the private land in the county is either agricultural land, forest, or an agriculture/forest mix. A large portion of the southern half of the county is comprised of the Warm Springs Indian Reservation, and the entire county is classified as rural except for land within the City of The Dalles.[4]

Steep rolling hills and sharp cliffs and canyons are characteristic landforms of Wasco County. Elevations vary from 5,700 feet at Flag Point in the western part of the county to 150 feet on the Columbia River. From the higher elevations of the Cascade Range, a general slope occurs to the north and east. Tributary streams dissect steep canyons as they make their way to the Columbia, Deschutes and John Day Rivers.

The soils in Wasco County have formed in a variety of parent materials. In the northeastern part of the county, soils have developed from loess deposits. These deposits range from a few inches to more than fifteen feet in thickness. In a southerly direction, the deposits become finer textured and thinner. Where a thin deposit of loess occurs, the soils developed from a mixture of loess and basalt. In the western part of the county, soils have developed from volcanic ash deposited over sediments, whereas soils in the southern part of the county have developed in fine textured sediments. These soils are predominantly fine textured with high percentages of coarse fragments. Water deposited soils formed in recent alluvium occur along the major drainages in the county, and small amounts of volcanic ash occur throughout the county.

Columbia Basin

As can be seen in Figure C.2 below, Wasco County is mainly within the Columbia Basin physiographic province, though it is bordered on its eastern boundary by the East and West Cascades, as well as the Blue Mountains to the South. Also commonly referred to as the Deschutes-Columbia Plateau, the Columbia Basin is predominantly a volcanic province covering approximately 63,000 square miles in Oregon, Washington and Idaho.[5] The basin is surrounded on all sides by mountains, the Okanogan Highlands to the north, the Cascade Range to the west, the Blue Mountains to the south and the Clearwater Mountains to the east. Almost 200 miles

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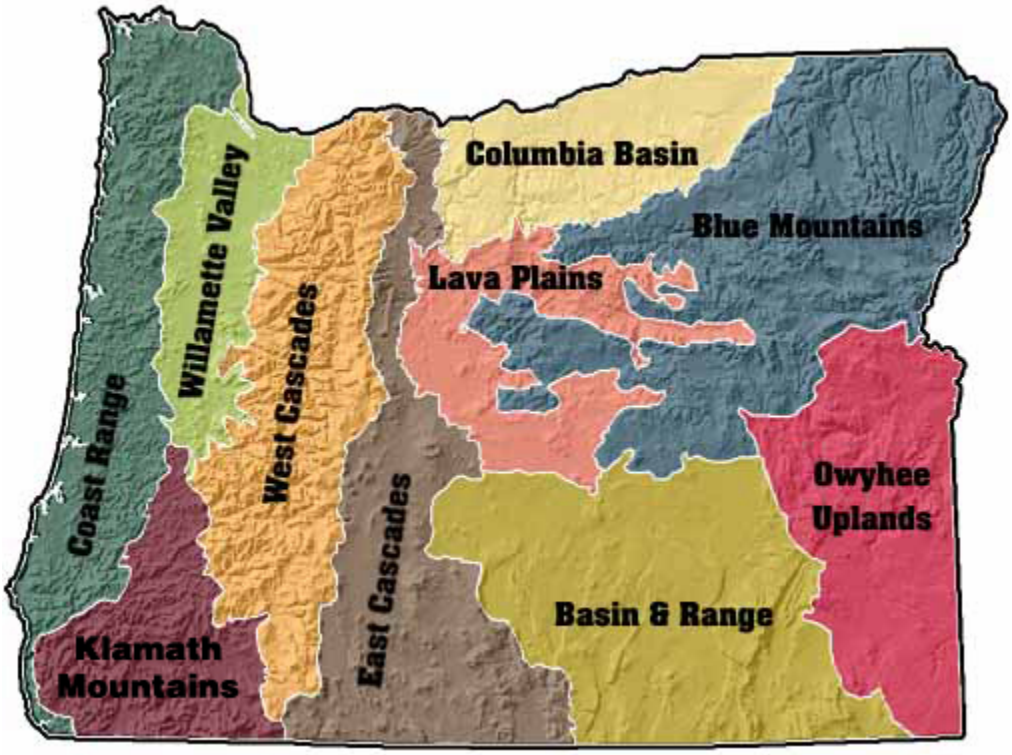
[2] Allan, Stuart et al., Atlas of Oregon. Pg. 83.
[3] Allan, Stuart et. al., Atlas of Oregon. Pg. 84.
[4] Census Bureau, 2010 Census, Oregon's 68 Urban Areas
[5] Western Oregon University. Oregon Physiographic Provinces. "Deschutes-Columbia Plateau". 1999. http://www.wou.edu/las/physci/taylor/eisi/orr_orr2.PDF.

long and 100 miles wide, the Columbia Basin merges with the Deschutes Basin lying between the High Cascades and Ochoco Mountains. The province slopes gently northward toward the Columbia River with elevations up to 3,000 feet along the south and west margins down to a few hundred feet along the river.[3]

Figure C.2: Physiographic Provinces of Oregon



Physiographic Provinces, Oregon Habitat Joint Venture - http://www.ohjv.org/projects.html

Level Four Ecoregions

"Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment management, and monitoring of ecosystem components. By recognizing the spatial differences in the capacities and potentials of ecosystems, ecoregions stratify the environment by its probable response to disturbance."[6] There are seven level four ecoregions within the Columbia Basin and East Cascades that are located in Wasco County; the Pleistocene Lake Basin, the Deschutes/John Day Canyons, the Umatilla Plateau, the Oak/Conifer Foothills, Grand Fir Mixed Forest, Cascade Crest Montane Forest, and the John Day/Clarno Uplands.

Pleistocene Lake Basins[7]: the Pleistocene Lake Basins once contained vast temporary lakes that were created by flood waters from glacial lakes Missoula and Columbia. In Oregon, the flood waters accumulated from the eastern entrance of the Columbia River Gorge upstream to

[6] Ibid.
[7] Environmental Protection Agency. "Ecoregions of Oregon." ftp://ftp.epa.gov/wed/ecoregions/or/or_front.pdf.

the Wallula Gap to form ancient Lake Condon. Today, the region is the driest and warmest part of the Columbia Basin with mean annual precipitation varying from seven to ten inches. Native vegetation consists of bunchgrass and sagebrush. Major irrigation projects provide Columbia River water to this region, allowing the conversion of large areas into agriculture.

UMATILLA PLATEAU[8]: the nearly level to rolling, treeless Umatilla Plateau ecoregion is underlain by basalt and veneered with loess deposits. Areas with thick loess deposits are farmed for dry land winter wheat, or irrigated alfalfa and barley. In contrast, rangeland dominates more rugged areas where loess deposits are thinner or nonexistent. Mean annual precipitation is nine to 15 inches and increases with increasing elevation. In uncultivated areas, moisture levels are generally high enough to support grasslands of bluebunch wheatgrass and Idaho fescue without associated sagebrush.

DESCHUTES/JOHN DAY CANYONS[9]: deeply cut into basalt, the Deschutes/John Day Canyons fragment a lightly populated portion of the Umatilla Basin. Canyon depths up to 2,000 feet create drier conditions than on the plateau above. In the canyons, bunchgrasses, Wyoming big sagebrush, and cheatgrass grow on rocky, colluvial soil. Riparian vegetation in narrow reaches is often limited to a band of white alder at the water line; broader floodplains and gravel bars are dominated by introduced species, such as reed canarygrass, sweetclover, and teasel. The rivers support Chinook salmon and steelhead runs.

OAK/CONIFER FOOTHILLS[10]: this ecoregion is much more diverse than other parts of the East Cascades. Marine weather enters the ecoregion via the Columbia River Gorge, moderating its otherwise continental climate. As a result, soil, climate, and vegetation share characteristics of both eastern and western Oregon. Grasslands, oak woodlands, and forests dominated by ponderosa pine, and Douglas-fir occur. The ecoregion is lower and drier than the nearby Grand Fir Mixed Forest ecoregion.

GRAND FIR MIXED FOREST[11]: this ecoregion is mostly outside the limit of maritime climatic influence. It is characterized by high, glaciated plateaus and mountains, frigid soils, and a snow-dominated, continental climate. Grand fir, Douglas-fir, ponderosa pine, and larch occur. The ecoregion is higher and moister than the Oak/Conifer Foothills, but the boundary between them is not sharp.

CASCADE CREST MONTANE FOREST[12]: this ecoregion consists of an undulating plateau punctuated by volcanic mountains and lava flows. Volcanism in the Pliocene epoch overtopped the existing Miocene Volcanics of the Western Cascades Montane Highlands. Later Pleistocene glaciations left numerous naturally-fishless lakes. Today the ecoregion contains forests dominated by mountain hemlock and Pacific silver fir. It has a shorter summer drought and fewer intermittent streams than the High Southern Cascades Montane Forest.

JOHN DAY/CLARNO UPLANDS[13]: this semiarid ecoregion forms a ring of dry foothills surrounding the western perimeter of the Blue Mountains. Highly dissected hills, palisades, and colorful ash

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[8] Ibid.
[9] Ibid.
[10] Ibid.
[11] Ibid.
[12] Ibid.
[13] Ibid.

beds flank the valleys of the John Day and Crooked Rivers. The ecoregion has a continental climate moderated somewhat by marine influence. Juniper woodland has expanded markedly into the sagebrush-grassland during the 20th Century due to a combination of climatic factors, fire suppression, and grazing pressure.

Rivers

Wasco County lies within three major drainage basins, the Hood River, Deschutes River and John Day River Basins. The major rivers which drain these areas include the Columbia, Deschutes and John Day Rivers. Stream flows are rapid during the spring and early summer months due to increased stream flow from snow melt, but also during the early winter rain-storms, before the heavy snowfall and freezing conditions prevail. The high water months normally are March, April, May, and June. The Deschutes and John Day Rivers, as with most streams that drain arid basins, are subject to extreme flow variations. These seasonal variations are quite pronounced, and the John Day River has had periods when no flow was recorded.

Columbia River Basin

The Columbia River Basin is North America's fourth largest, draining a 259,000 square mile basin that includes territory in seven states (Oregon, Washington, Idaho, Montana, Nevada, Wyoming and Utah) and one Canadian province (British Columbia). The river flows for more than 1,200 miles, from the base of the Canadian Rockies in southeastern British Columbia to the Pacific Ocean at Astoria, Oregon, and Ilwaco, Washington. The Columbia River Basin includes a diverse ecology that ranges from temperate rain forests to semi-arid plateaus, with precipitation levels from six inches to 110 inches per year. Furthermore, the Columbia is a snow-charged river that seasonally fluctuates in volume. Its annual average discharge is 160 million acre-feet of water with the highest volumes between April and September and the lowest from December to February. From its source at 2,650 feet above sea level, the river drops an average of more than two feet per mile, but in some sections it falls nearly five feet per mile.[14]

The Columbia River Basin is the most hydroelectrically developed river system in the world.[15] The Federal Columbia River Power System (FCRPS) encompasses the operations of 14 major dams and reservoirs on the Columbia and Snake rivers, operated as a coordinated system. In addition, the U.S. Army Corps of Engineers operates nine of 10 major federal projects on the Columbia and Snake rivers. These federal projects are a major source of power in the region, and provide flood control, navigation, recreation, fish and wildlife, municipal and industrial water supply, and irrigation benefits.[16]

John Day River

The John Day River basin drains nearly 8,100 square miles of central and northeast Oregon. It is one of the nation's longest free-flowing river systems. Elevations range from 265 feet at the confluence with the Columbia River to over 9,000 feet at the headwaters in the Strawberry Mountain Range. The river has no dams to control water flow; therefore flow levels fluctuate widely in relation to snow pack and rainfall. The John Day River system is under designation of

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[14] Center for Columbia River History. "Columbia River". Written by: Bill Lang Professor of History Portland State University, Former Director, Center for Columbia River History. http://www.ccrh.org/river/history.htm.
[15] Ibid.
[16] National Oceanic and Atmospheric Administration. Northwest Regional Office. "Columbia/Snake Basin". http://www.nwr.noaa.gov/Salmon-Hydropower/Columbia-Snake-Basin/.

two important river preservation programs: the National Wild and Scenic Rivers Act and the Oregon Scenic Waterways Act.[17] Together, these two acts, one a federal program and one a state program, provide protection for the natural, scenic, and recreational values of river environments. The Bureau of Land Management (BLM), in partnership with The Confederated Tribes of the Warm Springs, Oregon Department of State Lands, Oregon Parks and Recreation Department, Oregon Department of Fish and Wildlife and the John Day Coalition of Counties (making up the John Day River Interagency Planning Team) has responsibility for managing the 147-mile John Day Wild and Scenic River from Service Creek in Wheeler County to Tumwater Falls.[18]

Deschutes River

The Deschutes River flows approximately 245 miles through central Oregon and is a major tributary to the Columbia River. The Deschutes Basin encompasses roughly 10,700 square miles, making it the second largest river basin in the state.[19] The Deschutes begins in Little Lava Lake in the Cascade Mountains, flows through two reservoirs and the City of Bend, then flows north through a deep gorge. Groundwater provides 90% of the stream flow to the lower Deschutes River, adjacent to Wasco County, and any changes in water resource use in the upper Deschutes Basin have the potential to affect stream flow in the lower Deschutes River.[20] Oregon water law permits landowners and irrigators to own rights to more water than the rivers actually carry, causing parts of the Deschutes and many other rivers to nearly run dry during the summer months.[21]

Climate

Temperature, Precipitation and Topography

Wasco County lies in a transitional zone between western and eastern Oregon climates. Maritime air patterns are characteristic of western Oregon, while the drier continental air patterns dominate eastern Oregon. The Cascade Mountain Range forms a barrier which creates the climatic difference. The transition between these two major climates can be evidenced within the county.

Overall, the climate in Wasco County is temperate and semi-arid. Low annual precipitation, low winter temperatures, and high summer temperatures are typical. Seasonal differences in temperature are greater than daily changes. Extremes of temperature most often occur when a continental air mass dominates the area with an east wind.

Strong marine influences also reflect the occurrence of precipitation, more than half of which falls from November through February. Table C.1 highlights the average temperature,

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[17] U.S. Department of Interior. Bureau of Land Management. "John Day River". http://www.blm.gov/or/resources/recreation/johnday/.

[18] Public Announcement. John Day River Update, May 2010. http://www.blm.gov/or/districts/prineville/plans/files/jdr_update_may2010.pdf.

[19] Oregon Environmental Council. "Deschutes River." http://www.oeconline.org/our-work/rivers/cleaner-rivers-for-oregon-report/deschutes-river.

[20] Deschutes River Conservancy. "Lower Deschutes." http://www.deschutesriver.org/Our_Basin/Lower_Deschutes/default.aspx.

[21] Oregon Environmental Council. "Deschutes River." http://www.oeconline.org/our-work/rivers/cleaner-rivers-for-oregon-report/deschutes-river.

precipitation and snowfall in the City of the Dalles. From 1981 to 2010, the average annual precipitation in The Dalles equaled 14.6 inches per year. Snowfall amounts averaged 19.8 inches per year with the highest amounts occurring in December and January; however these snowfall averages in the table below are from over a hundred years of observation, and thus may not be representative of current climate trends.

Table C.1: Period of Record General Climate Summary, The Dalles, OR

Month	Mean Maximum Temperature (deg F)	Mean Minimum Temperature (deg F)	Mean Temperature (deg F)	Mean Precipitation (inches)	Average Snowfall (inches)
January	43.4	29	36.2	2.6	9.6
February	49.3	29.5	39.4	1.8	2.9
March	58.3	34.4	46.3	1.2	0.7
April	65.4	39.2	52.3	0.8	0
May	73.4	46.3	59.8	0.7	0
June	80	52.5	66.3	0.5	0
July	88.2	57.8	73	0.2	0
August	88.5	56.7	72.6	0.3	0
September	81.3	48.7	65	0.4	0
October	67.6	39.3	53.4	0.9	0
November	51.9	33.4	42.6	2.1	2.1
December	42.1	28.7	35.4	3.1	4.5
Annual	**65.8**	**41.4**	**53.6**	**14.6**	**19.8**

Source: Western Regional Climate Center, Western US Climate Historical Summaries, http://www.wrcc.dri.edu/CLIMATEDATA.html – Temperature and precipitation data (1981-2010), snowfall data (1893-2011)

The county's rolling topography creates local differences in wind patterns, and highly unstable climatic conditions are found in the Columbia Gorge and nearby areas as a result. The contact between continental and maritime air masses produces strong wind patterns. Prevailing winds are north-westerly in summer and northeasterly in winter. Winds are less dominant away from the Columbia Gorge, and western Wasco County is generally protected from winds by the Cascade Mountains to the west.

The topography of the county forms microclimates. The higher portions of rolling hills have higher soil temperatures because they are exposed to the sun and drying winds, while the creek bottoms and canyons have lower soil temperatures and retain a greater amount of moisture. Differences in microclimates can be seen in the changes of vegetation, as trees and bushes are found in the canyons, while bunchgrass dominates the tops of rolling hills.

Minerals and Soils

The soils in Wasco County have formed in a variety of parent materials. In the northeastern part of the county, soils have developed from loess deposits. These deposits range from a few inches to more than fifteen feet in thickness. In a southerly direction, the deposits become finer textured and thinner. Where a thin deposit of loess occurs, the soils developed from a mixture

of loess and basalt. In the western part of the area, soils have developed from volcanic ash deposited over sediments. Soils in the southern part of the area have developed in fine textured sediments, and are predominantly fine textured with high percentages of coarse fragments. Water deposited soils formed in recent alluvium also occur along the area's major drainages, and small amounts of volcanic ash occur throughout the county.

Hazard Severity

There are many potential hazards that can occur within Wasco County, however several warrant more concern due to Wasco County's geography. For example the high desert and rolling plains of Wasco County make it particularly susceptible to drought. During dry years, drought is fairly common around the county, especially during a succession of dry years. Of particular concern with regard to drought potential are areas in the county (the City of Mosier for example) that rely upon wells and have seen a reduction in groundwater supply.

Historically, flooding has occurred along one or more of the county's waterways every few years. These include the White River, the Deschutes River and the Columbia River. Flooding on these rivers usually occurs during spring and early summer. Long periods of heavy rainfall and mild temperatures coupled with snowmelt contribute to flooding conditions, however riverine and flash floods may both occur in Wasco County. Riverine floods happen when the amount of water flowing through a river channel exceeds the capacity of that channel.

Because of its wet climate and considerable topographic relief, the Pacific Northwest is one of the more prolific portions of the nation for slope failures. Wasco County has several areas where landslides have taken place and many areas that are susceptible to landslides. The slopes above the Columbia River are particularly susceptible. Slides in Wasco County generally range in size from thin masses of soil of a few yards wide to deep-seated bedrock slides. Landslides typically occur in Wasco County during or after periods of heavy rain and flooding.

Wasco County is large in size and contains a diverse set of wildfire hazard and risk situations. There are several climatic and topographic conditions found in Wasco County that are conducive for large wildfires: hot and dry conditions during the fire season throughout the county; frequent high winds along the Columbia River Gorge which can contribute to fast moving fires that are difficult to control; and moderate to steep slopes in places like Mosier which add to the rate of wildfire spread and suppression difficulty.

Synthesis

Natural capital is essential in sustaining all forms of life including human life, and plays an often under-represented role in natural hazard community resiliency planning. With four distinct mild seasons, a diverse terrain and its proximity to the Columbia Gorge, Wasco County historically has had to deal with habitual drought, flooding, wildfires and the occasional landslide. By identifying potential hazards, temperature and precipitation patterns, along with natural capitals such as key river systems, Wasco County can focus on key areas to better prepare, mitigate, and increase the resiliency of local communities.

Socio Demographic Capacity

Population

According to the Census Bureau, the population of Wasco County in 2010 equaled 25,213 and averaged 10.6 persons per square mile. While the population in the State of Oregon increased by 12% from 2000 to 2010, Wasco County experienced an increase of 6% during the same time period. The county is primarily rural and currently the twenty-third most populated in the State of Oregon. The population of the county is slightly larger than neighboring Hood River County and Jefferson Counties, and significantly larger than neighboring Sherman, Gilliam and Wheeler counties. Table C.2 describes the population change in Wasco County and the adjacent communities between 2000 and 2010.

Table C.2: Regional Change in County Populations

County	Population (2010)	Population (2000)	Population Change (2000 - 2010)	Percent Change (2000 - 2010)	Average Annual Growth Rate
Wasco	**25,213**	**23,791**	**1,422**	**6.0%**	**0.6%**
Clackamas	375,992	338,391	37,601	11.1%	1.1%
Gilliam	1,871	1,915	-44	-2.3%	-0.2%
Hood River	22,346	20,411	1,935	9.5%	0.9%
Jefferson	21,720	19,009	2,711	14.3%	1.3%
Sherman	1,765	1,934	-169	-8.7%	-0.9%
Wheeler	1,441	1,547	-106	-6.9%	-0.7%
Oregon	3,831,074	3,421,399	409,675	12.0%	1.1%

Source: U.S. Census Bureau, 2000 Census, 2010 Census

The largest populated area in Wasco County is The Dalles, where just over half of County residents reside. Table C.3 describes the population change since 2000 within the cities and unincorporated areas of Wasco County compared to county as a whole. The Dalles, which is located along the Columbia River and Interstate 84 in the northern part of the county, grew at twice the rate of the whole county from 2000 to 2010, and likewise had a larger rise in population. The rest of the county's population is dispersed between smaller towns, unincorporated communities and other isolated dwellings.

Table C.3: Change in Wasco County Population

Jurisdiction	Population (2010)	Population (2000)	Population Change (2000 - 2010)	Percent Change (2000 - 2010)	Average Annual Growth Rate
Antelope	46	59	-13	-22.0%	-2.5%
Dufur	604	588	16	2.7%	0.3%
Maupin	418	411	7	1.7%	0.2%
Mosier	433	410	23	5.6%	0.6%
Shaniko	36	26	10	38.5%	3.3%
The Dalles	13,620	12,156	1,464	12.0%	1.1%
Unincorporated	10,056	10,141	-85	-0.8%	-0.1%
Wasco County	25,213	23,791	1,422	6.0%	0.6%

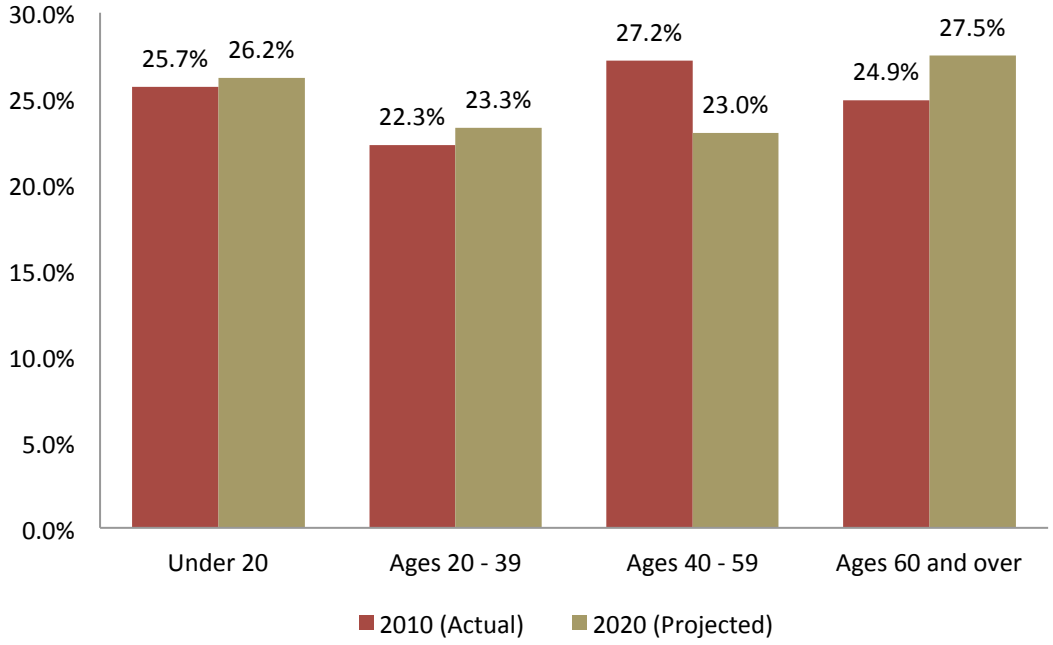
Source: U.S. Census Bureau, 2000 Census, 2010 Census

Population size itself is not an indicator of vulnerability. More important is the location, composition and capacity of the population within the community. Research by social-scientists demonstrates that human capital indices such as age, race, education, income, health and safety can greatly affect the integrity of a community, impacting its resilience to and ability to recover from, natural disasters.

Age

The age profile of an area has a direct impact both on what actions are prioritized for mitigation and how response to hazard incidents is carried out. Figure C.3 illustrates the current and projected percentage of population by age groups within the county. Currently, nearly a quarter (24.9%) of the population in the county is over the age of 60, compared to 20.1% of the population for Oregon as a whole. In addition, the Office of Economic Analysis (OEA) projects that from 2010 to 2020 the percent of the county's population under the age of 20 and over the age of 60 will increase.

Figure C.3: Wasco County Population by Age, 2010 and 2020

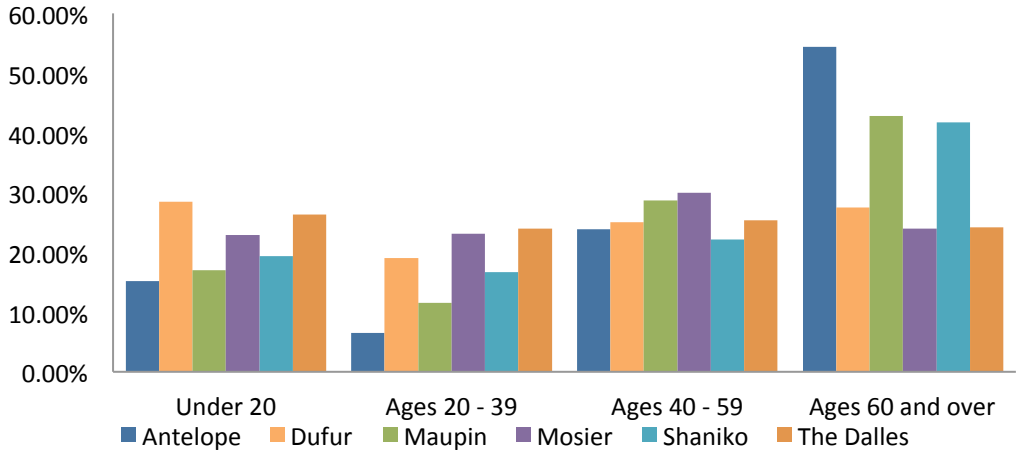


Source: 2010 (Actual), U.S. Census Bureau, 2010 Census
2020 (Projected), Office of Economic Analysis, Department of Administrative Services, State of Oregon, Released April 2004

Figure C.4 illustrates the percentage of population by various age groups in the incorporated communities of Wasco County. The Dalles and Dufur have the highest percentage of residents under the age of 20 and lower percentages of residents over the age of 60 compared to the county overall. School age children rarely make decisions about emergency management. Therefore, a larger youth population in an area will increase the importance of outreach to schools and parents on effective ways to teach children about fire safety, earthquake response, and evacuation plans. Children are also more vulnerable to the heat and cold, have few transportation options and require assistance to access medical facilities.[22] The City of Mosier has a very even age distribution, while the cities of Antelope, Maupin and Shaniko have significantly larger proportions of people age 60 and over in their populations. Older populations are another group that is likely to have special needs prior to, during and after a natural disaster. Older populations may require assistance in an evacuation due to limited mobility or health issues. Additionally, older populations may require special medical equipment or medications and can lack the social and economic resources needed for post-disaster recovery.[23]

[22] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.
[23] Wood, Nathan. Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon. U.S. Geological Survey, Reston, VA, 2007.

Figure C.4: Wasco County City Population Distribution by Age, 2010



Source: U.S. Census Bureau, 2010 Census

Other important considerations for high risk populations are the number of households where persons over the age of 64 live alone as well as single parent households with children under 18. Tables C.4 and C.5 describe the high risk populations in each jurisdiction within the county for which data is available. Over 30% of the 10,031 households in the county have individuals living in them who are 65 or older, and nearly half of those are 65 or older householders that live alone. Additionally, 8.9% of the households in the county are occupied by single parents with children under the age of 18. These groups are more heavily impacted because they may lack the necessary knowledge, skills, social support structures, or the mental and physical abilities necessary to take care of themselves. Historically, vulnerable populations present a special challenge to emergency managers and response agencies and they are more likely to be victims of a disaster. [24]

Table C.4: Wasco County High Risk Populations

High Risk Households	Wasco County	Percent	Dufur	Percent	Maupin	Percent
Total households	10,031		244		199	
Households with individuals under 18	2,937	29.3%	81	33.20%	39	19.6%
Single householder with own children under 18	889	8.9%	16	6.50%	8	4.0%
Households with individuals 65 years and over	3,094	30.8%	87	35.70%	87	43.7%
Householder 65 years and over living alone	1,249	12.5%	34	14%	42	21.1%

Source: U.S. Census Bureau, 2010 Census, American FactFinder, DP-1

[24] Source: Wasco County HIVA, July 2008

Table C.5: Wasco County High Risk Populations

High Risk Households	Mosier	Percent	The Dalles	Percent
Total households	203		5,472	
Households with individuals under 18	49	24.1%	1,659	30.3%
Single householder with own children under 18	16	7.9%	545	10.0%
Households with individuals 65 years and over	54	26.6%	1,654	30.2%
Householder 65 years and over living alone	23	11.3%	770	14.1%

Source: U.S. Census Bureau, 2010 Census, American FactFinder, DP-1

Race

The impact following a disaster in terms of losses and the ability of the community to recover may also vary among minority population groups. Studies have shown that racial and ethnic minorities can be more vulnerable to natural disaster events. Minorities are more likely to be isolated in communities, are less likely to have the savings to rebuild after a disaster, and less likely to have access to transportation and medical care. Additionally, minorities and the poor are more likely to rent than own homes, and in the event of a natural disaster, where homeowners would gain homeowner insurance, renters often do not have rental insurance.[25] Table C.6 describes the population in Wasco County by race and ethnicity.

Table C.6: Wasco County Racial Composition

Race	Count	Percent
Total Population	25,213	
One Race	24,571	97.5%
White	21,700	86.1%
Black or African American	106	0.4%
American Indian or Alaska Native	1,117	4.4%
Asian	192	0.8%
Native Hawaiian and other Pacific Islander	145	0.6%
Other race	1,311	5.2%
Two or more races	642	2.5%

Source: U.S. Census Bureau, 2010 Census, American FactFinder, DP-1

[25] State of Oregon Natural Hazards Mitigation Plan, Region 5 Mid-Columbia Regional Profile.

Table C.7: Wasco County Hispanic Ethnicity

Hispanic or Latino Origin	Count	Percent
Total Population	25,213	
Hispanic or Latino (of any race)	3,743	14.8%
Not Hispanic or Latino	21,470	85.2%

Source: U.S. Census Bureau, 2010 Census, American FactFinder, DP-1

The minority population in Wasco County is larger than several surrounding counties. The U.S. Census reports that nearly 14% of the Wasco County population identifies with a non-white race. Similarly, nearly 15% of the population is of Hispanic or Latino origin. Thus, it is important to identify specific ways to support all segments of the community through hazard preparedness and response. Culturally appropriate and effective outreach includes both methods and messaging targeted to this diverse audience. For example, connecting to historically disenfranchised populations through trusted sources or providing preparedness handouts and presentations in the languages spoken by the population can increase community resilience.

Education

Educational attainment of community residents is also an influencing factor in socio demographic capacity. Tables C.8 and C.9 describe educational attainment throughout the county and state. Compared to the state, Wasco County has a lower percentage of high school graduates and a much lower percentage of college graduates with a Bachelor's degree or higher, roughly 7% less.

Table C.8: Wasco County Educational Attainment

Educational Attainment	Count	Percent
Population 25 and over	17,080	
High school graduate or higher	14,398	84.3%
Bachelor's degree or higher	3,672	21.5%

Source: U.S. Census Bureau, 2010 Census, American FactFinder, S1501

Table C.9: Oregon Educational Attainment

Educational Attainment	Count	Percent
Population 25 and over	2,614,886	
High school graduate or higher	2,320,749	88.8%
Bachelor's degree or higher	751,803	28.8%

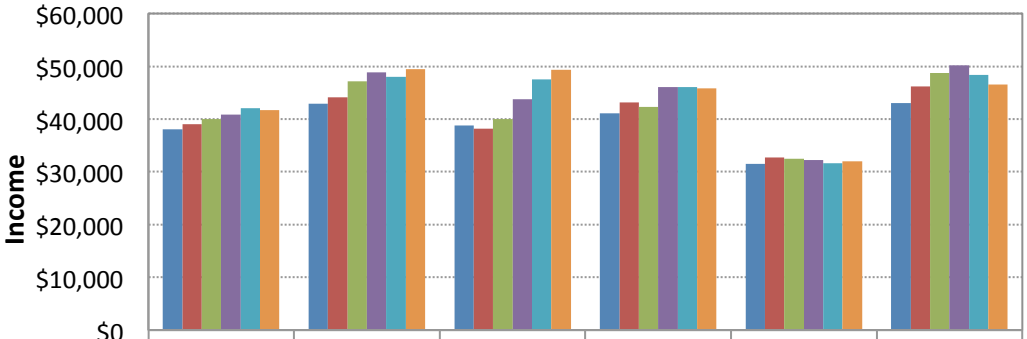
Source: U.S. Census Bureau, 2010 Census, American FactFinder, S1501

Educational attainment often reflects higher income and therefore higher self reliance. Widespread educational attainment is also beneficial for the regional economy and employment sectors as there are potential employees for professional, service and manual labor workforces. An oversaturation of either highly educated residents or low educational attainment can both have negative effects on the resiliency of the community.

Income

Household income and poverty status levels are indicators of socio demographic capacity and the stability of the local economy. Household income can be used to compare economic areas as a whole, but does not reflect how the income is divided among the residents in the area.[26] Figure C.5 illustrates changes in the median household income from 2005 to 2010 in Wasco and surrounding Counties. In 2010 the median household income across Wasco County equaled $41,711, roughly $5,000 lower than Oregon as a whole. However, the county's 9.5% growth in income between 2005 and 2010 is greater than the 8.1% growth indicated by the state over the same period of time.

Figure C.5: Median Household Income, 2005-2010



	Wasco County	Hood River	Sherman County	Gilliam County	Wheeler County	Oregon
2005	$38,092	$42,963	$38,806	$41,049	$31,525	$43,065
2006	$39,056	$44,148	$38,227	$43,111	$32,740	$46,228
2007	$40,048	$47,159	$39,954	$42,274	$32,522	$48,735
2008	$40,884	$48,895	$43,709	$46,111	$32,231	$50,165
2009	$42,015	$47,967	$47,473	$46,018	$31,570	$48,325
2010	$41,711	$49,490	$49,295	$45,827	$31,983	$46,536

Source: U.S. Census Bureau, Small Area Estimates Branch, 2005-2010

Income is a resiliency indicator as higher incomes are often associated with increased self reliance and ability to prepare oneself if an emergency does occur. Table C.10 identifies both the number and the percentage of individuals living below the poverty level. In 2010, the national poverty guideline for a family of four equaled income levels at or below $22,050.[27] The Census Bureau estimates that 15.7% of the total population and 23.5% of children live below the poverty level across the county. Poverty levels of all ages increased by 1% since 2005, while the percentage of children living below the poverty level decreased slightly. Poverty limits the ability of households to engage in household level mitigation activities. In addition, the higher the poverty rate, the more assistance the community will likely need in the event of a disaster in the form of sheltering, medical assistance and transportation. Notably, the poverty estimates as

[26] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.
[27] U.S. Department of Health and Human Services. *Federal Register*, Vol. 75, No. 148, August 3, 2010, pp. 45628–45629

a percentage are consistently higher in Wasco County compared to state and national averages, with the exception of poverty among all ages in 2010.

Table C.10: Individuals Living Below Poverty Level

	2005 Poverty All Ages (Estimate)	2010 Poverty All Ages (Estimate)	2005 Poverty Under 18 (Estimate)	2010 Poverty Under 18 (Estimate)
Wasco County	3,373	3,887	1,275	1,332

	2005 Percent Poverty All Ages	2010 Percent Poverty All Ages	2005 Percent Poverty Under 18	2010 Percent Poverty Under 18
Wasco County	14.7%	15.7%	23.8%	23.5%
Oregon	14.1%	15.8%	18.8%	21.7%
United States	13.3%	15.3%	18.5%	21.6%

Source: U.S. Census Bureau, Small Area Estimates Branch, 2005 Estimates, 2010 Estimates

Additionally, the number of school children eligible to receive free or reduced lunch has fluctuated but increased by 2% from 2005 to 2010. As shown in Table C.11 below, more than half of the students in the county have qualified for the lunch program over the past five years, with 60% qualifying in 2010.

Table C.11: Wasco County Free or Reduced Price School Lunch Eligibility

	2005	2006	2007	2008	2009	2010
Percent of children eligible to receive free/reduced lunch during the school year	58.0%	55.3%	51.5%	56.2%	55.6%	60.0%

Source: Children First for Oregon, Status of Oregon's Children, 2005-2010

The county has also seen an increase since 2008 in the number of individuals enrolling in assistance programs. As of August 2011, 22.2% of Wasco County residents were receiving Food Stamps. This figure represents a 46% increase from January 2008 levels. Furthermore, the number of people receiving cash assistance as a part of Temporary Assistance to Needy Families (TANF) has also increased to 1.4% of county residents, up 9% since January 2008.[28] The TANF program provides cash assistance to low-income families with children while they strive to become self-sufficient with the goal of reducing the number of families living in poverty, through employment and community resources.[29] The current maximum monthly benefit for a family of three is $506.

[28] Oregon State University, Rural Studies Program, Oregon Agriculture and County Information System, 2008-2011

[29] Oregon Department of Human Services. Food, Cash, Housing. Temporary Assistance for Needy Families. http://www.oregon.gov/DHS/assistance/cash/tanf.shtml

Health and Safety

Individual and community health play an integral role in community resiliency. It is recognized that those who lack health insurance have higher vulnerability to hazards and will likely require additional community support and resources. Table C.12 identifies health insurance coverage across Wasco County. The Census Bureau estimates in 2009 that the number of uninsured residents in Wasco County under the age of 65 equaled 4,251, roughly 21.8%. It is important to note that the uninsured rate for persons under the age of 65 has been consistently higher in the county compared to the state over the past five years. Overall, the percent of uninsured residents in Wasco County has gradually increased by about 2% since 2005.

Table C.12: Wasco County Health Insurance Coverage

		Percent Uninsured - Under Age 65	Margin of Error	Percent Uninsured - Under Age 19
2005	Wasco County	19.9%	+/-2.8%	n/a
	Oregon	18.7%	+/-0.9%	n/a
2006	Wasco County	21.6%	+/-2.6%	16.1%
	Oregon	19.1%	+/-0.9%	12.9%
2007	Wasco County	22.3%	+/-2.5%	17.5%
	Oregon	18.8%	+/-0.9%	12.8%
2008	Wasco County	22.6%	+/-1.9%	17.4%
	Oregon	18.0%	+/-0.4%	12.3%
2009	Wasco County	21.8%	+/-1.7%	13.6%
	Oregon	19.4%	+/-0.4%	11.0%

Source: U.S. Census Bureau, Small Area Health Insurance Estimates, 2005-2009

The availability of law enforcement officials and professional medical care providers can serve to strengthen the resilience of a community and lessen the immediate impacts during and immediately following a major disaster. There are a total of 23 full time sworn officers in the city of The Dalles Police Department including administration, and the Wasco County Sheriff's Office has 16 full time sworn officer positions including administration. As shown in Table C.13 below, the rate of sworn police officers per 1,000 people in Wasco County is essentially the same as the rate throughout the entire state. Similarly, the American Medical Association identifies that there are nearly two physicians in patient care per 1,000 people, about one fifth less than the state as a whole.

Table C.13: Wasco County Physicians and Sworn Police Officers

		Wasco County	Oregon
2010	Number of Sworn Police Officers	39	6,035
	Rate per 1,000 population	1.6	1.6
2009	Number of Physicians	50	9,609
	Rate per 1,000 population	2.0	2.5

Source: Wasco County Sheriff's Office; The City of The Dalles Police Department; Federal Bureau of Investigation, Uniform Crime Reports, Updated: November 17, 2010; American Medical Association, Physician Characteristics and Distribution in the US, Update: February 24, 2011.

Synthesis

Socio demographic capacity is a significant indicator of community hazard resiliency. The characteristics and qualities of the community population such as age, race, education, income, health and safety are significant factors that can influence the community's ability to cope, adapt to and recover from natural disasters. The current status of socio demographic capacity indicators can have long term impacts on the economy and general stability of a community, ultimately affecting an area's overall level of resilience.

Regional Economic Capacity

Economic resilience to natural disasters is far more complex than merely restoring employment or income to the local community. Building a resilient economy requires an understanding of how the component parts of employment sectors, workforce, resources and infrastructure are interconnected in any existing economic picture. Once inherent strengths or systematic vulnerabilities become apparent, both the public and private sectors can take action to increase the resilience of the local economy.

Regional Affordability

The evaluation of regional affordability supplements the identification of socio-demographic capacity indicators, i.e. median income, and is a critical analysis tool to understanding the economic status of a community. This information can capture the likelihood of individuals' ability to prepare for hazards, through retrofitting homes or purchasing insurance. Regional affordability is a mechanism for generalizing the abilities of community residents to get back on their feet without Federal, State or local assistance.

Median Income

Median income can be used as an indicator for the strength of a region's economic stability. Table C.14 shows that between 1999 and 2009 the median household income in Wasco County has risen at a much faster rate than both the state and nation as a whole, though the county's median income still remains below state and national averages.

Table C.14: Median Household Income, 1999 and 2009

	1999	2009	Change	Annual Average Growth Rate
Wasco County	$35,959	$42,015	$6,056	2.8%
Oregon	$40,916	$48,325	$7,409	1.7%
United States	$41,994	$50,221	$8,227	1.8%

Source: U.S. Census Bureau: Household Income 1999 – Census 2000 Brief; State and County Quick Fact – 2010 Census; American FactFinder – 2000 Census

Economic Diversity

Economic diversity is a general indicator of an area's fitness for weathering difficult financial times. One method for measuring economic diversity is through use of the Hachman Index, a formula that compares the composition of county and regional economies with those of states or the nation as a whole. Using the Hachman Index, a diversity ranking of 1 indicates the Oregon County with the most diverse economic activity compared to the state as a whole, while a ranking of 36 corresponds with the least diverse county economy. Wasco County and

neighboring Hood River County sit between the two most highly ranked counties in the state in terms of economic diversity, as well as three of the lowest ranked counties, with Sherman County ranked lowest in the state overall. The Wasco County economic diversity ranking is 17[30], in the middle tier of Oregon's 36 counties.

Table C.15: County Hachman Index Scores and Ranks

County	2009 Hachman Index Score	2009 State Rank	1999 State Rank
Wasco	**0.357**	**17**	**19**
Clackamas	0.855	1	4
Gilliam	0.066	35	35
Hood River	0.306	22	24
Jefferson	0.072	34	29
Sherman	0.064	36	36
Wheeler	0.148	29	31

Source: Oregon Employment Department

While illustrative, economic diversity is not a guarantor of economic vitality or resilience. For example as of 2010, though Multnomah and Clackamas Counties are ranked number 1 and 2 in the state for economic diversity, they are both listed as "economically distressed" by the Oregon Business Development Commission. Meanwhile, neighboring Hood River County, ranked 22 in terms of economic diversity, is not.[31] The economic distress measure is based on indicators of decreasing new jobs, average wages and income, and is associated with an increase of unemployment.

Employment and Wages

Data provided by the US Census in the 2010 American Community Survey indicate that Wasco County's labor force (defined as the population of 16 and older which are in the labor force) increased from 12,764 to 14,320 between 2001 and 2010, a 12.2% increase. [32]

Though there was a rise in unemployment in Wasco County from 2009 to 2010, reflecting national trends, unemployment dropped as low as 8.2% during 2011 according to the Oregon Employment Department. [33] Many surrounding Counties in the region have remained below the state average over the past three years, and Wasco County has remained below the national average during most of 2011. As of October 2011, total non-farm employment for the county was 9,550 individuals,[34] and total employment in the county was 13,365.[35]

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[30] Oregon Employment Department – 2009 Hachman Index Scores by County
[31] Business Oregon – Oregon Economic Data "Distressed Communities List"
[32] Oregon Employment Department - "Local Area Employment Statistics", http://www.qualityinfo.org/olmisj/labforce
[33] Ibid.
[34] Oregon Employment Department – "Current Employment Statistics", http://www.qualityinfo.org/olmisj/CES
[35] Oregon Employment Department - "Local Area Employment Statistics" http://www.qualityinfo.org/olmisj/labforce

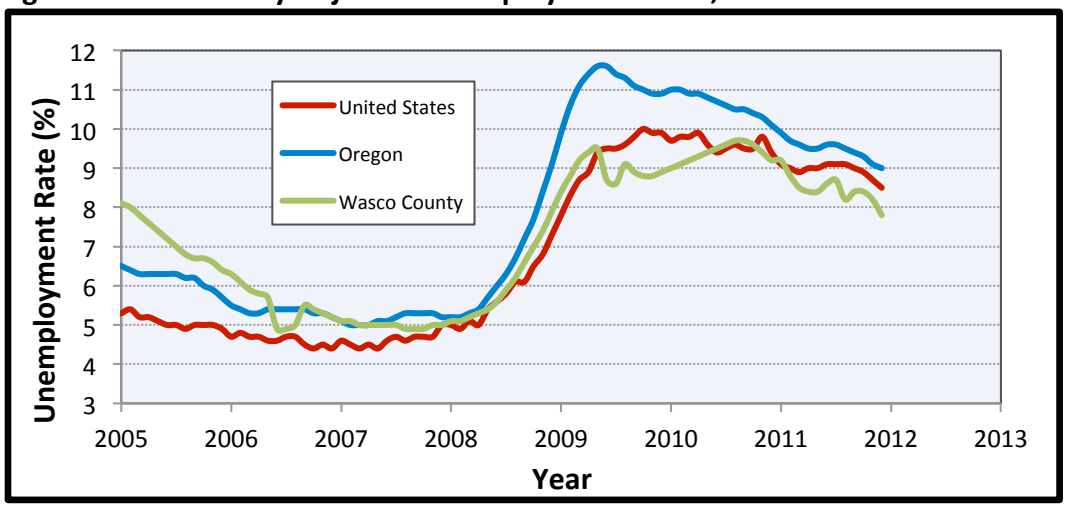
Table C.16: Regional Unemployment

County	2005 Unemployment Rate	2011 Unemployment Rate	Percent Change from 2005
Wasco	**7.1**	**8.4**	**18.3%**
Clackamas	5.5	8.7	58.2%
Gilliam	5.7	6.5	14.0%
Hood River	6.4	7.7	20.3%
Jefferson	6	13.1	118.3%
Sherman	6.9	9	30.4%
Wheeler	6.4	9.7	51.6%
Oregon	6.2	9.5	53.2%

Source: Oregon Employment Department, "Local Area Employment Statistics". http://www.qualityinfo.org/olmisj/labforce.

Employment data from the Oregon Employment Department demonstrate a cyclical employment pattern in the Wasco and Hood River County region, with a seasonal peak in the summer (July) in Wasco County and a seasonal peak in the fall (September/October) for Hood River County.[36] These peaks typically respond to the slowing of the primary tourist season along the Columbia River, as well as most agricultural operations, with the approach of fall and winter in the region.

Figure C.6: Seasonally Adjusted Unemployment Rates, 2005-2011



Source: Oregon Employment Department, "Local Area Employment Statistics". http://www.qualityinfo.org/olmisj/labforce.

As opposed to measurements of the labor force and total employment, Covered Employment provides a quarterly count of all employees covered by Unemployment Insurance. Table C.17 displays the County Covered Employment and payroll figures for Wasco and surrounding Counties in 2011.

[36] Oregon Employment Department, "Local Area Employment Statistics", http://www.qualityinfo.org/olmisj/labforce

Table C.17: 2010 County Covered Employment and Payroll

County	Employees	Annual Payroll	Average Pay
Wasco	**10,674**	**$334,221,890**	**$31,312**
Hood River	12,435	$353,319,141	$28,413
Sherman	723	$26,039,961	$36,017
Gilliam	896	$35,673,719	$39,814
Wheeler	301	$7,239,023	$24,050
Clackamas	136,805	$5,766,675,559	$42,153
Jefferson	6,035	$199,927,463	$33,128
Oregon	1,598,642	$66,613,214,679	$41,669

Source: Oregon Employment Department, County Covered Employment and Wages.

In 2009, there were 724 employment establishments operating in Wasco County, and 91.6% of those establishments had fewer than 20 employees.[37] The prevalence of small businesses in the county is a partial indication of sensitivity to natural hazards, because small businesses are typically more susceptible to financial uncertainty. If a business is financially unstable before a natural disaster occurs, financial losses (resulting from both damage caused and the recovery process) may have a bigger impact than they would for larger and more financially stable businesses.[38]

Industry

Major Regional Industry

Key industries are those that represent major employers and are significant revenue generators. Different industries face distinct vulnerabilities to natural hazards, as illustrated by the industry specific discussions below. Identifying key industries in the region enables communities to target mitigation activities towards those industries' specific sensitivities. It is important to recognize that the impact that a natural hazard event has on one industry can reverberate throughout the regional economy.[39]

This is of specific concern when the businesses belong to the basic sector industry. Basic sector industries are those that are dependent on sales outside of the local community. The farm and ranch, information, and wholesale trade industries are all examples of basic industries. Non-basic sector industries are those that are dependent on local sales for their business, such as retail trade, construction, and health and social assistance.[40]

Employment by Industry

Economic resilience to natural disasters is particularly important for the major employment industries in the region. If these industries are negatively impacted by a natural hazard, such that employment is affected, the impact will be felt throughout the regional economy.[41] Thus,

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[37] U.S. Census Bureau - 2009 County Business Patterns, http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl
[38] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile
[39] Ibid.
[40] Ibid.
[41] Ibid.

understanding and addressing the sensitivities of these industries is a strategic way to increase the resiliency of the entire regional economy.

The county's economy is based upon agriculture (orchards, wheat farming, livestock ranching), lumber, manufacturing, electric power, transportation, and tourism. The county made a large shift towards a service oriented economy following the decline of regional aluminum production, once a major pillar of the local economy. Retail trade and services are concentrated in the City of the Dalles, and are anchored by small business, tourism and recreation.

The county's proximity to the Portland area, the Southern Pacific, Union Pacific and Burlington Northern railroad lines that run across the western edge of the region, and Interstate 84 provide good opportunities for the transportation of manufactured and agricultural goods. In addition, the region's proximity to the Columbia River, the Cascade Mountains and the high desert terrain provide year-round sporting and tourism activities. Looking towards the future, healthcare services, manufacturing, retail trade, tourism, agriculture and food products, construction, lumber and wood products will continue to grow and develop to provide goods, services and work opportunities for area residents. [42]

Table C.18 identifies Covered employment in Wasco County by industry. The four industries with the most employees, as of 2010, are government (21.2%), health and social assistance (15.9%), natural resources and mining (14.7%) and retail (14.6%). While Wasco County has considerable employment in some non-basic industries, such as health and social assistance as well as government, the county's third largest industry (natural resources and mining) is of the basic nature and thus dependent to a large degree on sales outside of the local community. Basic industries encourage growth in non-basic industries and bring wealth into communities from outside markets. However, a high dependence on basic industries can lead to severe difficulties when recovering from a natural disaster if vital infrastructure or primary resource concentrations have been greatly damaged.

[42] OR-SNHRA: (Region 5) Mid-Columbia

Table C.18: 2010 Total Covered Employment by Industry

Industry	Number Employed	Percent of Employment
Government	2,266	21.2%
Health & Social Assistance	1,694	15.9%
Natural Resources and Mining	1,566	14.7%
Retail	1,556	14.6%
Leisure and Hospitality	1,097	10.3%
Manufacturing	557	5.2%
Professional and Business Services	479	4.5%
Other Services	326	3.1%
Construction	321	3.0%
Financial Activities	317	3.0%
Wholesale	159	1.5%
Transportation, Warehousing & Utilities	164	1.5%
Information	106	1.0%
Education	65	0.6%
Private Non-Classified	1	-
Total	**10,674**	

Source: Oregon Employment Department, Wasco County Covered Employment and Wages.

The Oregon Employment Department estimates net employment growth between 2001 and 2010. In that time period, two of the county's four largest industries (not including agriculture), retail, along with education and health services, experienced considerable employment growth (20.2% and 27.1% respectively). Four industries experienced net losses during the time period: government (-6%), information (-26.7%), wholesale (-22.7%), and manufacturing (-35.6%).[43] This equated to the loss of 550 jobs, including 310 from manufacturing, 40 from information, 50 more from wholesale, and 150 from government at all levels. Notably, government jobs still made up nearly 25% of the county's nonfarm employment, primarily at the local level.

[43] Oregon Employment Department, Wasco County Covered Employment and Wages. 2011

Table C.19: Total Wasco County Nonfarm Employment by Industry, 2001 & 2010

Industry	2001	2010	Change 2001-2010		
			Number	Percent	Annual Average Growth Rate
Mining, logging and construction	340	390	50	14.7%	1.5%
Manufacturing	870	560	-310	-35.6%	-4.8%
Wholesale	220	170	-50	-22.7%	-2.8%
Retail	1,290	1,550	260	20.2%	2.1%
Transportation, Warehousing, and Utilities	180	200	20	11.1%	1.2%
Information	150	110	-40	-26.7%	-3.4%
Financial activities	360	380	20	5.6%	0.6%
Professional and business services	290	470	180	62.1%	5.5%
Education and health services	1,400	1,780	380	27.1%	2.7%
Leisure and hospitality	1,080	1,100	20	1.9%	0.2%
Other Services	310	320	10	3.2%	0.4%
Government	2,490	2,340	-150	-6.0%	-0.7%
Total Annual Average Nonfarm Employment	**8,980**	**9,370**	**390**	**4.3%**	**0.5%**

Source: Oregon Labor Market Information System - Current Employment Statistics

Overall, there was a 4.3% increase in Wasco County non-farm employment between 2001 and 2010, equating to an overall increase of 390 jobs during the nine year period.

High Revenue Sectors

The two nonfarm sectors with the highest known revenue in 2007 were retail (61.7%), and health care and social assistance (22.2%). Table C.20 shows the revenue generated by each economic sector. All of the known sectors combined generated more than $618 million in revenue for the county in 2007, the most recent year for which data is available.

Table C.20: Revenue of Nonfarm Sectors in Wasco County

Sectors	Sector Revenue ($1,000)	Percent of Total Revenue
Manufacturing*	NA	NA
Retail	381,866	61.7%
Wholesale*	NA	NA
Health care and social assistance	137,351	22.2%
Accommodation and food services	47,598	7.7%
Professional, scientific, and technical services	17,167	2.8%
Other services (except public administration)	15,187	2.5%
Real estate and rental and leasing	9,842	1.6%
Arts, entertainment, and recreation	9,054	1.5%
Educational services	581	0.1%
Administrative and Support and Waste Management and Remediation Services*	NA	NA
Total Revenue ($1,000)	**618,646**	

* Data incomplete, unavailable or withheld by U.S. Census Bureau
Source: U.S. Census Bureau, 2007 Economic Census. Economy-Wide Key Statistics, EC0700A1

The retail trade sector of Wasco County brought in the most revenue during 2007, generating more than $381 million.[44] The sector is highly dependent on tourism and importing of goods for sale in commercial establishments, tying it directly to the conditions of the county's transportation infrastructure, particularly Interstate 84. Depending on the severity of a natural disaster and the pace of recovery, revenue generated from this sector could be greatly impacted during a natural hazard event.

In 2007, the *health care and social assistance* sector generated $137 million, making it the second largest earning sector in Wasco County for which data was available. The sector is a relatively stable revenue generator, and relies largely on the local presence of older residents and elderly facilities. It is likely that the populations that require such services on a daily basis will continue requiring assistance, such as those living in residential care facilities. However, in the event of a disaster medical needs may increase due to physical or stress induced injuries and trauma. The physical infrastructure of this sector will be essential for maintaining the capacity of service that it currently provides.

Accommodation and food services generated over $47 million in revenue during 2007. A large portion of the sector's revenue is generated through leisure and hospitality, serving regional residents with disposable income and tourists, and could be adversely affected by a disaster. The behavior of both demographics would be disrupted if tourists deter from visiting the impacted area, or local residents concentrate spending on essential items rather than luxury expenditures (e.g. dining out).

The majority of Wasco County's revenue generating sectors are highly dependent upon transportation networks in order to receive shipped goods (e.g. food supplies and products),

[44] U.S. Census Bureau, 2007 Economic Census. Table 1 Selected Statistics by Economic Sector.

export goods to outside markets, and maintain accessibility to traveling motorists. Therefore disruption of the transportation system could have severe consequences for all of the before mentioned sectors.

In the event that any of the county's primary sectors are impacted by a disaster, particularly the retail and health and care and social assistance sectors, Wasco County may experience a significant disruption of economic productivity and should therefore plan accordingly.

Regional Industry Employment Forecast

Sectors that are anticipated to be major employers in the future also warrant special attention in the hazard mitigation planning process. Between 2010 and 2020, the largest employment growth in the region is anticipated in educational and healthcare services, which are expected to grow by 26% and add 1000 new positions. The trade, transportation and utilities sector is expected to grow by 16% and add 670 new positions during the same time period, while leisure and hospitality are projected to create 630 new positions and grow by 20%. Professional and business services have the highest projected growth rate at 33%, and the sector is expected to create around 500 new jobs by 2020.[45] Considering these projected industries are relatively reflective of the highest revenue generating industries in Wasco County as of 2007, and all play a vital role in the resilience of the regional economy, the sensitivities of these industries should be incorporated into future hazard mitigation planning.

Labor and Commute Shed

Most hazards can happen at any time during the day or night. It may be possible to give advance warning to residents and first responders who can take immediate preparedness and protection measures, but the variability of hazards is one part of why they can have such varied impact. A snow storm during the work day will have different impacts than one that comes during the night. During the day, a hazard has the potential to segregate the population by age or type of employment (e.g., school children at school or office workers in downtown areas). This may complicate some aspects of initial response such as transportation or the identification of wounded or missing. Conversely, a hazard at midnight may occur when most people are asleep and unable to receive an advance warning through typical communication channels. The following labor shed and commute shed analysis is intended to document where county residents work and where people who work in Wasco County reside.

As shown in Table C.21, overall the workforce is moderately mobile between Wasco, Hood River, Clackamas and Multnomah Counties. While the majority of Wasco County residents are employed within the county (54.1%), there are also a significant number of workers who commute to locations outside the county to work. Over 21% of workers who live in Wasco County travel westward to Hood River, Clackamas, and Multnomah Counties for their job. Interestingly, a significant number (19.4%) of county residents are employed further afield in locations including La Grande, Eugene, and in communities in Central Oregon such as Prineville, Redmond and Bend. It is possible that these workers do not physically commute every day or on a regular basis and instead telecommute or otherwise have remote locations.

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[45] Oregon Employment Department, Regional Employment Projections by Industry and Occupation - http://www.qualityinfo.org/olmisj/PubReader?itemid=00003217

Table C.21: Commute Shed (Where workers are employed who live In Wasco County), 2009

Location	Number	Percent
Wasco County	5,371	54.1%
The Dalles	4,175	42.1%
Chenoweth CDP	190	1.9%
Maupin	109	1.1%
Dufur	105	1.1%
Hood River County	980	9.9%
Hood River	630	6.3%
Multnomah County	690	7.0%
Portland	502	5.1%
Clackamas County	441	4.4%
Deschutes County	258	2.6%
Washington County	254	2.5%
Marion County	191	1.9%
Yakima County, WA	186	1.9%
Umatilla County	169	1.7%
Klickitat County, WA	163	1.6%
Benton County, WA	113	1.1%
Skamania County, WA	101	1.0%
All Other Locations	1,012	10.2%
Total	**9, 929**	

Source: U.S. Census Bureau, OnTheMap, Area Profile Analysis in 2009 by All Jobs

Table C.22 below tells the statistical story about where workers live who are employed in Wasco County. The majority of workers employed in the county are also residents (63.1%). The location outside of Wasco County where the highest numbers of workers come from is neighboring Hood River County. However a substantial number of workers live farther west of Hood River in Multnomah, Clackamas and Washington Counties (7.1%), while many others live across the river in Klickitat and Cowlitz Counties (7.7%).

Table C.22: Labor Shed (Where workers live who are employed in Wasco County), 2010

Location	Number	Percent
Wasco County	5,371	63.1%
The Dalles	3,488	40.9%
Chenoweth CDP	447	5.2%
Dufur	78	0.9%
Hood River County	569	6.7%
Hood River	213	2.5%
Klickitat County, WA	566	6.6%
Multnomah County	268	3.1%
Portland	199	2.3%
Clackamas County	208	2.4%
Washington County	133	1.6%
Marion County	105	1.2%
Deschutes County	98	1.2%
Cowlitz County, WA	97	1.1%
Lane County	87	1.0%
Clark County, WA	84	1.0%
All Other Locations	932	10.9%
Total	**8,518**	

Source: U.S. Census Bureau, OnTheMap, Area Profile Analysis in 2009 by Primary Jobs

The Labor Shed and Commute Shed analyses reveal that there is a great deal of commuting and worker exchange between communities in the region. While 45% of Wasco County workers maintain employment outside of the county, nearly 37% of Wasco County workers live elsewhere, both east and south of The Dalles, as well as to the north across the Columbia River in various Washington Counties.

Synthesis

Regional economic capacity refers to the present financial resources and revenue generated in the community to achieve a higher quality of life. Forms of economic capital include income equality, housing affordability, economic diversification, employment, and industry. The current and anticipated financial conditions of a community are strong determinants of community resilience, as a strong and diverse economic base increases the ability of individuals, families and the community to absorb disaster impacts for a quick recovery.

Considering its comparatively low unemployment rate, and the moderate diversity of its economy (though dependent on several basic industries for revenue generation), Wasco County may experience a less difficult time in recovering from a natural disaster than one with a less diverse economic base, or one already suffering from unemployment at levels around or higher than the state and national averages.[46] However it is important to consider what might happen to the county economy if the largest revenue generators and employers (the natural resources,

[46] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

health care and social assistance industries), were heavily impacted by a disaster. To an extent, and to the benefit of Wasco County, these particular industries are a mix of basic and non-basic industries, dependent on both external markets and local residents.

It is imperative however that Wasco County continues to recognize that economic diversification is a long-term issue. More immediate strategies and actions to reduce vulnerability from an economic perspective should focus on risk management for the county's dominant industries (e.g. business continuity planning) as well as the county's dependence on main transportation arteries.

Built Capacity

Housing Building Stock

Housing characteristics are an important factor in hazard mitigation planning, as some housing types tend to be less disaster resistant than others, and therefore warrant special attention. Table C.23 identifies the type of housing most common throughout the county. Of particular interest are mobile homes and other non-permanent housing structures (including boats, RVs, vans, etc.), which account for 19% of the housing in Wasco County. Mobile structures are particularly vulnerable to certain natural hazards, such as windstorms, and special attention should be given to securing the structures as they are typically more prone to damage than wood-frame construction.[47] Table C.23 furthermore indicates that the majority of Wasco County's housing stock is single-family homes.

It is also important to consider multi-unit structures, as they are more vulnerable to the impacts from natural disasters due to the increased number of people living in close proximity. In short, a structural weakness in a multiunit structure will have an amplified impact on the population. According to the data presented in Table C.23, roughly 15% of housing in Wasco County is made up of multi-family dwellings.

Table C.23: Wasco County Housing Type Summary, 2009

Housing Type	Number	Percent
1 unit	7,575	66.6%
2 to 10 units	1,001	8.8%
10 to 19 units	367	3.2%
20 or more units	270	2.4%
Mobile home	2,100	18.5%
Boat, RV, van, etc.	54	0.5%
Total	**11,367**	

U.S. Census Bureau, American Community Survey, 5 year Estimates, 2006-2010; B25024

Age of housing is another characteristic that influences a structure's vulnerability to hazards. Generally the older a home is, the greater the risk of damage from natural disasters. This is because stricter building codes have only been implemented in recent decades, following improved scientific understanding of plate tectonics and earthquake risk. In Oregon, many structures built after the late 1960's began utilizing earthquake resistant designs and

[47] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

construction. Similarly, communities in the northwest began implementing flood elevation ordinances in the 1970's.[48] In 1990 Oregon again upgraded to stricter seismic standards that included earthquake loading in the building design.[49] Table C.24 shows that just under 20% of the housing stock in Wasco County was built after 1990 when the more stringent building codes were put in place, leaving about 80% with questionable seismic stability, and nearly 40% with very questionable seismic stability (percentage of homes built before 1960). [50] Thus knowing the age of the structure is helpful in targeting outreach regarding retrofitting and insurance for owners of older structures.[51]

Table C.24: Wasco County Housing Stock by Age, 2010

Year Structure Built	Number	Percent
Built 2005 or later	383	3.4%
Built 2000 to 2004	524	4.6%
Built 1990 to 1999	1,271	11.2%
Built 1980 to 1989	1,299	11.4%
Built 1970 to 1979	2,148	18.9%
Built 1960 to 1969	1,304	11.5%
Built 1950 to 1959	1,749	15.4%
Built 1940 to 1949	776	6.8%
Built 1939 or earlier	1,913	16.8%
Total housing units	**11,367**	

Source: U.S. Census, American Community Survey, 5 Year Estimates, 2006-2010; B25034

Mitigation and preparedness planning should also consider type of occupancy when developing outreach projects or educational campaigns. Residents who own their own home are more likely to want to take steps to reduce the impact of natural hazards through mitigation or insurance methods. Renters may be less invested in physical improvements to the unit, but outreach around personal preparedness or renters insurance would benefit this population. As demonstrated in Table C.25 below, approximately 36% of the occupied housing units in Wasco County are renter-occupied.

[48] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.
[49] Wang Yumei and Bill Burns. "Case History on the Oregon GO Bond Task Force: Promoting Earthquake Safety in Public Schools and Emergency Facilities." National Earthquake Conference. January 2006.
[50] Source: U.S. Census Bureau, 2005-2009 American Community Survey. B25034 Year Structure Built 5 Year Estimate.
[51] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

Table C.25: Wasco County Housing Unit Occupancy Summary, 2010

Housing Units	Number	Percent
Occupied housing	10,031	87.3%
Owner-occupied	6,434	64.1%
Renter-occupied	3,597	35.9%
Vacant housing	1,456	12.7%
Total	**11,487**	

Source: U.S. Census, American Community Survey, 2010; Census Summary File1, QT-H1

Physical Infrastructure

Physical infrastructure such as dams, roads, bridges, railways and airports support Wasco County communities and economies. Critical facilities are facilities that are critical to government response and recovery activities; however the term may also refer to facilities or infrastructure that could cause serious secondary impacts when disrupted. Many things can be counted as critical infrastructure and facilities depending on the social, environmental, economic, and physical makeup of the area under consideration. Some examples include: Agriculture and food systems; communications facilities; critical manufacturing; dams; emergency services; energy generation and transmission; government facilities; healthcare and public health; information technology; transportation systems; and water. Due to the fundamental role that physical infrastructure plays both in pre and post-disaster, they deserve special attention in the context of creating resilient communities.[52]

Dams

Dam failures can occur at any time and are quite common. Fortunately most failures result in minor damage and pose little or no risk to life safety.[53] However, the potential for severe damage still exists. The Oregon Water and Resources Department has inventoried all dams located in Oregon and Wasco County. Of the County's high hazard dams, of special concern is The Dalles Dam, which is by far the largest, and was last inspected in 1988.

Table C.26: Wasco County Dam Inventory and Threat Summary

Threat Potential	Number of Dams
High	8
Significant	0
Low	22

Oregon water Resources Department, Dam Inventory,
Query. http://apps.wrd.state.or.us/apps/misc/dam_inventory/

Rail Ways

Railroads are major providers of regional and national cargo trade flows. The Burlington Northern Santa Fe (BNSF) Railway and the Union Pacific Railroad run through Wasco County.[54]

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[52] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.
[53] Ibid.
[54] Oregon Department of Transportation, State of Oregon, Oregon Railways.
http://www.oregon.gov/ODOT/TD/TDATA/gis/docs/statemaps/railroads.pdf?ga=t

The Union Pacific Line in Wasco County is limited to the stretch of tracks that follow I-84 and the Columbia River on the northern border of the county. The BNSF Line crosses I-84 and the Columbia River around Wasco County's northeastern border, running north to south along the Deschutes River into Jefferson County.

Rails are sensitive to icing from winter storms that can occur in the Columbia Gorge region. For industries in the region that utilize rail transport, these disruptions in service can result in severe economic losses. The potential for rail accidents caused by natural hazards can also have serious implications for the local communities if hazardous materials are involved.[55]

Airports

Wasco County has no commercial service airports, but has 10 private airports, including a helipad at the Mid-Columbia Medical Center and another at Mid-Columbia Fire and Rescue.[56] The Portland International Airport in Portland is the only major commercial service airport near Wasco and surrounding Counties. However a small regional airport, Columbia Gorge Regional Airport, is located in Dallesport, WA, just across the Columbia River from The Dalles. Larger airports are also located in Yakima, WA to the northeast and in Redmond, OR to the south. Access to these airports faces the potential for closure from a number of natural hazards, including wind and winter storms common to the region.[57]

Roads and Bridges

The region's major expressway is Interstate 84. It runs East/West through Wasco County and is the main passage for automobiles, buses and trucks traveling along the Columbia River. Other major highways that service this region include:

- US Highway 197 connects The Dalles at I-84 with Dufur and Maupin to the South.
- US Highway 97 merges with US Highway 197, connecting Wasco County with Sherman County to the east and Jefferson County to the south.
- US Highway 26 provides an alternate route from Portland to Wasco County. The Highway wraps around the southern side of Mt. Hood before moving south to Warm Springs and then Madras.
- Highway 216 runs primarily east/west and connects Highways 197, 97 and 26 in the southern half of Wasco County.
- Highway 35 runs south from I-84 through Hood River before intersecting with US Highway 26 on the south side of Mt. Hood.

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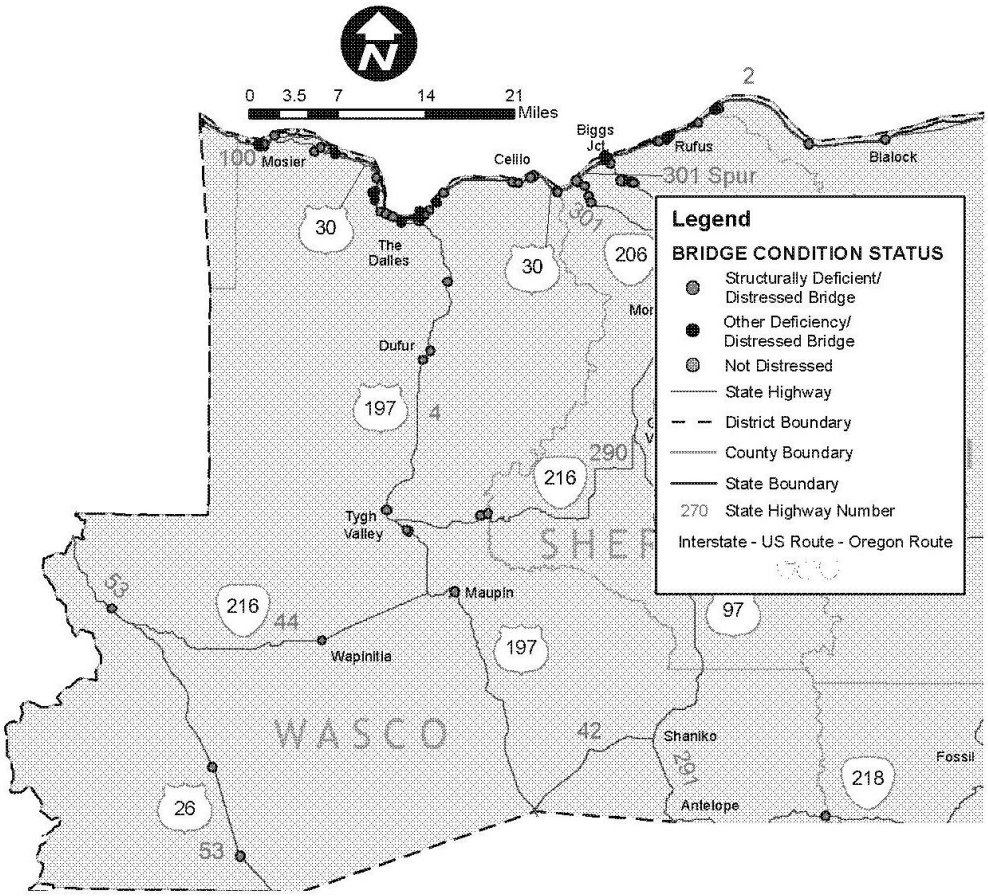
[55] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.
[56] FAA Airport Master Record. 2011. http://www.faa.gov/airports/airport_safety/airportdata_5010/
[57] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

Figure C.7: Wasco County Bridge Inventory, ODOT



Source: 2011 Bridge Condition Report, Oregon Department of Transportation

Daily transportation infrastructure capacity in the Columbia Gorge region is only moderately stressed by maintenance, congestion, and oversized loads, however peak loads and congestion can materialize during holidays and major construction projects, but can also fluctuate by season. Natural hazards tend to further disrupt automobile traffic and create gridlock; this is of specific concern in periods of evacuation during an emergency.[58]

The existing condition of bridges in the region is also a factor that affects risk from natural hazards. Bridge failure can have immediate and long term implications for the response and recovery of a community. Incapacitated bridges can disrupt traffic and exacerbate economic losses due to the inability to transport products and services in and out of the area.[59] The Wasco County Public Works Department is responsible for maintenance of 124 bridges around the county (includes 67 National Bridge Inventory (NBI) bridges (20' or longer), and 57 non-NBI bridges (less than 20')).[60] Table C.27 represents the condition of nearby NBI bridges, and highlights the number of distressed bridges in ODOT's Region 4, District 9. The region encompasses all of Wasco, Sherman and Gilliam Counties.

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[58] Ibid.
[59] Ibid.
[60] Wasco County Public Works Department, http://co.wasco.or.us/county/dept_works_roads.cfm

The NBI identifies 4 distressed bridges, and concludes that 20% of all the bridges in the region exhibit some form of structural or other deficiency. The classification of a distressed bridge does not imply the bridge is unsafe; however in the event of seismic activity these bridges are of higher vulnerability to failure.

Table C.27: ODOT Region 4, District 9 Bridge Condition and Deficiency Overview

Deficiency	Number	Percent
Structurally Deficient – Distressed Bridges	4	3.8%
Other Deficiency – Distressed Bridges	17	16.2%
Not Distressed	84	80.0%
Total	**105**	

Oregon Department of Transportation, 2011 Bridge Condition Report; Region 4, District 9

Utility Lifelines

Utility lifelines are the resources that the public relies on daily, (i.e., electricity, fuel and communication lines). If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines are closely related to physical infrastructure, (i.e., dams and power plants) as they transmit the power generated from these facilities.

The network of electricity transmission lines running through the Columbia Gorge region is operated by Pacific Power and Light, the Wasco Electric Cooperative, and the Northern Wasco PUD, the three entities that primarily facilitate local energy production and distribution in the area.

Power Generation

The majority of electrical power in the region is generated through hydropower; these dams are primarily situated on the Columbia River. There is one major hydroelectric dam in Wasco County, The Dalles Dam, which is located on the Columbia River just east of The Dalles. Wasco County has no power plants and there are no large wind power installations located within county limits, however the Summit Ridge Wind Project, a 200 MW facility, has been approved, and other projects are in various stages of development.[61]

Pacific Power

Pacific Power serves customers in Southern Washington, Oregon, Northern California, Eastern Idaho, Utah and Wyoming, including Wasco County and other communities in the Columbia Gorge.

Northern Wasco People's Utility District

Northern Wasco PUD, a not-for-profit customer-owned utility company, provides electricity to customers in Northern Wasco County, administering electricity produced by The Dalles Dam. Northern Wasco PUD also co-owns a ten megawatt unit at the McNary Dam in partnership with Klickitat County PUD.

[61] Renewable Northwest Project, Renewable Energy Projects - www.rnp.org/project_map/

WASCO ELECTRIC COOPERATIVE

The Wasco Electric Cooperative engages in energy transmission and distribution, providing electric service to customers in most of Wasco, Sherman, Jefferson, Gilliam and Wheeler Counties.

Gas Service

A gas distribution line crosses the Columbia River into Wasco County near The Dalles. The distribution line is fed by a larger natural gas transmission line that borders the northern bank of the Columbia River in Washington, which is controlled by Cascade Natural Gas. TransCanada controls another natural gas pipeline that crosses into the southeast corner of Wasco County from Sherman County before moving South to Jeffereson County.[62] Most of the natural gas Oregon uses originates in Alberta, Canada, and Avista Utilities owns the main natural gas transmission pipeline.[63] These lines may be vulnerable to severe, but infrequent natural hazards, such as earthquakes, which could disrupt service to natural gas consumers across the region. NW Natural Gas also distributes natural gas to communities in Oregon and southwest Washington. They are headquartered in Portland, OR, but Wasco County has access to NW Natural Gas through a service center in The Dalles.

Telecommunications

There are many telecommunication providers in Wasco County, including CenturyLink and Charter Communications, the third and fourth largest telecommunications companies in the United States. Comcast, gorge.net and most major cell phone service providers also operate throughout the region.

Sewage and Landfill

There are six community sewer systems in the county. The cities of Dufur, Maupin, Mosier, and The Dalles each have a community sewer system. The rural unincorporated community of Wamic also has a community sewer system, and the Sportsmen's Park subdivision has a community drainfield.

The Northern Wasco County Sanitary Landfill is a privately owned facility and is the only sanitary landfill in the county. Various garbage services across the region dump at the landfill.

Critical Facilities

Critical facilities are those facilities that are essential to government response and recovery activities (e.g., hospitals, police, fire and rescue stations, school districts and higher education institutions).[64] The interruption or destruction of any of these facilities would have a debilitating effect on incident management. Critical facilities in Wasco County are identified in Table C.28 below.

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[62] TransCanda, GTN System Map - http://www.gastransmissionnw.com/downloads/documents/system_map.pdf

[63] Loy, W. G., ed. 2001. Atlas of Oregon, 2nd Edition. Eugene, OR: University of Oregon Press.

[64] State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

Table C.28: Wasco County Critical Facilities

	County Total
Hospitals (# of beds)	1 (49)
Police / Sheriff's Offices	3
Fire & Rescue Stations	7
Dams	31
Bridges	124
School Districts & Colleges	3 districts, 1 Community College
Airports	10
Public Airport	*0*
Private Airport	*8*
Private Helipad	*2*

Source: Mid-Columbia Medical Center, Wasco County Sheriff's Office, Mid-Columbia Fire and Rescue, Oregon Water Resources Department, Wasco County Public Works Department, Oregon Department of Education, FAA Airport Master Record

Wasco County is served by the Oregon State Police Department and the Wasco County Sheriff's Office. The Dalles City Policy Department also provides services within the city limits. There are twelve fire response districts of various geographical extent and coverage operating in Wasco County. The districts are a mixture of Oregon and US Forest Service, county, municipal, and other various regionally affiliated entities.[65]

The County Courthouse, located in The Dalles, houses many of the administrative offices for Wasco County including the Sheriff as well as space for public hearings. The Courthouse also includes administrative offices for the State Courts. The Wasco County 911 Office is located at an undisclosed location nearby.

Dependent Facilities

In addition to the critical facilities mentioned in Table C.28, there are other facilities that are vital to the continued delivery of health services and may significantly impact the public's ability to recover from emergencies. Assisted living centers, nursing homes, residential mental health facilities, and psychiatric hospitals are important to identify within the community because of the dependent nature of the residents. Such facilities can also serve as secondary medical facilities during an emergency, as they are equipped with nurses, medical supplies and beds.

In Wasco County there are four assisted living centers, three registered nursing homes, and one residential mental health facility. Most of these facilities are located in The Dalles, though there is an assisted living facility in Maupin. There are also seven live-in care facilities around the county that have a resident capacity of five or less, where seniors and people with disabilities live and have care provided for them.[66] There is one psychiatric hospital in Wasco County, Wasco County Mental Health, which is located in The Dalles.

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[65] Wasco County Fire Districts Map - http://co.wasco.or.us/county/documents/public_works/fire_districts.pdf

[66] Seniors and People with Disabilities Service – Wasco County Office

Correctional Facilities

Correctional facilities are incorporated into physical infrastructure as they play an important role in everyday society by maintaining a safe separation of the public from potentially dangerous elements. There is one correctional facility located in Wasco County, NORCOR, which is located in The Dalles and serves correctional needs for Wasco, Hood River, Sherman and Gilliam Counties. While correctional facilities are built to code to resist structural failure and typically have back up power to sustain regulation of inmates following the immediate event of an emergency, logistical planning becomes more of a challenge when the impacts of the event continue over a long duration.

Synthesis

Built capacity refers to the built environment and infrastructure that supports a community. The various forms of built capital mentioned throughout this section, play significant roles in the event of a disaster. Physical infrastructure, including utility and transportation lifelines, are critical to maintain during a disaster and are essential for proper functioning and response. Community resilience is directly affected by the quality and quantity of built capital and lack of or poor condition of infrastructure can negatively affect a community's ability to cope, respond and recover from a natural disaster. Initially following a disaster, communities may experience isolation from surrounding cities and counties due to infrastructure failure. These conditions force communities to rely on local and immediate resources.

Around 19% of Wasco County's housing stock is made up of mobile homes and other non-permanent housing structures (including boats, RVs, vans, etc.), while roughly 15% is made up of multi-family dwellings, types of housing that may significantly amplify the human costs of natural hazards and disasters due to the density of occupants. Likewise over 80% of the county's housing was built before 1990, the year Oregon upgraded its seismic building standards to include seismic loading. In terms of infrastructure, eight of Wasco County's thirty dams are classified as high threat potentials, including The Dalles Dam, Wasco County's largest. Over 80% of bridges in the region are not distressed, but four are structurally deficient, and seventeen exhibit some other form of deficiency. Most of the county's critical facilities and vital infrastructure are located in The Dalles; however there are a number of alternative highways and roads aside from I-84 that may provide service access to people outside of the city, or serve as evacuation routes away from The Dalles in case of an emergency.

Community Connectivity Capacity

Social Organizations

Social organizations can play an important role in promoting hazard mitigation and in aiding recovery efforts following a natural disaster. These organizations are uniquely suited to reach vulnerable populations, which have a tendency to be more at-risk in the event of a disaster. Social organizations take a number of forms, but are often community oriented programs that provide social and community-based services for the public. In promoting hazard awareness, Counties should work closely with such programs to help distribute information and educate the public as to proper hazard mitigation practices.

Below are a few methods that social organizations located throughout Wasco County can use to become involved in hazard mitigation.

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

Civic Engagement

Civic engagement and involvement are important indicators of community connectivity. Whether it is engagement through volunteerism or through local, state, and national politics, you can gauge the connection people have to their community by their willingness to help out.

Residents who want to become involved in their community through volunteering have a number of opportunities available to them throughout the region. Through Gorge Search[67] and other programs, residents can search online through a variety of volunteer opportunities around the region and choose one that fits their skills, interests and schedule. These programs, among many others, allow residents to give back to their community.

Those who are more invested in their community may also have a higher tendency to vote in political elections. Below, Table C.29 outlines voter participation and turnout percentages from the 2008 Presidential General Election compared to the 2010 State Representative General Election. The 2008 Presidential General Election resulted in an 83.6% voter turnout in the county, while the 2010 State Representative General Election only resulted in a turnout of about 73.9% voter participation.[68] These results are synonymous with voter participation reported across the State.[69]

Table C.29: Wasco County Election Results, 2008 and 2010

	2008 Presidential General Election		2010 State Representative General Election	
	Wasco County	**Oregon**	**Wasco County**	**Oregon**
Total - Registered Voters	13,794	2,153,914	12,924	2,068,798
Total - Ballots Cast	11,525	1,845,251	9,546	1,487,210
Voter Turnout Percentage	83.6%	85.7%	73.9%	71.9%

Source: Wasco County Clerk: Wasco County Final Election Results; Oregon Blue Book Election Results

[67] Gorge Search - http://www.gorgesearch.com/volunteer.htm
[68] Wasco County Clerk, Accessed 4 January 2012. http://co.wasco.or.us/county/dept_clerk_elections.cfm
[69] Oregon Blue Book. Accessed 15 December 2011. http://bluebook.state.or.us/state/elections/elections04.htm.

Cultural Resources

Cultural resources provide residents with a sense of belonging and can be used to teach current residents about the histories and lives of past residents. Historic sites, museums, and libraries are just a few of the resources that give residents and visitors a sense of cultural connectivity to a place. These resources celebrate history and help define an area that people call *home.*

Historic Places

The National Register of Historic Places lists all types of facilities and infrastructure that help define a community. Whether it is the first schoolhouse in town or even just the home of a resident who played a vital role in the success of the community, the *Register* lists all types of historic features that characterize the area. Table C.30 categorizes the 32 different National Historic Sites located throughout Wasco County by their distinction and function.

These places provide current residents, youth, and visitors with a sense of community. Because of the history behind these sites, and their role in defining a community, it is important to protect these *historic sites* from the impacts natural disasters might have on them.

Table C.30: National Register of Historic Sites in Wasco County

Type of Structure	Number of Structures
Bridges and Locks	-
Cabins, Estates, Farms, Houses, Huts, Lodges, Log Cabins	15
Mills	-
Historic Campsites, Complexes and Scenic Stretches	3
Hotels	2
Churches	2
Schools	-
Historic Districts	3
Buildings, Halls, City Sturctures	7
Total	**32**

Source: National Register of Historic Places - http://nrhp.focus.nps.gov/natregadvancedsearch.do

Libraries and Museums

Libraries and Museums are other facilities which a community can use to stay connected. The Dalles-Wasco County Library is the main facility in the county; however Maupin, Mosier and Dufur each have their own public libraries. These facilities serve a critical function in maintaining a sense of community, however library buildings should also be considered as a common place for members of communities to gather during a disaster.

Museums can also function in maintaining a sense of community as they provide residents and visitors with the opportunity to explore the past and develop cultural capacity. There are many museums throughout Wasco County that provide information on the region's natural and human history, with the largest, the Columbia Gorge Discovery Center, situated in The Dalles.[70] As with public libraries, it is important to consider museums in the mitigation process for

[70] Historic The Dalles Oregon - http://www.historicthedalles.org/the_dalles-museums.htm

community resilience. These structures should be protected in critical times to preserve cultural heritage, but may also serve as a place of refuge for community members during a disaster event.

The Confederated Tribes of Warm Springs

"Reservation lands extend from the summit of Oregon's Cascade Mountains and snowcapped Mt. Jefferson at 10,497 feet, east to the Deschutes River's elevation at 1,000 feet, with the Metolius River and Lake Billy Chinook forming the southern boundary.

Showcasing most of the Pacific Northwest's natural wonders, the Warm Springs Reservation includes Alpine lakes, pristine rivers, deep canyons and vistas of high desert and volcanic peaks. Over half the reservation is forested, with the remainder primarily range land.

Home of the Warm Springs, Wasco, and Paiute tribes, the Warm Springs Reservation is inhabited by nearly 4,000 tribal members, most of whom live in or around the town of Warm Springs.

Within the community, the Tribal government provides a variety of services, including education, public safety, utilities, health, resource management, business development and recreation. Many services not offered by the Tribal government are provided by locally-owned private businesses.

The tribal economy is based primarily on natural resources, including hydropower, forest products and ranching. Tourism and recreation also make important contributions."[71]

Community Stability

Residential Geographic Stability

Geographic stability often results in a feeling of connectedness to one's community and is a measure of one's rootedness. A person's place attachment refers to this sense of community and can often magnify efforts to help revitalize a community.[72] Regional residential stability is important to consider in the mitigation process as those who have been in one place for awhile are more likely to have a vested interest in the area and should be more likely to help with hazard mitigation efforts. Table C.31 estimates residential stability across the region. It is calculated by the number of people who have lived in the same house and/or county for more than a year, compared to the percentage of people who have not. Wasco County is estimated to have 91.8% of its residents live in the same house or within county boundaries generally for more than a year as of 2010, very near the state average. Aside from Hood River and Jefferson Counties, the figures of community stability below are relatively consistent across the region as well as compared to the State average.

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[71] Warm Springs, http://www.warmsprings.com/

[72] Susan Cutter, Christopher Burton, and Christopher Emrich, "Disaster Resilience Indicators for Benchmarking
Baseline Conditions," Journal of Homeland Security and Emergency Management 7, no. 1 (2010): 9.

Table C.31: Regional Residential Stability

County	Geographic Stability
Wasco	**91.8%**
Clackamas	92.8%
Gilliam	91.2%
Hood River	94.8%
Jefferson	88.3%
Sherman	91.9%
Wheeler	90.9%
Oregon	92.5%

Source: US Census Bureau, American Community Survey, 2006-2010; B07003

Homeownership

Another measure of community stability and place attachment is homeownership. One does not seek to be a homeowner in a place they don't feel safe and secure. Residents who become homeowners search for a place in which they are happy, protected, and can afford. Homeownership is an indicator that residents will most likely return to a community post-disaster, as these people are economically and socially invested in the community. Similarly, homeowners are more likely to take necessary precautions in protecting their property. Table C.32 identifies the percentage of homeownership across the region, where the remaining households are renters. Wasco County's home ownership rate is close to other counties in the region and notably higher than the state average.

Table C.32: Regional Homeownership

County	Home Owners
Wasco	**67.5%**
Clackamas	70.7%
Gilliam	66.6%
Hood River	68.3%
Jefferson	70.2%
Sherman	67.0%
Wheeler	77.8%
Oregon	63.8%

Source: US Census Bureau, American Community Survey, 2006-2010; B25003

Synthesis

Community connectivity capacity places a strong emphasis on social structure, trust and norms, and the cultural resources within a community. In terms of community resilience, these emerging elements of social and cultural capital will be drawn upon to stabilize the recovery of the community. Social and cultural capitals are present in all communities; however, it is dramatically different from one town to the next as they reflect the specific needs and composition of the community residents. A community with low residential stability may hinder the full potential of social and cultural resources, adversely affecting the community's coping and response mechanisms in the event of a disaster.

Place attachment can be determined through a variety of outlets. Wasco County has a wide range of resources in the form of social organizations, civic engagement, and cultural capital that help retain a sense of community and add to regional stability. Wasco County residents match state levels of voter turnout, regional stability and regional homeownership, suggesting that the county should continue to invest time informing and supporting its residents to build more resilient and better prepared communities, as they are more likely to return in the event of a disaster. Likewise, it is important to consider the roles such services and facilities can and will provide to residents during a disaster event.

Political Capital

Government Structure

Wasco County's Mission is "to ensure the provision of essential public services, which allow the people of Wasco County to enhance the quality of their lives. These services will be delivered in an efficient, effective and respectful manner."

Wasco County is governed by a Board of Commissioners consisting of three half time County Commissioners, all of which are elected positions. The Board of Commissioners normally meets on the first, second and third Wednesdays of each month in the County Courthouse to conduct county business. The County Courthouse, located in downtown The Dalles, houses many of the administrative offices for Wasco County including the Sheriff as well as space for public hearings. The Courthouse also includes administrative offices for State Courts, and the Wasco County 911 Office is located at an undisclosed location nearby. Although the County Board of Commissioners shares the actual administration of county affairs with elective department heads, it is, nevertheless, the focal point for decisions that must be made locally with respect to county affairs.[73]

Beyond Emergency Management, all the departments within the county governance structure have some degree of responsibility in building overall community resilience. Each plays a role in ensuring that the county functions and normal operations resume after an incident, and the needs of the population are met. Some divisions and departments of Wasco County government that have a role in hazard mitigation include:

- **Commission for Children and Families:** The Wasco County Commission on Children & Families (WCCCF) plans, advocates, and mobilizes the community to act on behalf of children, youth, and families; promoting their health, safety, and well being. In addition, WCCCF receives and manages grant resources, such as state, federal, and private foundation grants for distribution to community based agencies, organizations, and individuals. Because this department is in frequent contact with families and children, often thought of as vulnerable populations due to increased sensitivity to the impacts of hazard incidents, it should be a natural partner in mitigation actions for outreach efforts and to build the county's awareness of the needs of children and families.

[73] Wasco County Website, Departments, Board of County Commissioners - http://co.wasco.or.us/county/dept_county_court.cfm

- **Emergency Management:** Wasco County's Emergency Management system requires coordination of activities to mitigate, prepare for, respond to and recover from major emergencies or disasters. The Emergency Management program is administered by the Sheriff's Office with the Sheriff designated as the Director of Emergency Services. The program is coordinated by an Emergency Manager. The scope of the emergency management system includes cities, service districts, volunteer agencies, schools, and other organizations with emergency responsibilities.
- **Fairground Facilities:** The local fairground facilities serve as an entertainment venue but should be considered as a staging site for response efforts. Mitigation could include specific actions to ensure the facilities can be used during an emergency response; such as extra power should it need to be used as a shelter. A small fairground with limited space and facilities is located within the City of Dalles, while the county fairgrounds located south of The Dalles in Tygh Valley offers considerably more space and full facilities.
- **Health and Human Services:** The North Central Public Health District serves citizens of Wasco, Sherman and Gilliam Counties, and is responsible for enforcement and administration of public and environmental health laws of federal, state, and county government. The North Central Public Health District conducts activities necessary for the preservation of health, prevention of disease, and protection of the public by following the three core public health functions: *assessment, monitoring*, and *policy development***.** Furthermore, the Public Health Emergency Preparedness (PHEP) Program develops plans and procedures to better prepare the counties to respond, mitigate, and recover from all public health emergencies.[74]
- **Planning:** The Wasco County Planning Department strives to make the planning process understandable, convenient, and expeditious while treating everyone in an equitable, professional and respectful manner. The Department is primarily responsible for comprehensive land use planning in Wasco County. Among other functions and responsibilities, the department maintains Wasco County's Comprehensive Plan to establish a single, coordinated set of policies which act to provide for orderly development of Wasco County. These policies give a direction to planning, establish priorities for action, serve as a basis for future decisions, provide a standard by which progress can be measured, and promote a sense of community for an improved quality of life. It also helps all levels of government and private enterprise to understand the wants and needs of all Wasco County citizens.[75]
- **Public Works:** Wasco County's 25-person Department of Public Works consists foremost of the County Road Division. The Department is responsible for the construction and maintenance of 697 miles of roadway (300 miles of which is paved), 124 bridges, hundreds of culverts, and a myriad of other related items, such as signs and guardrail. Road maintenance activities involve pavement maintenance, gravel road grading, ditch and culvert cleaning, brushing, snow and ice removal, bridge maintenance, and sign maintenance. The Public Works Department and its employees have important information about the resilience of the physical aspects

[74] North Central Public Health District Website - http://www.wshd.org/wshd/default.htm
[75] Wasco County Planning Department Website - http://co.wasco.or.us/planning/planhome.html

of the community. The Department can help to prioritize projects for mitigation and should be a key partner in implementation as well.[76]

- **Sheriff Office:** The Sheriff's Office currently has fifteen sworn positions, with a mission to serve and protect persons and property and to maintain the peace and order within Wasco County. The Wasco County Sheriff's Office provides primary law enforcement services throughout Wasco County with the exception of the City of The Dalles. The Office oversees Patrol, Criminal Investigations, 911 Communications, Parole and Probation and Emergency Management.[77]

Existing Plan & 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. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.[78] The Wasco County 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, and maximizes the county's resources.

The following are a list of plans and policies already in place in Wasco County:

- Wasco County Comprehensive Plan

Originally Adopted: August 1983

- Wasco County Land Use and Development Ordinance

Originally Adopted: June 1985

- Wasco County Emergency Operations Plan

Original Release: 2006, Updated: January 2012

- Columbia Gorge National Scenic Area Management Plan

Originally Adopted October 1991, Amended: June 2007

- Wasco County National Scenic Area Land Use and Development Ordinance

Adopted: May 1994, Revised: August 19, 2010

- Wasco County Transportation Systems Plan

Adopted: July 2009

- Community Wildfire Protection Plan

Adopted: December 21, 2005

- Mt. Hood Coordination Plan

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[76] Wasco County Website, Departments, Public Works - http://co.wasco.or.us/county/dept_works_info.cfm

[77] Wasco County Website, Departments, Sherriff Office - http://co.wasco.or.us/county/dept_sheriff_info.cfm

[78] Burby, Raymond J., ed. 1998. Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities.

Prepared: September 2005

- Wasco County Area Service Ambulance Plan

Adopted: March 2012

- Wasco County Economic Development Strategic Action Plan

Created: November 2011

- Wasco County Economic Development Action Plan

Adopted: June 20, 2007

Synthesis

Political capital is recognized as the government and planning structures established within the community. In terms of hazard resilience, it is essential for political capital to encompass diverse government and non-government entities in collaboration; as disaster losses stem from a predictable result of interactions between the physical environment, social and demographic characteristics and the built environment.[79]

[79] Mileti, D. 1999. Disaster by Design: a Reassessment of Natural Hazards in the United States. Washington D.C.: Joseph Henry Press.

Appendix D: Economic Analysis of Natural Hazard Mitigation Projects

This appendix was developed by the Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center. 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 economic 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.

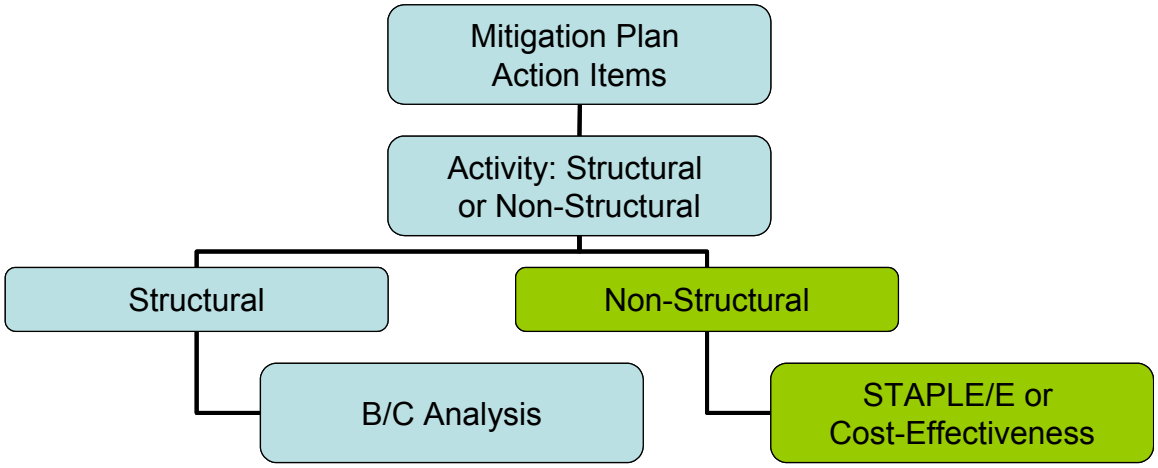
- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

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 D.1: Economic Analysis Flowchart



Source: Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center, 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

CUREe 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 E: Mid-Columbia Regional Natural Hazard Mitigation Public Opinion Survey

Survey Purpose and Use

The purpose of this survey was to gauge the overall perception of natural disasters, determine a baseline level of loss reduction activity for residents in the community, and assess citizen's support for different types of individual and community risk reduction activities.

Data from this survey directly informs the natural hazard planning process. Counties in the Mid-Columbia region can use this survey data to enhance action item rationale and ideas for implementation. Other community organizations can also use survey results to inform their own outreach efforts. Data from the survey provides the counties with a better understanding of desired outreach strategies (sources and formats), a baseline understanding of what people have done to prepare for natural hazards, and desired individual and community strategies for risk reduction.

Background

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201 require that jurisdictions maintain an approved NHMP in order to receive federal funds for mitigation projects. Development of the Natural Hazards Mitigation Plan update process for eight counties in the Mid-Columbia Gorge and surrounding regions was pursued in compliance with subsections from 44 CFR 201.6 guidelines.

Citizen involvement is a key component in the natural hazard mitigation planning process. Citizens should have the opportunity to voice their ideas, interests and concerns about the impact of natural disasters on their communities. To that end, the DMA2K 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 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."

According to Bierle[1], the benefits of citizen involvement include the following: (1) educate and inform public; (2) incorporate public values into decision making; (3) substantially improve the quality of decisions; (4) increase trust in institutions; (5) reduce conflict; and (6) ensure cost effectiveness.

Methodology

In the fall of 2011, the Oregon Partnership for Disaster Resilience (OPDR) distributed a mailed survey to 7,500 random households throughout an eight county region in Northern Oregon. The counties surveyed included: Clackamas, Hood River, Gilliam, Morrow, Sherman, Umatilla, Wasco, and Wheeler. OPDR developed and distributed the survey in partnership with three members of the University of Oregon's Resource Assistance for Rural Environments (RARE) program.

Given the geographic extent of the survey area and significant county population differences in the region, OPDR stratified the survey sample across three distinct sub-regions (see Table E-1 below). To ensure a minimum number of returns in each of the counties in sub-region three, OPDR leveled the sample at 400 surveys per county (excepting Umatilla). Once OPDR determined the sample size for each county, they contracted with the Oregon Secretary of State Elections Division (OED) to randomly select names and addresses from state voter rolls. Table E-1 shows the survey sample size by sub-region.

[1] Bierle, T. 1999. "Using social goals to evaluate public participation in environmental decisions." *Policy Studies Review*. 16(3/4), 75-103.

Table E-1: Survey Sample Size

County	Population '09	Pop as percent of subregion	Survey sample size by county
Subregion 1 - West			
Clackamas	379,845	100%	**2,500**
Subregion 2 - Gorge			
Hood River	21,725	47%	1,200
Wasco	24,230	53%	1,300
Subtotal	**45,955**	**100%**	**2,500**
Subregion 3 - East			
Sherman*	1,830	2%	400
Gilliam*	1,885	2%	400
Wheeler*	1,585	2%	400
Morrow	12,540	14%	400
Umatilla	72,430	80%	900
Subotal	**90,270**	**100%**	**2,500**
Combined Total	**516,070**		**7,500**

Source: 2011 NHMP Public Opinion Survey
*Indicates that OPDR modified the sample size in these counties in an attempt to ensure a minimum number of survey returns.

Each mailed survey packet contained: (1) a cover letter that explained the purpose of the survey and described the survey incentives; (2) a copy of the survey; (3) a survey participation card; and (4) a postage-paid envelope in which to return the completed survey and participation card.

The survey consisted of 24 questions divided into four sections: natural hazard information; community vulnerabilities and hazard mitigation strategies; mitigation and preparedness activities in your household; and general household information. OPDR and RARE designed the survey to determine public perceptions and opinions regarding natural hazards. Questions also focused on the methods and techniques survey respondents prefer to use in reducing the risks and losses associated with natural hazards.

The survey participation card asked survey recipients to enter the amount of time it took them to complete the survey. It also functioned as a voluntary entry form into a drawing for an assortment of household preparedness items. The drawing provided participants an incentive for completing the survey and expressed that it was not required, but rather encouraged, that they complete it. One winner from each of the eight participating counties was chosen at random by the OPDR office.

Ten days before the survey deadline, OPDR sent a reminder postcard to each household urging them to complete the survey and return it as soon as possible. Of the 7,500 surveys sent, 733 were returned undeliverable for a final sample size of 6,767. OPDR received 951 completed surveys for a 14-percent overall survey response rate.

A key concern of organizations that conduct surveys is statistical validity. If one were to assume that the sample was perfectly random *and* that there was no response bias, then the survey would have a margin of error of ±5-percent at the 95-percent confidence level. In simple terms, this means that if a survey were conducted 100 times, the results would end up within ±5-percent of those presented in this report.

One limitation of the study's methodology is potential non-response bias from the mailed survey. The survey results represent only those households where residents are registered to vote. There could also be a bias of answers based on which residents are renters compared to owners. Despite these areas of potential response bias, the intent of this survey was not to be statistically valid but instead to gain the perspective and opinions of resident's regarding natural hazards in the region. Our assessment is that the results reflect a range attitudes and opinions of residents throughout the eight surveyed counties

Survey Results

This section presents the compiled data and analysis for the 2011 Mid-Columbia Region Natural Hazard Mitigation Public Opinion Survey. We provide a copy of the survey instrument as Attachment A of this report; raw data is provided in Attachment B.

Natural Hazard Information

This section reports the experiences of survey respondents involving natural hazards, and their exposure to preparedness information.

The survey results indicate that about 28-percent of the respondents or someone in their household has personally experienced natural disasters in the past five years, or since they have lived in the community in which they currently reside (see Table E-2 below).

Table E-2: Direct Experience with Natural Disasters in Respondent County

Answer	Percent	Number
Yes	28%	249
No	72%	656
Q-1 total	100%	905

Source: 2011 NHMP Public Opinion Survey

Of those respondents who have experienced a natural disaster in the last five years, 51-percent experienced windstorms, 49-percent experienced wildfire, 38-percent experienced severe winter storms, and 19-percent experienced flood. Table E-3 illustrates the disasters experienced in the past five years in the Mid-Columbia region.

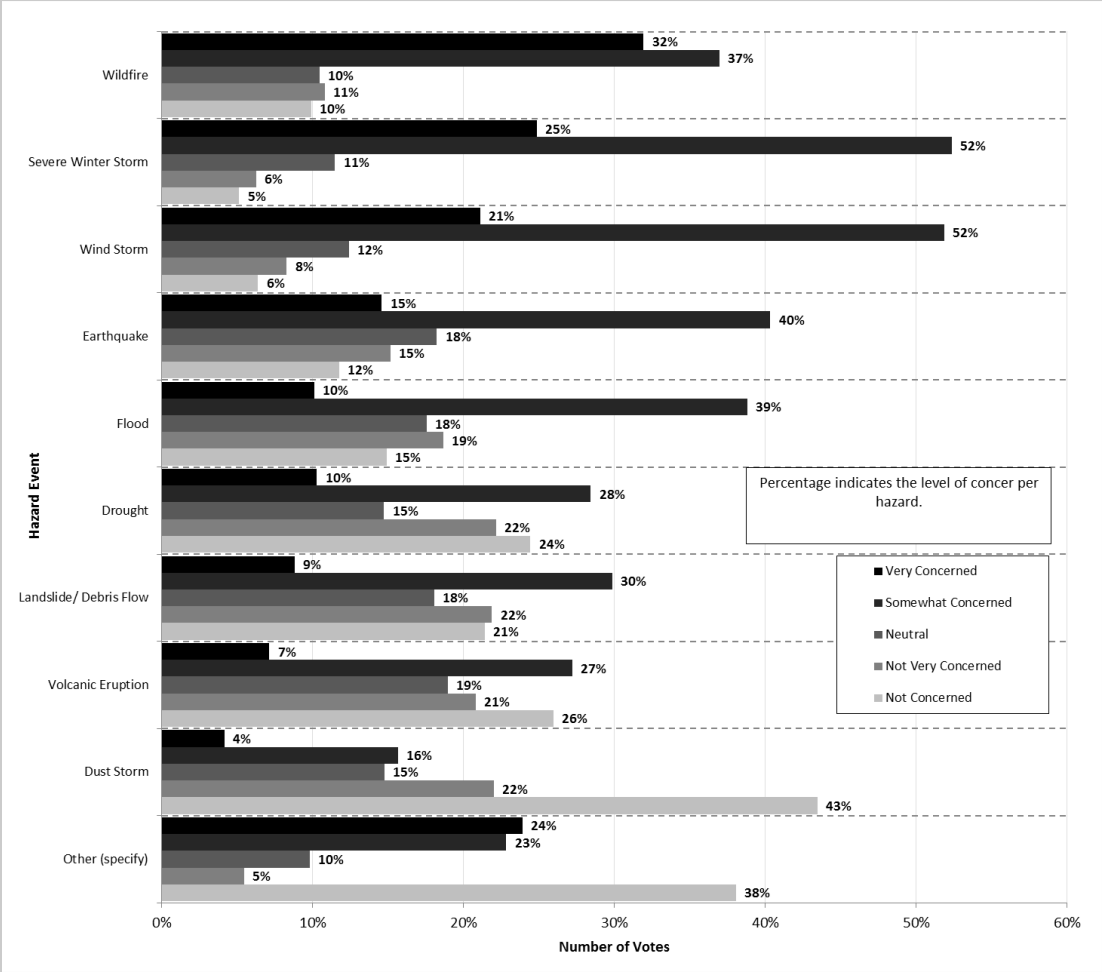
Table E-3: Type of Natural Disaster Experienced in Past Five Years

Hazard	Percent	Number
Windstorm	51%	126
Wildfire	49%	121
Severe Winter Storm	38%	94
Flood	19%	48
Drought	11%	27
Dust Storm	7%	17
Landslide/Debris Flow	7%	17
Earthquake	5%	13
Other	4%	10
Volcanic Eruption	1%	3
Q-1 "yes" answers	100%	249

Source: 2011 NHMP Public Opinion Survey

The survey also asked respondents to rank their personal level of concern for specific natural disasters affecting their community. Figure E-4 shows that more than 70-percent of respondents indicated that they are concerned or very concerned about windstorms and winter storms with nearly 60-percent indicating a high level of concern related to wildfires. A majority of respondents also demonstrated concern over earthquake and flood hazards with 55-percent and 49-percent of respondents marking “concerned” or “very concerned” for those two hazards respectively. Of lesser concern were the landslide, drought and volcano hazards with 47-, 46- and 43-percent of respondents marking “not very concerned” or “not concerned” for those hazards respectively. Dust storm is the hazard respondents are least concerned about with roughly 65-percent of respondents marking the “not very concerned” or “not concerned” choices. Figure E-1 summarizes respondent answers by hazard.

Figure E-1: Level of Concern About Natural Disasters Affecting Respondent County



Source: 2011 NHMP Public Opinion Survey

Next, the survey asked if survey recipients had received information about how to increase the safety of their households and homes from natural hazards. Table E-4 shows that over half (53-percent) of respondents indicated that they have received information regarding home and family safety from natural disasters at some time in the past.

Table E-4: Respondents Who Have Received Information Concerning Natural Disaster Home Safety

Answer	Percent	Number
Yes	53%	489
No	47%	438
Q-3 total	100%	927

Source: 2011 NHMP Public Opinion Survey

Of respondents who had received information, 27-percent received the information within the last six months and 20-percent received information six months to one year ago (see Table E-5). This suggests that, while outreach is occurring, it is reaching fewer than half of

the households in the Mid-Columbia region and surrounding areas, and that many of the households have not received any information in over a year.

Table E-5: Most Recent Date of Contact for Information Concerning Natural Disaster Home Safety

Answer	Percent	Number
Within last 6 months	27%	131
Between 6-12 months	20%	99
Between 1-2 years	22%	107
Between 2-5 years	15%	75
5 years or more	11%	55
Q-3 "yes" answers	100%	489

Source: 2011 NHMP Public Opinion Survey

Of the respondents who received information on natural hazard preparedness, the news media (36-percent) and government agencies (18-percent) were cited most often as being the source of the information. Table E-6 shows the sources most respondents last received information from. Note that while the question directed respondents to check only one answer, a number of respondents selected more than one choice. Therefore, readers should use some caution when interpreting these results.

Table E-6: Most Recent Provider of Natural Disaster Home Safety Information

Answer	Percent	Number
News Media	36%	174
Government Agency	18%	86
Other	15%	74
Not Sure	14%	68
Utility Company	8%	38
American Red Cross	6%	29
Neighbor/friend/family	5%	25
Insurance Agent/Company	5%	24
Other non-profit org.	4%	17
Social media (e.g. Facebook)	1%	4
Univ./research facility	0%	2
Elected official	0%	0
Q-4 total	111%	489

Source: 2011 NHMP Public Opinion Survey
Note: Total percentage exceeds 100% because some respondents chose more than one category.

Survey respondents provided an interesting contrast between the sources that they had recently received information from, and those that they perceived to be the most trustworthy. While only six-percent of respondents said they last received information from the American Red Cross, more respondents chose the American Red Cross as the most

trusted source of information than any other option. The second and third most trusted sources cited by respondents were “utility company” and “government agency”. “Elected Official” and “Social Media” received the lowest number of responses. Table E-7 shows the sources respondents trust the most for providing this information.

Table E-7: Most Trusted Providers of Information for Natural Disaster Home Safety

Answer	Number
American Red Cross	359
Utility Company	313
Government Agency	312
Univ./research facility	242
News Media	221
Insurance Agent/Company	186
Neighbor/friend/family	166
Not Sure	97
Other non-profit org.	93
Other	78
Elected official	14
Social media (e.g. Facebook)	9
Q-5 total	2,090

Source: 2011 NHMP Public Opinion Survey
Note: Respondents could check up to three information providers

When asked what the most effective way was to receive information, respondents indicated that television news (440 responses), newspaper stories (331 responses), and mail (315 responses) were the most effective. Interestingly, various types of advertisement (televisions, radio, billboards, newspaper) all received relatively low responses. Table E-8 shows the effectiveness rating of information dissemination methods expressed by survey respondents.

Table E-8: Most Effective Method for Respondents to Receive Information Concerning Natural Disaster-Related Home Safety

Answer	Number
Television news	440
Newspaper stories	331
Mail	315
Fire Department/Rescue	245
Radio news	227
Fact sheet/brochure	224
Email newsletters	220
Online news outlets	126
Public workshops/meetings	121
University or research institution	87
Schools	72
Television ads	56
Books	50
Social media (e.g. Facebook)	38
Magazine	34
Radio ads	33
Other	33
Outdoor ads (e.g. billboards, etc.)	32
Newspaper ads	26
Chamber of Commerce	21
Q-6 total	2,731

Source: 2011 NHMP Public Opinion Survey

An overwhelming majority of survey respondents (87-percent of those who answered Question 7) indicated that they were not aware of their county's natural hazards mitigation plan prior to receiving the survey. This suggests the need for increases in or changes to local NHMP education and outreach programs.

Table E-7: Respondent Knowledge/Awareness of County Natural Hazards Mitigation Plan

Answer	Percent	Number
Yes	13%	124
No	87%	814
Q-7 total	100%	938

Source: 2011 NHMP Public Opinion Survey

Consistent with the responses displayed in Table E-7, only 12-percent of respondents claimed to be aware, prior to the survey, that FEMA requires their county to update the NHMP every five years in order to be eligible for federal pre- and post-disaster hazard mitigation funds.

Table E-8: Respondent Awareness of FEMA Requirements for Five Year NHMP Update to Receive Hazard Mitigation Funding

Answer	Percent	Number
Yes	12%	110
No	88%	827
Q-8 total	100%	938

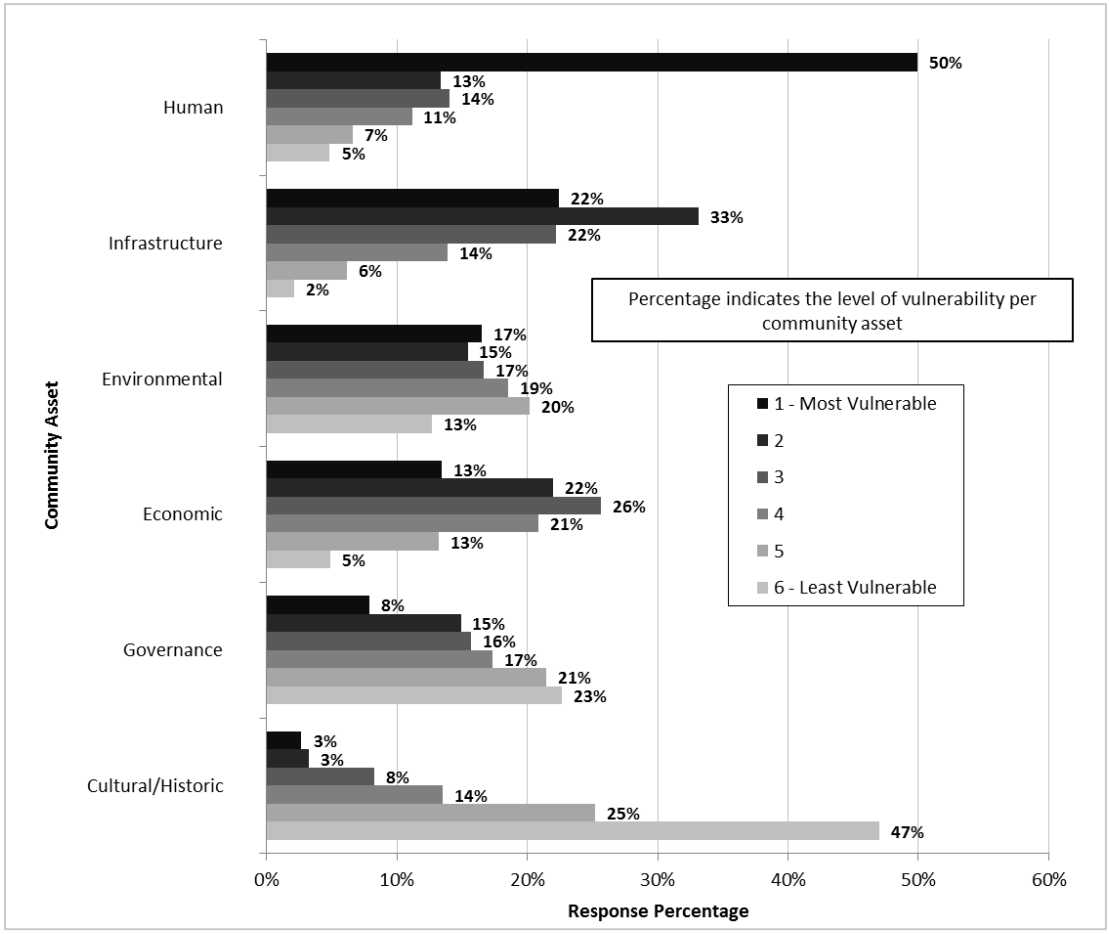
Source: 2011 NHMP Public Opinion Survey

Community Vulnerabilities and Hazard Mitigation Strategies

This section outlines the assets that survey respondents felt would be vulnerable to natural hazards in the region. The section also describes citizens' priorities for planning for natural hazards and the community-wide strategies respondents support.

The survey asked respondents to rank categories of community assets in terms of their vulnerability. These questions were intended to help the Mid-Columbia region and surrounding communities determine citizen priorities when planning for natural hazards, by comparing the level of importance that they attach to specific community assets and risk reduction activities. Figure E-2 illustrates that respondents found human related assets to be by far the most vulnerable (50-percent), followed distantly by infrastructure (22-percent). Survey respondents found environmental assets to be the third most vulnerable (17-percent), followed closely by economic assets (13-percent), however economic assets made up a noticeably higher proportion than environmental assets in rankings 2-4. Cultural/historic assets (three-percent) received the lowest consistent ranking in terms of vulnerability, preceded somewhat closely by governance (eight-percent).

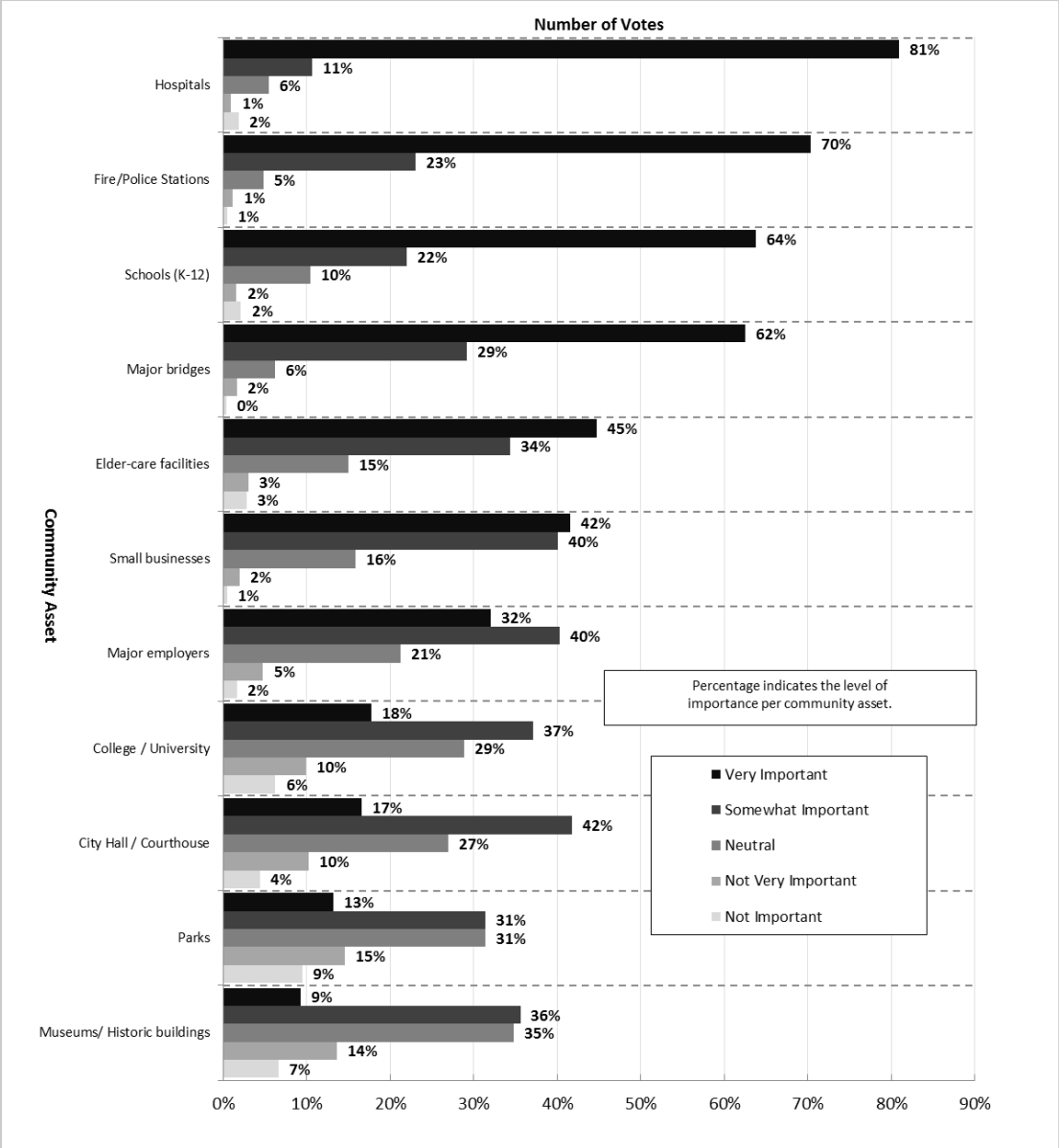
Figure E-2: Respondent Perceptions of Community Vulnerability



Source: 2011 NHMP Public Opinion Survey

Next, the survey asked respondents to indicate the importance that they attach to particular types of public and private community assets. As shown in Figure E-3, over 90-percent of respondents indicated that hospitals, major bridges and fire/police stations are very important or somewhat important to them. In addition, over 80-percent indicated that schools (K-12) and small businesses are very important or somewhat important to them. Parks were the least important to survey respondents, followed closely by museums/historical buildings, college/university, and city hall/courthouse.

Figure E-3: Respondent Community Asset Valuation



Source: 2011 NHMP Public Opinion Survey

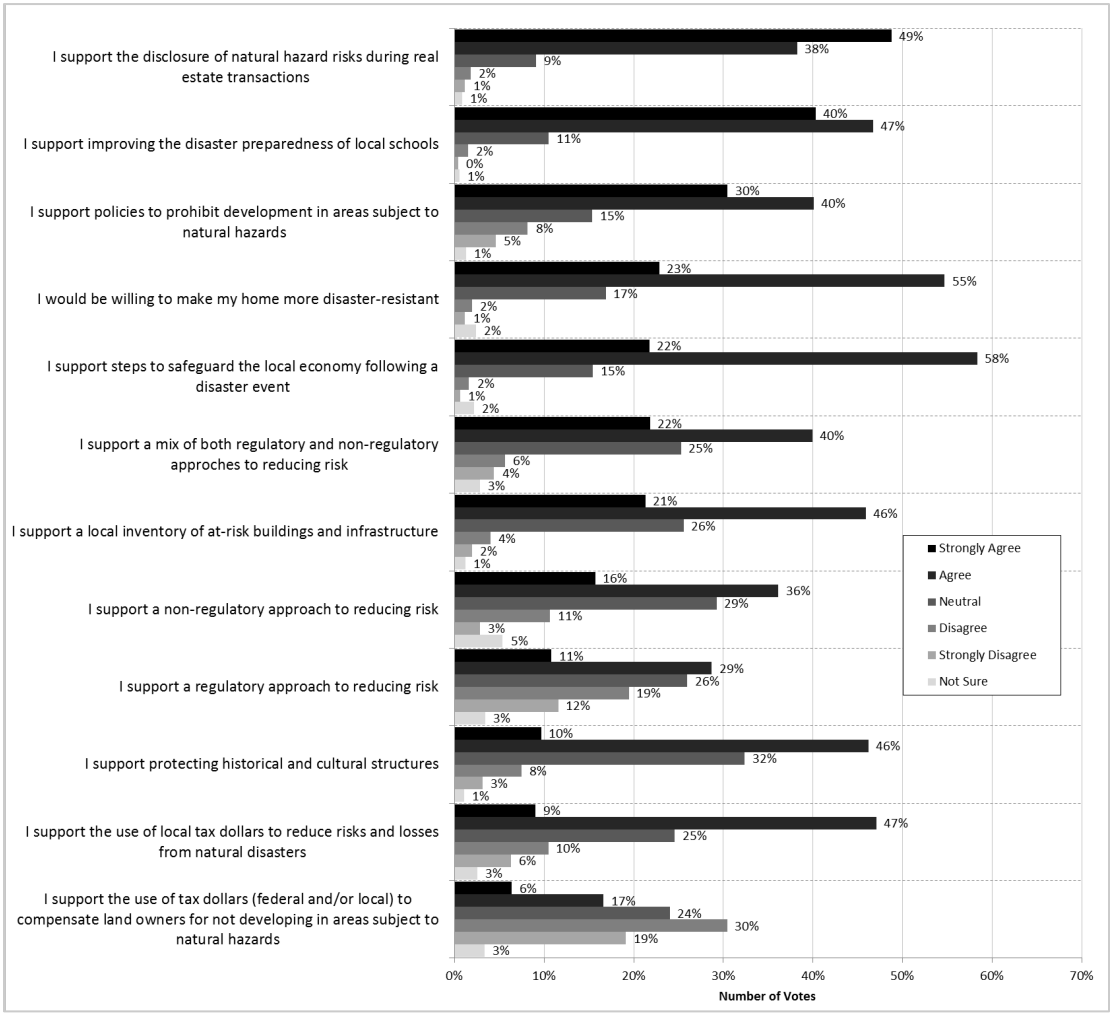
A number of activities can reduce your community's risk from natural hazards. These activities can be both regulatory and non-regulatory. Please check the box that best represents your opinion of the following strategies to reduce the risk and loss associated with natural disasters.

To gauge attitudes toward different types of mitigation strategies, the survey asked respondents to indicate their level of support for various risk reduction activities. Figure E-4 shows that while there is general support among survey respondents about protecting assets such as schools, homes, businesses and historic or cultural assets, respondents were somewhat mixed in their agreement about how to accomplish those protections.

With respect to specific asset types, 87-percent of the respondents strongly agree or agree that they support improving the disaster preparedness of local schools, over 80-percent of respondents strongly agree or agree that they support steps to safeguard the local economy, and over 77-percent strongly agree or agree that they would be willing to make their homes more disaster-resistant. In addition, 87-percent strongly agree or agree that they support disclosure of natural hazard risks during real estate transactions.

With respect to risk reduction strategies, respondents generally appear to support a mix of regulatory, non-regulatory and tax-dollar based approaches. For example, over 50-percent of respondents support the use of tax dollars to reduce risk and losses from natural hazards and over 60-percent indicate support for a mix of regulatory and non-regulatory approaches to reducing risk. That said, respondents overwhelmingly support the use policy strategies over the use of tax supported compensation strategies when specifically used to limit development in hazard areas. As Figure E-4 shows, fewer than 25-percent of respondents indicated support when specifically asked about the use of tax dollars to compensate property owners for not developing in hazard areas (with close to 50-percent disagreeing or strongly disagreeing with a compensations approach) while 70-percent of respondents indicated general or strong support for policies that prohibit development in areas subject to natural hazards (with only 13-percent in disagreement).

Figure E-4: Respondent Preferences for Community Risk Reduction Activities

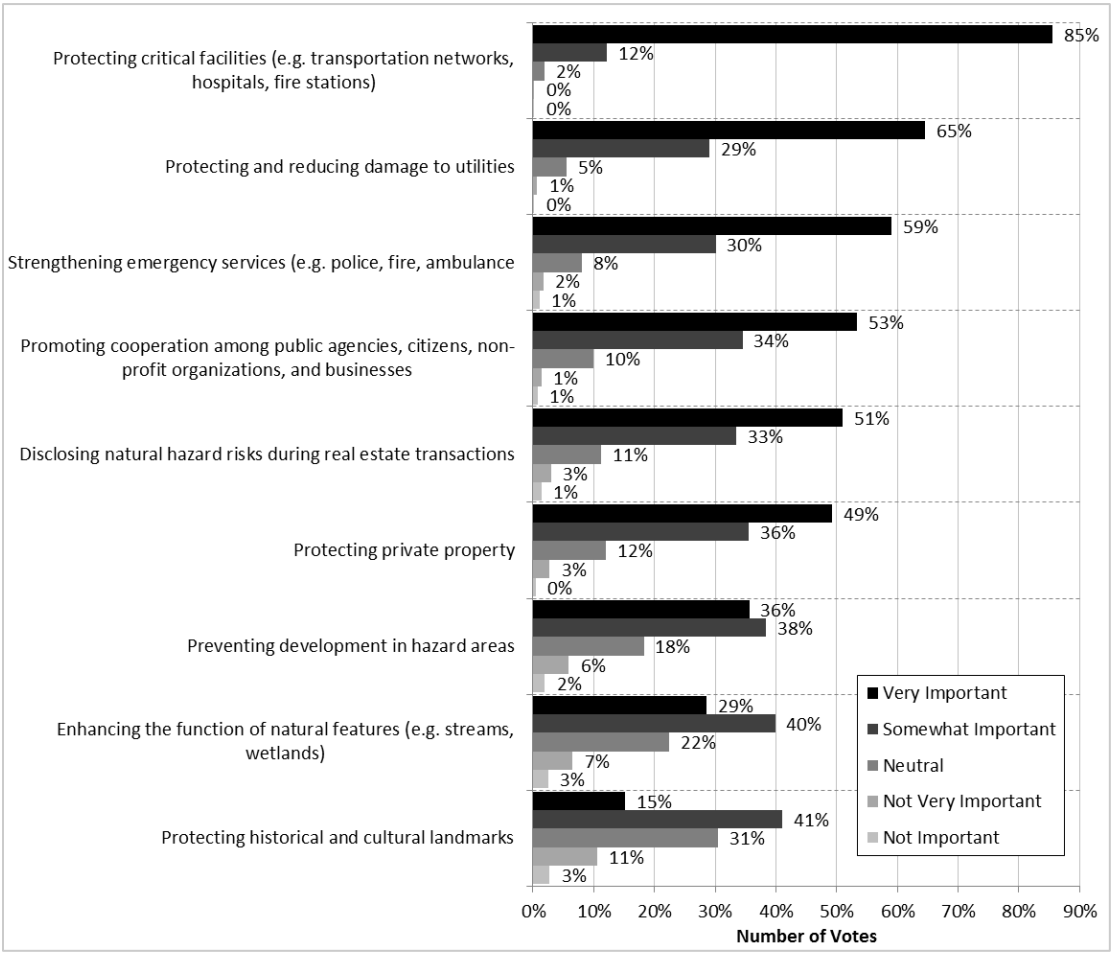


Source: 2011 NHMP Public Opinion Survey

The survey then asked respondents to indicate the level of importance they would place on a number of policies and priorities within their communities. The protection of critical facilities (e.g. transportation networks, hospitals, fire stations) received the strongest level of support with close to 100-percent of respondents finding it to be important or very important. Similarly, over 90-percent of survey respondents found protecting and reducing damage to utilities to be important or very important, with just under 90-percent who found strengthening emergency services (e.g. police, fire, ambulance) to be worthy of the same designation.

Roughly 50-percent of survey respondents felt that protecting private property and disclosing natural hazard risks during real estate transactions was important, as was promoting cooperation among public agencies, citizens, non-profit organizations, and businesses. Protecting historical and cultural landmarks was the lowest priority for survey respondents, followed by enhancing the function of natural features (e.g. streams, wetlands), and preventing development in hazard areas. Figure E-5 summarizes the results for priorities regarding planning for natural hazards in the region.

Figure E-5: Respondent Natural Hazard Planning Priorities



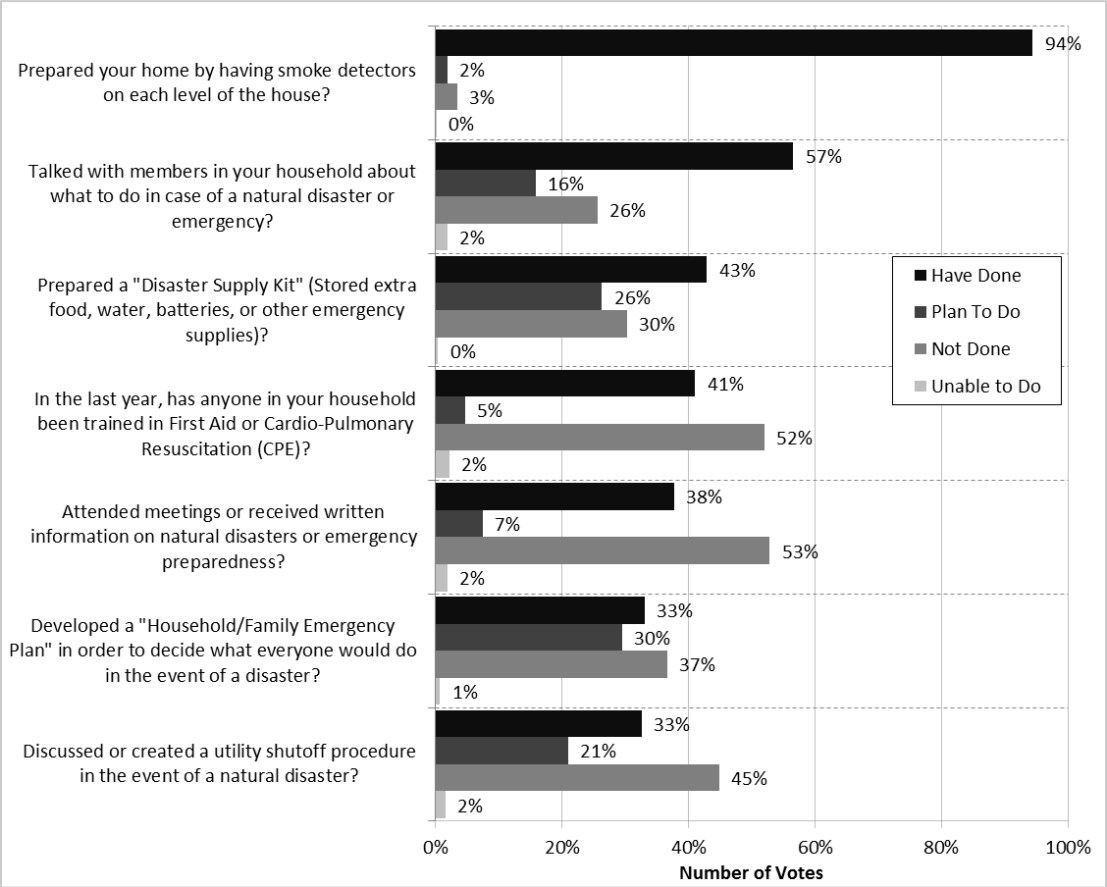
Source: 2011 NHMP Public Opinion Survey

Mitigation and Preparedness Activities in your Household

This section provides an overview of household level natural hazard mitigation and preparedness activities in the Mid-Columbia region.

Over 56-percent percent of respondents claimed to have talked with members of their households about what to do in the case of a natural disaster or emergency. In addition, 43-percent had prepared a "Disaster Supply Kit" which entails storing extra food, water, and other emergency supplies, while 41-percent were trained in first aid or CPR during the past year. Nearly 95-percent of respondents had placed smoke detectors on every level of the home while more than a third of respondents claimed to have attended meetings or received information on natural disasters or emergency preparedness, developed a "Household/Family Emergency Plan," and/or discussed/created a utility shutoff procedure in the event of a natural disaster. Figure E-5 summarizes all of the activities that respondents indicated they have done, plan to do, have not done, or were unable to do to prepare for natural disasters.

Figure E-5: Activities that Respondents Have Done, Plan to Do, Have Not Done, or are Unable to Do



Source: 2011 NHMP Public Opinion Survey

General Household Information

Demographic questions provide a statistical overview of the characteristics of the respondents. This section asked respondents about their age and gender, level of education, median income, race, ethnicity, and length of residence in the state of Oregon.

Age and Gender

Table E-9 shows the age range of survey respondents. The median age of survey respondents was 55-64 years old.

Table E-9: Age of Survey Respondents

Age	Percent	Number
<19	1%	5
20-24	2%	18
25-29	2%	19
30-34	3%	23
35-39	5%	43
40-44	6%	56
45-49	7%	65
50-54	12%	111
55-59	14%	127
60-64	15%	141
65-69	13%	121
70-74	8%	69
75-79	5%	47
80+	8%	73
Q-14 total	100%	918

Source: 2011 NHMP Public Opinion Survey

Table E-10 displays the gender of survey respondents, where women accounted for 54-percent of the sample.

Table E-10: Gender of Survey Respondents

Gender	Percent	Number
Female	46%	428
Male	54%	502
Q-15 total	100%	930

Source: 2011 NHMP Public Opinion Survey

Level of Education

In general, survey respondents were evenly distributed in terms of levels of education. About 16-percent of survey respondents specified they held a GED or were high school graduates, compared to over 31-percent who specified having attended some college or trade school. Just fewer than 35-percent of respondents had completed a college degree, while just over 16-percent of respondents had acquired a postgraduate degree.

Table E-11: Level of Education

Answer	Number	Percent
High School Grad/GED	147	16%
Some College/Trade School	291	31%
College degree	323	35%
Postgraduate degree	149	16%
Other	16	2%
Q-16 total	926	100%

Source: 2011 NHMP Public Opinion Survey

Household Income

Just under 22-percent of respondents had household incomes of $30,000 or less, over 32-percent had incomes from $30,000-$60,000, roughly 25-percent had incomes between $60,000-$99,999, while just over 21-percent had incomes of $100,000 or more.

Table E-12: Household Income

Household Income	Percent	Number
Less than $10,000	4%	33
$10,000-$19.999	9%	70
$20,000-$29,999	9%	74
$30,000-$39.999	10%	86
$40,000-$49,999	10%	86
$50,000-$59,999	11%	89
$60,000-$69,999	9%	71
$70,000-$79,999	7%	59
$80,000-$89,999	6%	46
$90,000-$99,999	4%	33
$100,000-$149,999	14%	119
More than $150,000	7%	56
Q-17 total	100%	822

Source: 2011 NHMP Public Opinion Survey

Regional Residency

Table E-13 lists the zip codes reported by survey respondents.

Table E-13: Respondent Zip Code

Answer	Percent	Number	Answer	Percent	Number
96086	0%	1	97063	3%	12
97001	0%	2	97065	3%	12
97002	0%	2	97067	1%	4
97004	0%	2	97068	6%	26
97009	2%	9	97070	2%	8
97013	3%	12	97071	0%	2
97014	2%	8	97081	0%	1
97015	2%	7	97086	1%	4
97017	0%	1	97089	2%	7
97021	3%	12	97140	0%	1
97022	1%	3	97206	1%	3
97023	2%	8	97219	0%	2
97027	1%	5	97222	4%	20
97028	0%	1	97267	6%	28
97029	0%	1	97750	4%	16
97031	22%	99	97756	0%	1
97033	1%	3	97801	7%	32
97034	2%	11	97812	4%	18
97035	3%	13	97813	0%	1
97037	2%	7	97818	1%	5
97038	3%	13	97823	1%	4
97039	4%	18	97830	6%	29
97040	2%	8	97835	0%	1
97041	4%	18	97836	1%	6
97042	0%	1	97838	8%	35
97044	0%	2	97843	0%	1
97045	8%	36	97844	1%	5
97049	1%	3	97862	4%	18
97050	1%	6	97868	0%	2
97051	0%	1	97874	2%	8
97055	2%	11	97875	1%	3
97056	0%	1	97880	0%	1
97058	28%	129	97882	1%	4
97062	0%	2	97886	1%	4
			Q-18 total	100%	456

Source: 2011 NHMP Public Opinion Survey

Of the seven counties the survey was mailed to, the most returned surveys came from residents of Clackamas County (31.8-percent). In Wasco County 201 surveys were returned, followed by 153 in Hood River County, and 122 in Umatilla County. Due to the survey distribution methodology, fewer surveys were distributed to Umatilla County than were to

Clackamas, Wasco or Hood River Counties, otherwise the return rate from the county may have more closely matched that of Clackamas County, which has a more comparable number of residents compared to the other counties in the region.

Table E-14: Percent of Surveys Received Per County

County	Percent	Number
Clackamas County	32%	297
Hood River County	16%	153
Gilliam County	3%	26
Morrow County	3%	25
Sherman County	5%	47
Umatilla County	13%	122
Wasco County	21%	201
Wheeler County	7%	64
Q-19 total	100%	935

Source: 2011 NHMP Public Opinion Survey

Over 80-percent of survey respondents have lived in Oregon for 20 years or more, roughly 10-percent have lived in Oregon for 10-19 years, and nearly 5-percent have for 5-9 years.

Table E-15: Length of Oregon Residency

Answer	Percent	Number
Less than 1 year	1%	5
1-5 years	4%	34
5-9 years	5%	44
10-19 years	10%	97
20 years or more	81%	754
Q-22 total	100%	934

Source: 2011 NHMP Public Opinion Survey

Housing Characteristics

Homeownership is an important variable in education and outreach programs, and knowledge of the percentage of homeowners in a community can help target the programs. Additionally, homeowners might be more willing to invest time and money in making their homes more disaster resistant. Over 87-percent of survey respondents are homeowners.

Table E-16: Home Ownership

Answer	Percent	Number
Rent	13%	119
Own	87%	808
Q-23 total	100%	927

Source: 2011 NHMP Public Opinion Survey

Nearly 79-percent of survey respondents live in single family homes, 12-percent live in manufactured homes, and five-percent in apartments; the other four-percent live in duplexes, condo/townhouses, or some other form of housing.

Table E-17: Housing Type

Answer	Percent	Number
Single-family home	79%	710
Duplex	1%	5
Apartment (3-4 units)	1%	8
Apartment (5 or more units	4%	35
Condo/townhouse	2%	16
Manufactured home	12%	112
Other	2%	18
Q-24 total	100%	904

Source: 2011 NHMP Public Opinion Survey

Race and Ethnicity

Just under 97-percent of survey respondents specified white as their race; of those that replied, only 28 (roughly three-percent) specified a race other than white. Table E-18 presents the results.

Table E-18: Respondent Race

Race	Percent	Number
American Indian or Alaska Native	2%	16
Asian	1%	12
Black or African American	0%	3
Native Hawaiian or Other Pac Islander	0%	1
White	96%	879
Q-20 total	100%	911

Source: 2011 NHMP Public Opinion Survey

With respect to ethnicity, just under two-percent of survey respondents self identified as Hispanic or Latino, whereas US Census figures suggest that the number should be much higher for the region. For example, nearly 15-percent of the population in Wasco County is reported as Hispanic or Latino in origin, compared to nearly 24-percent in Umatilla County.

Table E-19: Respondent Ethnicity

Ethnicity	Percent	Number
Hispanic or Latino	2%	16
Not Hispanic or Latino	98%	826
Q-21 Total	100%	842

Source: 2011 NHMP Public Opinion Survey

Written Responses to Open-Ended Questions

This section includes the transcripts of respondent answers when checking the "other" option provided in some questions. In addition, we've included comments provided by respondents at the end of the survey.

Question 1: During the past five years in the county you currently reside in, have you or someone in your household directly experienced a natural disaster such as an earthquake, severe windstorm, flood, wildfire, or other type of natural disaster? Other:

- Electrical outage
- Excess air pollution related to coal-fired plant and/or coal transported through Wasco County
- Hurricane
- Large fallen trees
- Rainstorm – very heavy
- Solar flares (emergency pulse)
- Unseasonable freeze, crops killed
- Water spout
- Wild animal damage

Question 2: How concerned are you about the following natural disasters affecting your county? Other:

- Airborne pathogens
- Anarchy
- Animal/plant virus infection
- Asteroid annihilation
- Chemical spill
- Combinations of . . .
- Corona mass ejections
- Dam failure (3)
- Dangerous wild animals
- December 21, 2012
- Depression & hunger
- Electrical outage
- Fog
- Government exploding more
- Hail
- Human cause (fallout)
- Ice storm
- Incompetent government @ all levels
- Large fallen trees (2)
- Mt. Ranier erupting
- Nuclear meltdown/war
- One of dams break
- Radiation from Hanford
- Reservoir above us getting damaged & flooding downhill on top of us
- Severe rain storm
- The Dalles dam breaking
- Tornado (2)
- Tsunami
- Tsunami evacuation zone

Question 4: From whom did you last receive information about how to make members of your household and your home safer from natural disasters? Other:

- Books (2)
- Boy Scouts & school projects
- CERT Training through Fire Dept.
- Church (4)
- Coast to Coast - George Nory
- CSEP
- Discover Channel, OPB, History Channel
- Emergency department of some type
- Employer (15)

- Employer CERT team
- Family
- FEMA
- Fire Department (12)
- Fire department distributed "Fire Preparedness" brochure
- Forest service
- Internet (4)
- Internet blogs
- Local health fair, community events
- Magazine
- Myself, I'm a former combat sailor (Panama 89, Desert Shield, Desert Storm)
- Myself, I was in a flood in Ashland that ruined the water & sewage plant
- Never
- None
- Providence Health Fair (hospital)
- Reading
- Safety commission
- School (2)
- Self
- Self-Google search
- Senior center
- Talk radio conservative
- Training
- TV commercials
- TV Outdoor Channel
- Web
- Work on disaster control committee OHSU library

Question 5: Whom would you <u>most trust</u> to provide you with information about how to make your household and home safer from natural disasters? Other:

- Books (3)
- Churches (10)
- Coast to Coast – George Nory
- Common sense
- Community events
- Consumer Reports
- County sheriff
- Department of Forestry
- Depends on what kind of disaster
- Drinking water supply
- Fellow church members
- Fire department (4)
- Fire department/police (2)
- God
- Hospital
- Internet blogs
- Internet research
- Mortgage lender
- Multiple sources preferred
- Law offices
- Local government agencies
- Local police department
- None
- Not the government!
- Personal research/internet
- Police
- Self (3)
- Senior center
- Several sources – best
- Someone who has gone through disaster
- Talk radio conservative
- Utility services

Question 6: What is the <u>most effective</u> way for you to receive information about how to make your household and home safer from natural disasters? Other:

- Churches (9)
- Door-to-door "hangers"
- Fire department/police
- Government

- Internet blogs
- News podcasts
- Newspapers
- Online, institution info
- Online publications/websites
- Read book
- Sheriff's office
- Website

10. Next we would like to know what specific types of community assets are most important to you. *Other*

Rating	Community Asset
1	Active senior center
1	Active volunteer opportunities
1	Agriculture
1	Airports (2)
1	Ambulance
1	Animal shelters
1	Bridges
1	Broadband
1	Children!
2	Chamber of Commerce
1	Child abuse services/facility
1	Churches (12)
1	City maintenance
1	City works
1	Clean air
1	Columbia River (2)
1	Communications (3)
1	Community hall
1	Cultural arts
1	Dams (8)
1	Disaster plan
1	Dog & cat rescue
1	Ecological resources (2)
1	Education
1	Electrical substations
1	Electricity (6)
1	EMS
1	Evacuation routes
1	Family
1	Family farms
1	Farms (4)
1	Fire/ambulance
1	Food supplies/banks (19)
1	Forests
1	Foster care homes
1	Fuel availability (2)
1	Gas (3)
1	Geological study
1	Grain storage & shipping facilities
1	Hardware/lumber stores
1	Health Dept.
1	Highway/street maint. (2)
1	Highways/streets (17)
2	Highways/streets
1	Homes (2)
1	Humans
1	Individual property
1	Internet access (2)
1	Jobs
1	Lake

Rating	Community Asset
1	Laundromat
1	Livestock facilities
2	Library (9)
1	Local Catholic church
1	Local general practice MDs
1	Local medical clinic
2	Local rural veterinarian
2	Meals on Wheels
1	Local shopping
1	Medical clinic (7)
1	Mentally ill facilities
1	Mountains/trees/streams (2)
1	Movie theater
1	My apt.
1	National forest
1	NORCOR
1	Orchards
1	OSU Extension/4-H
1	People
1	Pharmacies (2)
1	Police/sheriff
2	Pool
1	Post Office (3)
1	Power infrastructure
1	Prisons
1	Public transportation (5)
1	Radio/CB
1	Range land
1	Recreation (3)
1	Red Cross (2)
1	River health
1	Scenic view
1	Security/safety (2)
1	Sewer
2	Sewer
1	Sheriff's Dept. (2)
1	Shopping areas
1	Sidewalks
1	Social services
1	Telephone (4)
1	Utilities (11)
1	Walking trails
1	Water sources (12)
1	Water for farming
2	Water supply
1	Water treatment
1	Wilderness areas (2)
2	Wildlife/fish
2	Wildlife
2	Wineries

Question 16: Please indicate your level of education. Other:

- 11th grade (2)
- Associates degree
- Automotive engineering, fire science degree, fire science instructor (retired)
- D.M.D., M.D., Ph.D.
- Dropped out of high school
- Extensive post-grad studies
- Half way through master's program online
- I got to the 9th grade, but did not finish
- JD, UO law school
- Masters in music
- Navy schools
- Nuclear medicine technology
- Post-master certification
- Quit high school to join the army
- Still in high school

Question 24: Do you own or rent your home? Other:

- 3 livable quarters, all separate
- 3,000 ft w/2 story garage
- Apartment (2)
- Apartment in single family home
- Retirement community
- Cracker box
- Farm (3)
- Farm w/outbuildings (2)
- Live with family
- Ranch (3)
- Ranch w/bunkhouses
- House
- Commercial property
- RV
- Travel trailer

Additional Comments

We received the following comments in response to the "Please feel free to provide any additional comments in the space provided" box at the end of the survey.

- You should be aware that I live in an apartment at Willamette View Retirement Community and preparedness is ever present in the general and overall planning in programs and printed word.
- Floods if all Columbia dams burst.
- Thanks for your interest in our community. U of O is positioned to use evidence-based science to evaluate/recommend/prioritize strategies to mitigate the disruptions of likely national disasters. Before acting, most citizens must be energized to prepare based upon credible & direct advice.
- Churches and schools are important for 1) comfort, 2) familiarity, 3) size for housing large groups, 4) willingness to be open for the public. I saw nothing suggesting the importance of churches.
- I thank God for your efforts to make us safe.
- 1) It would be very useful to discover locations of local community buildings that would provide emergency provisions. 2) Taking a quick seminar regarding emergency things-to-know.
- Income info should have NO effect on any questionnaire – there are stupid wealthy people and other very intelligent poor people, i.e. example – people running for elected offices – there sure are some "real sinners" out there!
- I feel there needs to be help for land owners to clear brush to prepare for wildfire in areas, also as land owners.
- The big earthquake is coming. Oregon must be ready.
- Building codes are too easy-going knowing that the sub-Cascadia fault line is waiting to happen. In other words, the prescriptive path for building is too lenient.
- My answers are based on the fact that I live in a disaster-free area, mostly.
- Due to my health and age I live in an assisted living facility.
- I neither trust nor rely on government for anything. I have ZERO confidence in the propaganda machine that is our current print and broadcast media. I trust only myself and my family. We will survive.
- I would not support any proposals for tax increases!
- Biggest threat is a major earthquake affecting the entire Pacific Northwest region. Public seems unaware of this threat from Cascadia Subduction Zone.
- I feel wildfire is by far the most problem in the Eastern Oregon area. Now that Ordnance is almost closed I would like to see "Oregon Emergency Management" set up to build fire guards now. It would put lots of people to work and we sure do need that and next summer is too late to start building them. We had lots of cleared areas many years ago. Now railroad and wheat farmers buy insurance and don't have fire guards.
- As I and my family only moved to Oregon in January 2008 from the U.K. I am still not familiar with many of the situations referred to in this survey. I am sorry I cannot be more helpful.
- As a geologist in OR & WA, earthquakes are the biggest concern facing our area in the near future. Our infrastructure and non-reinforced structures will not withstand even a moderate subduction zone quake. Geologic history has shown repeated 9+ magnitude earthquakes, most recently in the 1600s. Government will cease to function without our

bridges and roads. Serious effort needs to be dedicated to identifying vulnerable features and buildings.

- I applaud your efforts to improve and comply with disaster preparedness and its requirements.
- I own an adult foster home. I have emergency preparedness plan, maps, supplies, food, water, info on every single person in my home, and phone numbers of contacts in case of emergency. I and my staff are as prepared as anyone can be. A lot of survival depends on how quick you are at making decisions and right decisions under pressure. So have plans, practice procedures, and if it happens hopefully everyone reacts correctly based on practice.
- I lost faith in FEMA after Hurricane Katrina and in info given by top government officials ("duct tape"). But I think the government (Fed and local) should show leadership in these areas. Partnership with university may help with credibility. I also don't trust the media to report it accurately enough. These days they often seem to oversimplify or over-sentimentalize.
- Don't want to see implementation of disaster plans as reason to hire more government employees.
- Should ask type of social economic data for people 1) Do they work? 2) Do they work for a) emergency service, 2) critical infrastructure, 3) government, 4) disaster mitigation group, 5) school. 3) Do they have children? 4) Is there anyone in the household with disabilities? This will allow for more detailed trenching & more focus on community efforts.
- Due to cutbacks I'm not too confident Umatilla County can provide any realistic disaster plan or relief. Ensuring electrical utility service/restoration is most critical for disaster recovery in my area.
- Hope the time, effort, and expense of this survey results in information that will be used to plan for dealing with natural disasters. If not, this survey is a waste of time and expense.
- We have no school, hospital, or elder care facilities. Our daycare facilities are important. We have pre-school but no permanent site. Also, we did (5 to 6 years ago) have a county-wide power outage and I called everywhere to find fuel for stranded motorists – the only gas station in Sherman County that can still pump gas is the station (Texaco @ the time) at the east end of Rufus! Shaniko in Wasco County could not pump gas either. My husband is an EMT/firefighter and regional safety officer for ODOT. He will respond (either as ODOT or a volunteer) in the event of a natural disaster and I and extended family will do as he says if he's able to communicate with me. More planning and preparedness would be good though so I know exactly what to do, how to do it, and when to do it! Thank you for your survey!
- It's hard to relate to any natural disasters in our area as we've never had any real ones in my 80 years except strong winter storms. Our town is on a hill so is pretty immune to these.
- Thanks for doing this. My best to all in 2012.
- We would be interested in a disaster training – not via video or internet – from a line person.
- Several years ago I was involved in a severe dust storm traveling on I-84. In this dust storm a number of people were killed in highway accidents. It was really terrible. Since this time, not much, if anything, has been done to mitigate or regulate the high levels of

agricultural tillage adjacent to the interstate highway. I would suspect that the agricultural operators along this highway receive significant federal subsidies. Why not regulate this?

- I never had understood why people develop in possible high risk areas such as on rivers or bluffs, and expect someone else to pay for loss. I am not for regulatory action or policies to prohibit owners from doing what they want, however, I do believe people should be responsible for their actions.
- FEMA is bungling and incompetent at best and looks like a criminal dirty tricks outfit. Not only did they fail @ New Orleans, they attacked people who did help. Recommend disbanding of FEMA, prosecute FEMA. They have much to answer for and have done no good. The kind of emergency they want is to attack people and put them in slave labor camps.
- I would like to recommend that at least once a year the counties should do a Practice run just in case there is a natural disaster. That way people won't freak out and cause more problems if a disaster happens.
- Concern for seniors who retire in rural places. How will their residence be identified for providing assistance in a major disaster? The question applies to handicapped as well.
- My family has had some unhappy experiences with FEMA. A bridge over a creek built by the owners for approximately $1,200 was flooded and when they tried to borrow money to rebuild were told that they must have an engineer fly over inspection, etc. to the tune of approximately $10,000 in order to get a loan. Even though this was not a grant but a payable loan. Needless to say, they did not use FEMA loan and found it a big joke that FEMA was there to help in emergencies!
- Education on preparedness is essential (widespread). Community preparedness is key – community involvement, truth about regional hazards would help people to prepare. Government cannot be relied on for truth. Media cannot be relied on for truth. Possibly very proactive community education workshops through fire, police, schools for the entire area. Some people's emergency preparedness = a gun → they just take what they need by force instead of stocking up.
- We experience wildfires or a threat of one nearly every year. Our volunteer fire departments are a great comfort. They respond immediately and perform with unbelievable expertise.
- 1) We need more local first aid classes. 2) Posting notices in our Post Offices is a good way to communicate. 3) All of our local utilities need to be more involved in educating for disasters.
- Fuel (*e.g. dead wood) for wildfires in the forests is one of the main hazards in our area.
- We live in a remote area, in a canyon, crossing creeks, accessible from one direction only. We are extremely concerned about wildfire & flood due to our lack of accessibility. We have been instructed by a fire department visit how to make our area more fire safe.
- An earthquake near Spray would isolate (100-percent) the town from outside help or leaving for any reason. Surrounded by a lot of rock rims. One way in would be air!
- Good info, needs to be done. Good survey!
- Encouraging employers to train employees would be another outlet for learning. My employer, Mid Col Center for Living, has taken an upfront, prepared, and involved approach to emergency and/or disaster awareness. I think all employers should do the

same. I have taken my training home & shared w/my family & friends it is comforting to know we are prepared.

- The time taken for a federal agency to act/react places much undue strain on those most affected. The recent Nehalam flooding and the FEMA antics were an embarrassment to the citizens of Vernonia & surrounding area.
- About 7-8 years ago I attended a Red Cross Preparedness meeting to deal with the possibility of a chemical depot leak and its effects on the populace. Fortunately, we never had to find out how the plan worked!
- Fish & wildlife don't allow streams to be cleared to avoid flooding. Fish seem to be more important than people or property to them!! Not a good way to be.
- I live in a home for the elderly, about 100 people. I answered the questions about where I live.
- Some of the answers I gave are because I don't trust the people who would ultimately make the decisions – especially environmentalists. I think some are not in the majority of our population to realize the basic needs. In other words, they go overboard and only have their opinion. Thank you.
- Organize acts, curb disobedience. Could result in serious consequences & would refute an organized response.
- Wildfire, wind, & ice storms are our biggest concern here. Maintaining the farming lifestyle is more important than preserving buildings. Saving farms leads to continued support of the community as farms continue to generate income.
- Education is much stronger than regulation because you can achieve voluntary action; nobody has resources to enforce regulations after they are written.
- I am very concerned about the long-term detrimental effects of extensive pesticide use in this area on the many orchards here and the cross-contamination with the drinking water, both municipal and even individual wells that are privately owned. I see what appears to be a statistically larger developmentally challenged population here and wonder if there is a connection to the extensive pesticide use and water runoff.
- Resources need to be developed, determined, and maintained by local neighborhoods and communities because in the event of a large disaster outside resources will more than likely be strapped or not available.
- I have worked in hospitals in nuclear medicine, s-ray, and radiation therapy for 38 years. Have been involved in nuclear medicine disaster preparedness in Arkansas and Oregon and gone through training for dirty bomb response. Worked at Mid-Columbia Medical Center in The Dalles, Oregon, for 22½ years.
- Thanks to those of you who are devoted to smart safety strategies. We do what we can, also.
- I feel that the emphasis should be on individual preparedness. Too many people feel that the government should & will be at their doorstep in an emergency. I feel that the information should be aimed at citizens.
- 1) Need community information as to where to assemble in a disaster. 2) Need education as to how to prepare as a public employee to help others. 3) Is a staging area in place for children and animals?
- Homeowners/buyers should be aware of potential risk, but government should not ensure again (e.g. flood) it.
- Our county/city has never held a meeting to inform the public of any disaster plan. I don't even know where they have emergency shelter or supplies.

- Utilities, utilities, utilities.
- Thanks for the opportunity to participate in your survey.
- We do not have a hospital in our county. Roads and bridges are very important to reach a hospital if Air Link cannot fly. The John Day River floods often.
- We live in a secure community & have very few natural disasters and Mexicans help me out a lot!!
- With global climate change and natural disasters increasing in frequency and severity it is a good thing that you are undertaking this work! I became particularly frustrated while trying to honestly complete this survey, especially Questions 11 and 12 and almost threw it in the trash. Why? Lack of definitions, examples, explanations, implications of answers, etc. Some of the questions seemed to me could only be validly answered by someone fairly well versed in land use planning, disaster planning, and management. Please understand that I find almost all surveys of any type frustrating and I throw them away, however, I believe in what you are doing, so I am taking the time to offer my comments. The survey would probably have gotten a better feeling for citizen attitudes, ideas, and priorities and thus more accurate and meaningful results if there had been some type of **introductory "white paper"** document discussing the hazards and explaining the current principles of natural hazard mitigation and providing some of the information mentioned below. Q1: Minimizes the import by framing it only in the personal context – "…have you or someone in your household directly experienced…" The questions should have started with "Which natural disasters have your county experienced in the last 4 years?" Q6: The "Other methods" seemed to actually be sources of the information, not ways of receiving information. Q11: "… regulatory approach to reducing rick, "…non-regulatory approaches." Examples of regulations that might be used and examples of non-regulatory approaches would be helpful to know. "support policies to prohibit development in areas subject to natural hazards." Private property? Public lands? Examples of such policies. Use of local tax dollars to reduce risks and losses from natural disasters – examples. Steps to safeguard the local economy following a disaster – examples. Q12: Protecting private property? By whom? How? Who pays? I cannot accurately answer this question without knowing the context. In a "white paper," ODF's wildfire impact/protection self-certification program for Forestland-Urban Interface Lots would be a great example. What does "enhancing the function of natural features" mean? Q11 and 12: Disclosure of natural hazard risks during real estate transactions – Who is to be the official body to make these risk determinations including the probabilities of such occurrences? Will insurance companies be able to use this information to "cherry pick" clients offering to insure some clients/properties, both public and private, and not others?
- We believe successful disaster management depends on people working together in specific local neighborhood groups rather than depending on community-wide response by EMS. Help with organizing these groups on a community-wide scale is necessary.
- Thank you for bringing this to our attention. It lets us know what we need to be thinking about doing to prepare for a disaster.
- I received far more disaster info (i.e. hurricane) the few years I lived in Florida than I have ever received while living in Oregon.
- We have spent about $30,000 in the last two decades to flood-proof our residence. Our neighbors have paid/constructed similar amounts to control flood/debris flow problems!

- Because the questions were pretty general there was a need of more specific information (Q11). The survey was a good vehicle to have a discussion with our children and grandchildren. We did the survey at a family dinner.
- I do understand that government needs to be involved in mitigating/preventing natural disasters, but I also believe citizens and landowners have the same responsibility. I don't believe tax dollars should be used to pay landowners when they buy property and it has potential disaster areas, i.e. building a house on an ocean beach.
- We live near the Columbia River and experience windstorms frequently throughout the year. More information about "severe windstorms" would be beneficial.
- There are several homes and properties not occupied or bank-owned in the area. This is a hazard as well since they're not being maintained or kept up. These can be disasters waiting to happen. It's frustrating when the bank won't sell until prices are up.
- Wheeler County has a population of around 1200 – no radio, no newspaper! We have no way to communicate with residents in small communities that are 75 to 90 miles apart. Our officials are elderly and for the most part uneducated or unwilling to act on behalf of citizens. The best thing the U of O could do is provide us with a way to communicate. Cell towers, cable, radio stations, etc are all needed.
- I think people who live in cities are more likely to be unprepared. There is an assumption that the state, FEMA, or National Guard can take care of them. If the disaster is widespread this is not true. When a widespread disaster strikes, people have to rely upon themselves and assist others as possible. I've lived on a farm and in cities. Farm people know their neighbors. I believe community building and outreach are important aspects that are missing, especially in areas of population density. If a large disaster strikes Facebook & Twitter could go down – even if it doesn't it does not substitute for knowing one's immediate neighbors. We insulate ourselves – from neighbors and extreme possibilities.
- Both have had first aid training. One had CPR training, many hours of fire fighting. We have landscaped our property protecting in case of flooding.
- In the future you should define the "use of a regulatory approach." I don't think many "civilians" are familiar with the jargon. Jargon should be avoided when at all possible in public surveys.
- I feel people should be able to build where they want. However, if they choose to build in a natural disaster prone area and the natural disaster occurs, tax @ shouldn't go to help them. They knew!
- Small towns such as Pendleton are home to many intelligent, flexible, and self-sufficient people who I am confident, once they learn to communicate better, will make the changes necessary to weather any storm.
- Would be very excited to attend informational meetings on this subject. We as a family are not prepared for a disaster. This makes you think about the issue.
- RE: #20 & 21. Hispanic is no more white than Indian. Why isn't there a race for Hispanic? Just saying!
- In the event of a national disaster information on preparing for pets would also be appreciated.
- I want to thank all who are working with this organization. This survey has brought awareness to me and everyone around me that I have talked to about this matter. Thank you.

- As a small business owner I already filled out three sets of reports each year to BATF, Oregon Fire Marshall, and Fed DOT. Also pay $700-800 to file reports. Don't need any more paperwork to fill out or fees to pay.
- The Sheriff's Department employees do not understand or know local ordinances. Planning Commissions do not support environmental issues. All departments refuse to comply with ORS 192 preventing citizens from access to information.
- My husband and I took the time to fill out this questionnaire because we've been concerned about what would happen if we were to have a natural disaster occur in The Dalles-Hood River, Oregon area. To the best of our knowledge the two most devastating disasters that could occur in this area would be an earthquake and Mt. Hood could erupt. With the major fault line that we have in this area, along with the chance of Mt. Hood could erupt, we truly feel that the residents in this area have not been prepared properly for either of those disasters. If either of these were to occur, the entire area on both sides of the river would basically be shut off from the rest of the state on both sides of the Columbia River. We have been extremely fortunate for many years not to have incurred a disaster, but our day is coming. We truly feel that this area needs to be educated on what to do and where to go sometime in the near future, before it's too late.
- Mostly I'm concerned with wildfire. We have two homes, paid for. One is in the urban interface in Washington State. I keep my property clear of brush and downed trees, but it is only a matter of time until the west burns given all the bug kill.
- Earthquake is my biggest feat of property damage and possible loss of live.
- Thanks for asking! Good luck with your results.
- No mention of housing & feeding of victims. Don't wait for FEMA.
- See "Oregon At Risk" from OSSPAC.
- In future surveys, either allow "mixed" for race and ethnicity, or don't ask. It makes a mixed-ethnicity person like me have to choose one parentage over another. As for race, in addition to inter-'racial' marriage, there is no biological/scientific basis for the term. Also, this should be literacy-adjusted. Many of the words would stump many people. This is a very high-literacy level survey. Is this being made available in Spanish?
- Oregon residents who are not accustomed to earthquakes really need to be educated. News media needs to stop acting like they want a serious natural disaster to occur in Oregon. Education needed for everyone if there is a big earthquake on the Cascadia Subduction Zone.
- This is a wonderful idea. I look forward to receiving info on how to plan for disasters.
- 1) Every household needs to know the current route of evacuation! Need to teach this in the schools. 2) Need fire extinguishers or garden hoses ready to go in case of indoor/outdoor fires (burn barrel ban!). 3) Our hazard in Maupin is the railroad & tanks that haul chemicals. The general public <u>has not</u> been informed of any siren system & evacuation route.
- I live in a three-story apartment building built in the late 60s. If there is an earthquake it will all come down and I am on the bottom level. Also, I lived through Hurricane Andrew in Florida so I know exactly what preparedness can do.
- I'm worried about unsafe trees falling on our house.
- 1) I believe we have two major threats – windstorms, resulting in downed trees, damaged buildings, etc. This can happen any year. It should be a foundation from which

to build disaster preparedness. 2) The other threat is earthquake. When it finally does hit, it might be ugly – if we are practiced at one we will be better prepared for two.

- Police, fire, medical very important for us all. Thanks. Our gorge is most beautiful and loved by all. Recycling, peace, and harmony for all hopefully. Thanks.
- Sheriff's offices were not listed. While similar, they perform a more demanding service in rural counties than police. In Wasco County they cover almost 3,000 miles as opposed to less than 10. They have responsibility for search and rescue, marine, forest, animal control functions, and jails in addition to law enforcement duties, all of which are critical in emergencies.
- I think people in rural areas are generally more prepared because they experience power outages (along with water loss) more often and have become more self-reliant. I don't want a nanny state! We don't need government doing more things for us. We need government doing less things to us.
- We do not trust FEMA for anything!
- For me, as a senior citizen, it would be helpful to get a brief written summary of what I should do in my area of town for listed emergencies. Evacuating is not an easily accomplished option for many of us as senior citizens. Would buses (school?) be a possibility? Pets?
- Have lived in earthquake-prone areas. Also high wind areas. Always have disaster kit at ready.
- I believe in less government regulation and I do not think there is tax money available to pay for some of the things implied here. Our county is almost broke and so is our state & federal government. People need to take more care of themselves and not depend on the government to do so.
- We are very concerned about wildfires in our area. We are surrounded by wooded acreage with a large electrical line and a natural gas line to the east of our property.
- This county couldn't help anyone. They argue over everything. The government is in the way to progress. Red tape, no jobs, only stoppage from government. We had a diabetic visit who forgot their needles – no one had any available. Clinics or ambulance said it was not their job. In a disaster? Laughing out loud. You better look out for yourself if you visit here. Sheriff is 1 hour away. Better be packing a gun. Robbers get away with no consequences.
- I'm in a small town in Wheeler County. The need I see is how to care for these people in a natural disaster. In the rest of the state supplies of food would stop & they would come to this area. I think there should be stockpiles in each community.
- 1) Give homeowners more freedom to cut down very large trees near or around home, property, roads, infrastructures, etc. that they believe will cause major damage to these areas if trees should fall down from storms and/or natural or war acts. Permits and/or city requirements are to regulatory and leave dangerous trees in place. So please stop permits and regulations. We need to get these trees under control and away from private and public structures. 2) Every two to three days police, fire, and ambulance come down Hwy 43 in West Linn, Lake Oswego, etc. blaring their sirens. Could we have them train on highways outside city limits with sirens, and train in Hwy 43 with sirens off or maybe just once a month with them on. We don't know if it is something serious that they are going to or just training. This is also causing major noise pollution and disturbance during sleep hours with animals barking and we won't know when it is for real or not when something major happens such as disasters. Thank you so much.

- Might be a good idea to address special needs of rural landowners. These people have animals, livestock, and other features that may present unique circumstances in an emergency. Utilities are the primary asset I rely on, especially electricity which is important for heat, refrigeration, & well water. Earthquake or volcanic eruption is two major disasters I am concerned about that will have a major effect on Clackamas County. Special info, training, information, and survival kits would be valuable. Thanks for this opportunity!
- It is up to the owners of property to take care of themselves and their property, not the government. Neighbors and friends will take care of each other.
- As a survivor of an F-5 tornado in 1974 and then a blizzard in 1978 I strongly believe in disaster preparedness and possibly emergency exercises involving as many agencies as possible such as what Gary Brown did for Sioux City, Iowa, in 1989. They had an awesome response from police, fire, National Guard, volunteers, etc. resulting in lives saved after the crash of United 232. It would be great to have that kind of team ready to respond to any natural disaster!
- I don't know where to find the information needed to do the things listed in the household preparedness section.
- Community meetings are always on Saturday and I work. Evenings would be better.
- Stop spending money on light rail and use it to fortify road and utility infrastructure.
- Newspapers could print stories/maps, etc. occasionally to help inform the public of regular procedures, possible problems, escape routes, and who would be first responders to different types of events. So at least the public would have a "rough" idea in place.
- One area of disaster mitigation could be the promotion of PVSolar to offer a backup plan for electrical power should our utility grid breakdown.
- There needs to be more workshops or disaster meetings.
- The Native American, disregarding spiritual beliefs & customs, has more common sense than any other race/ethnicity. The Native American has always respected, preserved, and taken care of the land. They (American/Native Indian) take only what they need and preserve/protect what they don't need. The Native American is the best EPA ever. PUT THEM IN CHARGE OF ECOLOGY. They (Native Americans) don't rape the landscape. ASK THEM!!! Also, we need less, not more, federal government.
- We have very few instances of natural disasters. The worst have been freezing & destroying fruit trees and some destruction from high winds and dust.
- In Wasco County not enough information goes out to the public about preparedness programs. Can public access online a copy of programs?
- We had a large tree limb fall on cars and insurance wouldn't pay for anything because they say it was a natural disaster. And there was a flood once because the dam was full and the man who opened the gates of the dam was gone. Do you consider this a natural disaster or negligence?
- We have chemical facilities here with ammonia and weed & bug killers (all poisons) – most in large tanks. A disaster could trigger a second disaster. These tanks are located on the edge of town at a higher elevation than 98-percent of the town. The natural drainage would be into the town proper.
- I am a Red Cross volunteer and trainer.
- Brochure mailings explaining utility shutoff, emergency kit contents, quantity of food (days) to have on hand, good places for family members to meet if separated & why,

other issues regularly associated but not thought about during/concerning natural disasters. Have community information meetings made up of community citizens. If any of these exist make them more accessible/known about to community citizens. Thank you!

- In Wamic we are only concerned about flood because we are not allowed to clear the stream bed of three mile creek above and below town. We flood because the creek is forced to spread out because of overgrowth in the creek. The creek is dry for part of the year, yet we are not allowed to clean the creek. We flood only because of politics and nothing natural.
- Good idea – thank you for asking!
- I believe people should be advised on real estate documents if the home they are about to buy is built on an ancient landslide. As consumers we'd have no idea! I am shocked how few people carry earthquake insurance. To me, this is like a ticking time bomb situation like those who didn't insure in Louisiana before Katrina hit. Wish we'd help people understand the real quake danger here!
- This is a great thing to do. As a small community, a natural disaster would devastate our town.
- Thank you!!! Would be interested in the results. Number 9 was a little confusing … human life is most important to me but in our rural area it is not likely to impact people.
- My experience is that my local fire department & U.S. Forest Service office had little/limited info readily available about fire prevention in small acreage residential zones in upland forest ecosystem. This should change with staff and related kits/packets of info easily accessible/no fee.
- Like the concept of personal preparedness for natural disasters, etc. Personal responsibility and gathering of info, etc. Don't totally agree with government agencies mandating policies or spending money on things that should be individual responsibility, etc., i.e. government really does things half as good for twice the cost.
- I'm very concerned that our county's grotesquely incompetent "planning" department could be involved in any activities that could affect safety or emergency response.
- Would like to know if there is a community facility where people can go if their homes are damaged (i.e. school gym, etc.).
- We have a wood stove in case electricity goes out. We have also strapped water heaters to walls & reinforced beams to floor joists with gussets. We have thinned out many tr5ee limbs near house but still have more. Attending a meeting and receiving written info on preparedness would be very helpful.

Appendix F: Grant Programs

Post-Disaster Federal Programs

Hazard Mitigation Grant Program

- The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.
  http://www.fema.gov/hazard-mitigation-grant-program

Physical Disaster Loan Program

- When physical disaster loans are made to homeowners and businesses following disaster declarations by the U.S. Small Business Administration (SBA), up to 20% of the loan amount can go towards specific measures taken to protect against recurring damage in similar future disasters.
  http://www.sba.gov/category/navigation-structure/loans-grants/small-business-loans/disaster-loans

Pre-Disaster Federal Programs

Pre-Disaster Mitigation Grant Program

- The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.
  http://www.fema.gov/pre-disaster-mitigation-grant-program

Flood Mitigation Assistance Program

- The overall goal of the Flood Mitigation Assistance (FMA) Program is to fund cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other National Flood Insurance Program (NFIP) insurable structures. This specifically includes:
  - Reducing the number of repetitively or substantially damaged structures and the associated flood insurance claims;

- Encouraging long-term, comprehensive hazard mitigation planning;
- Responding to the needs of communities participating in the NFIP to expand their mitigation activities beyond floodplain development activities; and
- Complementing other federal and state mitigation programs with similar, long-term mitigation goals.
  http://www.fema.gov/flood-mitigation-assistance-program

Detailed program and application information for federal post-disaster and pre-disaster programs can be found in the f, available at :
https://www.fema.gov/library/viewRecord.do?id=4225

For Oregon Emergency Management grant guidance on Federal Hazard Mitigation Assistance, visit: http://www.oregon.gov/OMD/OEM/pages/all_grants.aspx - Hazard_Mitigation_Grants

OEM contact: Dennis Sigrist, dennis.sigrist@oem.state.or.us

State Programs

Community Development Block Grant Program

- Promotes viable communities by providing: 1) decent housing; 2) quality living environments; and 3) economic opportunities, especially for low and moderate income persons. Eligible Activities Most Relevant to Hazard Mitigation include: acquisition of property for public purposes; construction/reconstruction of public infrastructure; community planning activities. Under special circumstances, CDBG funds also can be used to meet urgent community development needs arising in the last 18 months which pose immediate threats to health and welfare.
  http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs

Oregon Watershed Enhancement Board

- While OWEB's primary responsibilities are implementing projects addressing coastal salmon restoration and improving water quality statewide, these projects can sometimes also benefit efforts to reduce flood and landslide hazards. In addition, OWEB conducts watershed workshops for landowners, watershed councils, educators, and others, and conducts a biennial conference highlighting watershed efforts statewide. Funding for OWEB programs comes from the general fund, state lottery, timber tax revenues, license plate revenues, angling license fees, and other sources. OWEB awards approximately $20 million in funding annually.
  http://www.oregon.gov/OWEB/Pages/index.aspx

Federal Mitigation Programs, Activities & Initiatives

Basic & Applied Research/Development

- National Earthquake Hazard Reduction Program (NEHRP), National Science Foundation. Through broad based participation, the NEHRP attempts to mitigate the effects of earthquakes. Member agencies in NEHRP are the US Geological Survey (USGS), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the

National Institute for Standards and Technology (NIST). The agencies focus on research and development in areas such as the science of earthquakes, earthquake performance of buildings and other structures, societal impacts, and emergency response and recovery. http://www.nehrp.gov/

- Decision, Risk, and Management Science Program, National Science Foundation. Supports scientific research directed at increasing the understanding and effectiveness of decision making by individuals, groups, organizations, and society. Disciplinary and interdisciplinary research, doctoral dissertation research, and workshops are funded in the areas of judgment and decision making; decision analysis and decision aids; risk analysis, perception, and communication; societal and public policy decision making; management science and organizational design. The program also supports small grants for exploratory research of a time-critical or high-risk, potentially transformative nature. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423

Hazard ID and Mapping

- National Flood Insurance Program: Flood Mapping; FEMA. Flood insurance rate maps and flood plain management maps for all NFIP communities. http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping
- National Digital Orthophoto Program, DOI – USGS. Develops topographic quadrangles for use in mapping of flood and other hazards. http://www.ndop.gov/
- Mapping Standards Support, DOI-USGS. Expertise in mapping and digital data standards to support the National Flood Insurance Program. http://ncgmp.usgs.gov/standards.html
- Soil Survey, USDA-NRCS. Maintains soil surveys of counties or other areas to assist with farming, conservation, mitigation or related purposes. http://soils.usda.gov/survey/printed_surveys/

Project Support

- Coastal Zone Management Program, NOAA. Provides grants for planning and implementation of non-structural coastal flood and hurricane hazard mitigation projects and coastal wetlands restoration. http://coastalmanagement.noaa.gov/
- Community Development Block Grant Entitlement Communities Program, HUD. Provides grants to entitled cities and urban counties to develop viable communities (e.g., decent housing, a suitable living environment, expanded economic opportunities), principally for low- and moderate- in come persons. http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/entitlement
- National Fire Plan (DOI – USDA) Provides technical, financial, and resource guidance and support for wildland fire management across the United States. Addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability. http://www.forestsandrangelands.gov/
- Assistance to Firefighters Grant Program, FEMA. Grants are awarded to fire departments to enhance their ability to protect the public and fire service personnel from fire and related hazards. Three types of grants are available: Assistance to Firefighters Grant (AFG), Fire

Prevention and Safety (FP&S), and Staffing for Adequate Fire and Emergency Response (SAFER). http://www.fema.gov/welcome-assistance-firefighters-grant-program

- Emergency Watershed Protection Program, USDA-NRCS. Provides technical and financial assistance for relief from imminent hazards in small watersheds, and to reduce vulnerability of life and property in small watershed areas damaged by severe natural hazard events. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp
- Rural Development Assistance – Utilities, USDA. Direct and guaranteed rural economic loans and business enterprise grants to address utility issues and development needs. http://www.rurdev.usda.gov/Utilities_Programs_Grants.html
- Rural Development Assistance – Housing, USDA. Grants, loans, and technical assistance in addressing rehabilitation, health and safety needs in primarily low-income rural areas. Declaration of major disaster necessary.

  http://www.rurdev.usda.gov/HAD-HCFPGrants.html
- Public Assistance Grant Program, FEMA. The objective of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President. http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit
- National Flood Insurance Program, FEMA. Makes available flood insurance to residents of communities that adopt and enforce minimum floodplain management requirements. http://www.fema.gov/national-flood-insurance-program
- HOME Investments Partnerships Program, HUD. Grants to states, local government and consortia for permanent and transitional housing (including support for property acquisition and rehabilitation) for low-income persons. http://www.hud.gov/offices/cpd/affordablehousing/programs/home/
- Disaster Recovery Initiative, HUD. Grants to fund gaps in available recovery assistance after disasters (including mitigation). http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/dri
- Emergency Management Performance Grants, FEMA. Helps state and local governments to sustain and enhance their all-hazards emergency management programs. http://www.fema.gov/fy-2012-emergency-management-performance-grants-program
- Partners for Fish and Wildlife, DOI – FWS. Financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats. http://www.fws.gov/partners/
- North American Wetland Conservation Fund, DOI-FWS. Cost-share grants to stimulate public/private partnerships for the protection, restoration, and management of wetland habitats. http://www.fws.gov/birdhabitat/Grants/index.shtm
- Federal Land Transfer / Federal Land to Parks Program, DOI-NPS. Identifies, assesses, and transfers available Federal real property for acquisition for State and local parks and recreation, such as open space. http://www.nps.gov/ncrc/programs/flp/index.htm

- Wetlands Reserve program, USDA-NCRS. Financial and technical assistance to protect and restore wetlands through easements and restoration agreements. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands
- Secure Rural Schools and Community Self-Determination Act of 2000, US Forest Service. Reauthorized for FY2012, it was originally enacted in 2000 to provide five years of transitional assistance to rural counties affected by the decline in revenue from timber harvests on federal lands. Funds have been used for improvements to public schools, roads, and stewardship projects. Money is also available for maintaining infrastructure, improving the health of watersheds and ecosystems, protecting communities, and strengthening local economies. http://www.fs.usda.gov/pts/