Clatsop County

Natural Hazards Mitigation Plan

Report for:

Clatsop County

800 Exchange Street

Astoria, OR 97103

Prepared by:

C.R.E.S.T.

750 Commercial St., Rm 205

Astoria, OR 97103

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Regional partners include:

- Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center
- Oregon Emergency Management
- FEMA Region X

Project Steering Committee:

- Jay Flint, Plan Facilitator, CREST
- Gene Strong, Clatsop County Emergency Management
- Patrick Wingard, Clatsop County Planning Department
- Jennifer Bunch, Clatsop County Planning Department
- Bruce Francis, Clatsop County Planning Commissioner
- Margo Lalich/Maurine Taylor, Clatsop County Public Health
- Brett Estes, City of Astoria
- Carol Parker/Pamela Alegria, City of Warrenton
- Kevin Cupples, City of Seaside
- Richard Mays, City of Cannon Beach
- Dennis McNally/Sabrina Pearson, City of Gearhart
- Patrick Corcoran, OSU Sea Grant Extension, Clatsop County
- Christine Lolich, Columbia Memorial Hospital
- Susan Trabucco, Coast River Business Journal
- Lora Eddy, Port of Astoria
- Doug Dougherty, Seaside School District
- Cleve Rooper, Fire Defense Board
- Lindi Overton, Clatsop Community College

Project Managers:

Jay Flint, Plan Facilitator, Columbia River Estuary Study Taskforce

Gene Strong, County Liaison, Clatsop County Emergency Services

Community Service Center Staff:

Andre LeDuc, Director, Oregon Partnership for Disaster Resilience

Krista Dillon, Associate Director, Oregon Partnership for Disaster Resilience

Megan Findley, Program Manager, Oregon Partnership for Disaster Resilience

Sara Schooley, Graduate Research Intern, Oregon Partnership for Disaster Resilience

Geographic Information Systems (GIS) Maps:

The contributions from the Clatsop County Planning Department were essential in illustrating the extent and potential losses associated with the natural hazards affecting the community.

Jennifer Bunch, Planner/GIS Specialist, Clatsop County Planning Dept.

Clatsop County

Natural Hazards Mitigation Plan

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Executive Summary

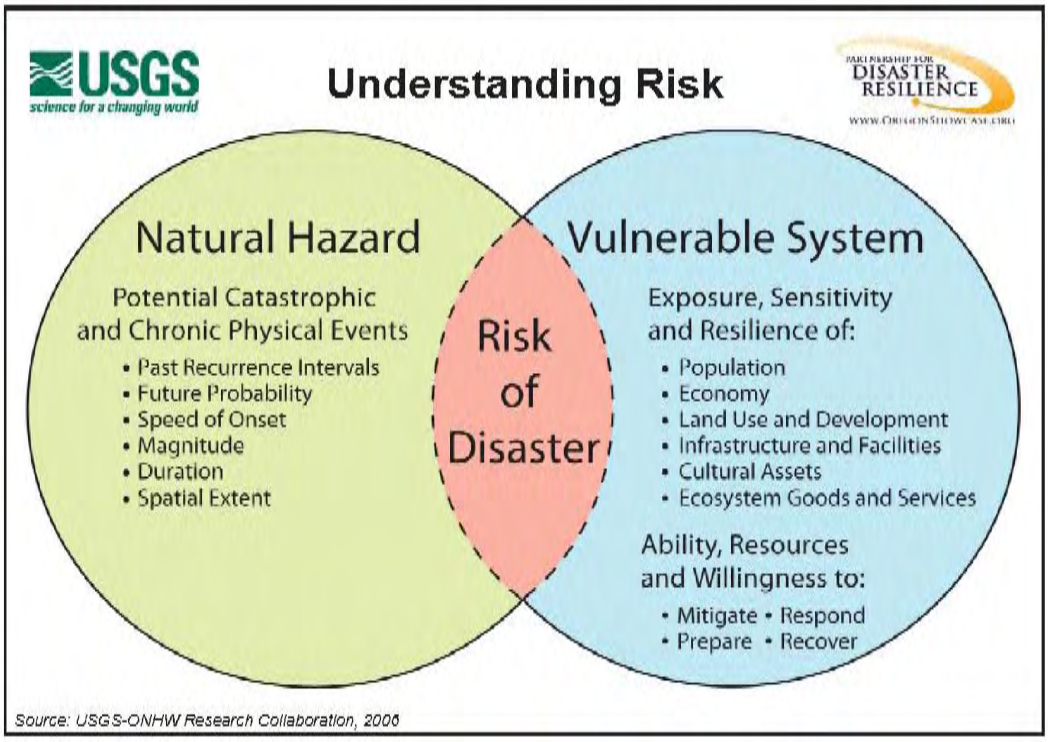
Clatsop County developed this multi-jurisdictional Natural Hazard Mitigation Plan in an effort to reduce future loss of life and damage to property resulting from natural hazards. This plan was developed with and for the following jurisdictions: Clatsop County, City of Astoria, City of Warrenton, City of Gearhart, City of Seaside, and the City of Cannon Beach. 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 minimize the losses that can result from natural hazards.

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

Why Develop this Mitigation Plan?

This natural hazard mitigation plan is intended to assist Clatsop County, City of Astoria, City of Warrenton, City of Gearhart, City of Seaside, and the City of Cannon Beach in reducing the risk from natural hazards by identifying resources, information, and strategies for risk reduction. It will also help guide and coordinate mitigation activities throughout the County. The figure below is utilized throughout the plan to illustrate the concept of risk reduction.

Figure i.1 Understanding Risk



Source: USGS-Partnership for Disaster Resilience Research Collaborative, 2006

A natural hazard mitigation plan can assist jurisdictions in understanding what puts the community at risk. By identifying and understanding the relationship between natural hazards, vulnerable systems, and existing capacity, communities in Clatsop County become better equipped to identify and implement actions aimed at reducing the overall risk to natural hazards.

Who Participated in Developing the Plan?

In Fall 2006, the Oregon Partnership for Disaster Resilience (OPDR/The Partnership) at the University of Oregon's Community Service Center partnered with Oregon Emergency Management (OEM) and Clatsop and Lincoln counties to develop a Pre-Disaster Mitigation Planning Grant proposal. Each county joined The Partnership by signing (through their County Commissions) a Memorandum of Understanding for this project. FEMA awarded the Oregon Coast Region a grant to support the development of the natural hazard mitigation plans for the two counties at the cities therein. The Partnership, OEM, and the participating communities were awarded the grant in the Fall of 2006 and local planning efforts in this region began in the Fall of 2007.

Clatsop County Natural Hazard 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 steering committee was comprised of representatives from the following organizations.

- Clatsop County Emergency Services/ Sheriff's Dept.
- Clatsop County Transportation and Services Dept.
- Clatsop County Public Health Dept.
- Clatsop County Planning Commission
- City of Astoria
- City of Warrenton
- City of Gearhart
- City of Seaside
- City of Cannon Beach
- Columbia River Estuary Study Taskforce
- Fire Defense Board
- Columbia Memorial Hospital
- Coast River Business Journal
- Port of Astoria
- Seaside School District
- OSU Sea Grant Extension
- Clatsop Community College

Clatsop County's Planning Department and Emergency Services were designated as the plan's co-conveners, following the development of the plan. They will take the lead after plan adoption, including implementing, maintaining and updating the plan.

Public participation played a key role in the development of goals and action items.

What is the Plan's Mission?

The mission of the Clatsop County Natural Hazards Mitigation Plan is to create a disaster resilient Clatsop County.

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. They are as follows:

- Protect life
- Minimize damage to public and private buildings and infrastructure
- Reduce economic loss
- Decrease disruption to critical services
- Protect natural and cultural resources
- Increase education and awareness of the risks and hazards in Clatsop County
- Increase cooperation and collaboration among County partners

How are the Action Items Organized?

The action items are organized by hazard as follows. Data collection and research and the public participation process resulted in the development of these action items. In addition, the **action items** in bold print indicate County priorities. Full action item forms can be found in Appendix A.

Multi-Hazard

- **Build new centralized Emergency Operations Center.**
- **Centralize Countywide 911 system.**
- Develop a pre-plan of how to accommodate visitors to the coast following a major disaster.
- Evaluate the vulnerability of wastewater treatment facilities in the County.
- Evaluate the feasibility of undergrounding utilities where appropriate.
- Identify and develop emergency shelter facilities throughout the County.
- Develop secondary back-up power, communication, and lighting for the Port of Astoria airport.
- Develop Post-Disaster Recovery Plans for communities in Clatsop County.
- Encourage residents to maintain and update 72 hour kits.
- Harden the Wickiup repeater site.
- Develop an inventory of available generators and fuel distribution.
- Partner with Clatsop County Community College on mitigation efforts.

- Post-disaster pet/animal shelter.
- Emergency Preparedness CDs.
- Food and Emergency Supply Stations.
- Relocate Lewis and Clark RFPD – Station #1.
- CERT Program support.
- Upgrade Wickiup Grange to become shelter for both short and long term disasters.
- Public Emergency Information Boards.
- Outreach and education to volunteer organizations that may be designated relief sites in a disaster regarding safe food, water, and sanitation practices.
- Mitigating the risk of communicable disease in vulnerable, congregate settings.
- Develop a disaster debris management plan.
- Increase public education and outreach in natural hazards which affect the north coast.

Tsunami

- Rebuild four Seaside School District schools outside of the tsunami inundation zone.
- Build "tsunami towers" in coastal cities.
- Complete tsunami risk assessment for Clatsop County.
- Improve public notification and warning system.
- Relocate Arch Cape Fire Station out of the tsunami inundation and flood zones.
- Elevate Brownsmead Rural Fire District Station.
- Establish long term supply and assembly areas outside of inundation zones.
- Upgrade and improve evacuation routes as well as assembly areas outside of tsunami inundation zones.
- Seismic vulnerability assessment/vertical evacuation routes.
- Conduct preliminary research on the development of a County. Land Use Ordinance relating to Tsunami Hazards.
- Establish high ground commercial districts (above tsunami lines).

Winter/Windstorm

- Develop and implement hazard tree program.
- Promote tree planting projects on private and public properties.
- Have one to three ISA-certified arborists in each community that know how to properly prune storm damaged trees.
- Heightened awareness by First Responders and appropriate staff of the factors contributing to tree stability.

- Educate homeowners about methods to tie down metal roofs and metal sheds.
- Identify major transportation routes that are at risk during a major winter storm event.

Earthquake

- **Retrofit County bridges that are identified by a seismic vulnerability assessment.**
- Complete assessment of County owned bridges.
- Seismic upgrades for the Ecola Creek Bridge in Cannon Beach (Hwy 101).
- Complete a seismic vulnerability assessment for Port of Astoria facilities.
- Develop incentive programs to encourage homeowners to do seismic retrofits.
- Seismic retrofitting of old Hamlet Fire Station.

Flood

- Partner with Oregon Department of Transportation to elevate Highway 101 roadbed to an elevation sufficient to avoid annual winter flooding on multiple sections between City of Seaside and the junction of Highways 101 and 26.
- Elevate runway at Port of Astoria airport and improve diking around the airport.
- Complete a risk assessment related to levees in the County and adjacent development.
- Westport Railroad Bridge (71.3) replacement.
- Provide support and assistance to Diking Districts in respect to accreditation of the County's levees.
- Continue compliance with the National Flood Insurance Program (NFIP).

Landslide

- Build new access road on east side of Astoria from Hwy 30.
- Continue upgrading and enhancing GIS data in order to more efficiently identify areas prone to landslide and mass movement.
- Develop alternative transportation routes around slide-prone areas in County.

Drought

- Investigate the viability of county wide public awareness activities regarding water conservation.

Wildfire

- Development and Implement the Community Wildfire Protection Plan.

How will the plan be implemented?

The plan maintenance section of this plan details the formal process that will ensure that the Clatsop County Natural Hazards Mitigation Plan remains an active and relevant document. The plan will be implemented, maintained and updated by designated co-conveners. The co-conveners are 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 co-conveners 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

After the Plan is locally reviewed and deemed complete, the Plan Facilitator will be responsible for submitting it to the State Hazard Mitigation Officer at Oregon Emergency Management. Oregon Emergency Management will then submit the Plan to the Federal Emergency Management Agency (FEMA – Region X) for review. This review will address the federal criteria outlined in FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA the County will adopt the plan via resolution. The individual jurisdiction's conveners will be responsible for ensuring local adoption of the Clatsop County multi-jurisdictional Natural Hazards Mitigation Plan (and its addendums) and providing the support necessary to ensure plan implementation. At that point the County will gain eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and the Flood Mitigation Assistance program funds.

The 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.

Section1:
Introduction

What is Natural Hazard Mitigation?

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

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?

Clatsop County developed 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 was developed with and for the following jurisdictions: Clatsop County, City of Astoria, City of Warrenton, City of Gearhart, City of Seaside, City of Cannon Beach, and the Port of Astoria. It is impossible to predict exactly when these disasters will occur, or the extent to which they will affect the County. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from natural hazards.

The figure below is utilized throughout the plan to illustrate the concepts of risk reduction.

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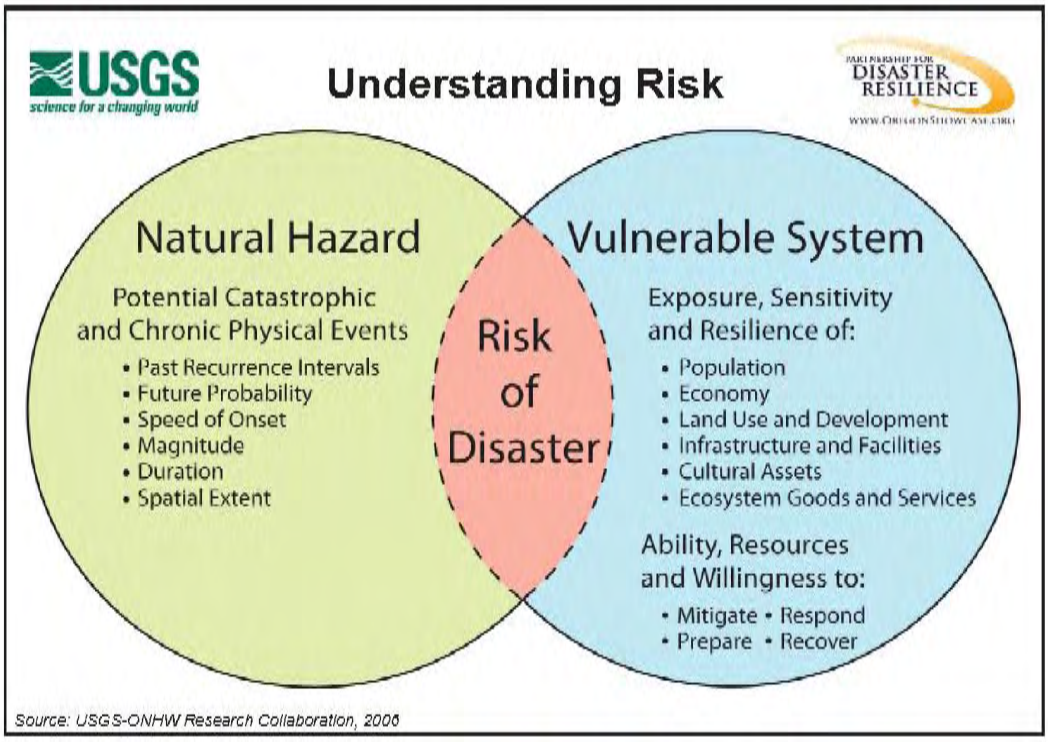

Source: USGS – The Partnership for Disaster Resilience Research Collaborative, 2006

A natural hazard mitigation plan can assist the community in understanding what puts the community at risk. By identifying and understanding the relationship between natural hazards, vulnerable systems, and existing capabilities, communities in Clatsop County become better equipped to identify and implement actions aimed at reducing the overall risk of hazards.

This plan focuses on the primary natural hazards that could affect Clatsop County, Oregon, which include Coastal Erosion, Droughts, Earthquakes, Floods, Landslides, Tsunamis, Volcanoes, Wildfires, and Winter Storms/Windstorms. The dramatic increase in the costs associated with natural disasters over the past decades has fostered interest in identifying and implementing effective means of reducing vulnerability. A report submitted to Congress by the National Institute of Building Science's Multi-hazard Mitigation Council (MMC) highlights that for every dollar spent on mitigation, society can expect an average savings of $4.[i] This multi-jurisdictional Natural Hazards Mitigation Plan is intended to assist all participating jurisdictions in reducing its risk from natural hazards by identifying resources, information, and strategies for risk reduction.

The plan is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the County; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements

and qualifying for assistance programs. The mitigation plan works in conjunction with other County and City plans and programs including, Comprehensive Land Use Plans, Emergency Response and Recovery Plans, Economic Development Strategic Plans, Capital Improvement Plans, Buildable Lands Inventories, as well as the State of Oregon Natural Hazards Mitigation Plan.

The plan provides a set of actions to prepare for and reduce the risks posed by natural hazards through education and outreach programs, the development of partnerships, the implementation of preventative activities such as land use and watershed management programs, and infrastructure retrofitting programs. The actions described in the plan are intended to be implemented through existing plans and programs within the County and/or city.

Policy Framework for Natural Hazards in Oregon

Planning for natural hazards is an integral element of Oregon's statewide land use planning program, which began in 1973. All Oregon cities and counties have comprehensive plans and 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).

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.

How was the Plan Developed?

In Fall 2006, the Oregon Partnership for Disaster Resilience (OPDR/The Partnership) at the University of Oregon's Community Service Center partnered with Oregon Emergency Management (OEM) and Clatsop and Lincoln counties to develop a Pre-Disaster Mitigation Planning Grant proposal. Each county joined The Partnership by signing (through their County Commissions) a Memorandum of Understanding for this project. FEMA awarded the Oregon Coast Region a grant to support the development of the natural hazard mitigation plans for the two counties at the cities therein. The Partnership, OEM, and the participating communities were awarded the grant in the Fall of 2006 and local planning efforts in this region began in the Fall of 2007.

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

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

Each community is responsible for facilitating the mitigation planning process locally, utilizing the resources provided by The Partnership, OEM and other state partners. Participating jurisdictions reviewed the resources provided by the various organizations and applied local knowledge, information and data about community characteristics, assets and resources in order to identify potential mitigation actions aimed at reducing overall risk.

The planning process and associated resources used to create Clatsop County's multi-jurisdictional Natural Hazards Mitigation Plan were developed by The Partnership. The planning process was designed to: (1) result in a plan that is DMA 2000 compliant; (2) coordinate with the State's plan and activities of The Partnership; and (3) build a network of jurisdictions and organizations that can play an active role in plan

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

Phase I: Getting Started

The pre-disaster mitigation planning process in Clatsop County is organized through the Emergency Services Coordinator within the Sheriff's Department. Subsequently, the County contracted with the Columbia River Estuary Study Taskforce (CREST) to facilitate the development of the plan for both the County and each of the incorporated cities within the County. CREST is a bi-state council of governments, which among other things, provides local and regional planning services to member jurisdictions, including Clatsop County. The Coastal Planner for CREST managed the planning process from inception to adoption. The drafting of the elements of the plan was a collaborative effort between Clatsop County Planning Department staff, CREST's Coastal Planner (Plan Facilitator), and the Oregon Partnership for Disaster Resilience (OPDR).

A Steering Committee was formed to guide the process of developing the plan. The formation and recognition of the Pre-Disaster Mitigation Plan Steering Committee as the group responsible for guiding the County through the planning process was authorized by the County Manager through a Memorandum of Agreement.

The development of the Steering Committee was a collaborative effort. The Plan Facilitator utilized the information made available through OPDR's initial training to develop a list of potential groups and organizations that would like to participate in the plan or have a critical role to play in the planning process, such as county and city representatives. Next, the organizations were contacted and names of available candidates began to take shape. In some instances, several referrals were needed to locate a candidate that could dedicate the time and energy needed to join the Steering Committee.

The objective in forming the committee was to include County and city representatives, local officials, hazards experts, local business representatives, and other groups with an interest in participating. The Steering Committee's final makeup, as a result of this process, consisted of the following groups:

- Clatsop County (Departments: Emergency Services, Community Development/Planning, Public Health, Planning Commission),
- CREST,
- City of Astoria,
- City of Warrenton,
- City of Gearhart,
- City of Seaside,

- City of Cannon Beach,
- Oregon State University Sea Grant Extension Services,
- Columbia Memorial Hospital,
- Coast River Business Journal,
- Port of Astoria,
- Seaside School District,
- Clatsop County Fire Defense Board, and
- Clatsop Community College.

The roles of the Steering Committee members were as follows. The Plan Facilitator was in charge of coordinating the planning process with OPDR, the Steering Committee, the County and cities, as well as organizing the internal meetings and public involvement. The County's Emergency Services Coordinator provided oversight of the planning process and served as the Steering Committee Chairman. The County's Planning staff provided the bulk of County input in the drafting of the plan. The County Public Health department provided input on vulnerable populations. The Planning Commission gave valuable input on land use issues. The City representatives were the liaisons for the development of the City Addendums. The Columbia Memorial Hospital, Coast River Business Journal, Port of Astoria, Fire Defense Board, Seaside School District and Clatsop Community College representatives provided input from their unique perspectives.

During the first phase of the planning process, one Steering Committee meeting was held. This initial meeting took place on November 15, 2007, from 1pm-3pm at the Clatsop County Sheriff's Department. During the meeting the following issues were addresses:

- What is mitigation?
- Why is it important?
- The role of the steering committee
- What the plan will accomplish
- The Plan's mission and goals
- Public involvement strategy
- Review of the state's community profile for Region 1
- Review and approval of a memorandum of understanding with the County

Public Involvement

One of the main components of the planning process was to develop a public involvement strategy. Involving the public plays a crucial role in the shaping of the plan to meet local needs. A public involvement strategy was developed early on in the planning process by the Plan Facilitator and was presented and approved by the Steering Committee during their first meeting in November. The public involvement strategy can be found in Appendix B. The strategy is broken down into the four phases of the planning process. This was done to include the public in all stages of plan development. During phase one, a media announcement and subsequent articles in the Daily Astorian (published January 11, 16, 17) focused on letting the public know that the pre-disaster mitigation process had begun and that there would be opportunities in the future for public input in the plan.

The second and third phases had the greatest amount of public participation. Several avenues for disseminating information were employed. First, a survey went out to County residents by OPDR which is explained in further detail below. During the second phase, the Steering Committee collectively developed a list of stakeholders who were then interviewed by a graduate student from the University of Oregon working on behalf of OPDR. Alternatively, an online survey of similar questions to the stakeholder interview was utilized by stakeholders who did not participate in the phone interviews. In all, eleven stakeholders were interviewed and five completed the online survey. A summary of their responses can be found in Appendix B.

The lion's share of direct public input into the plan occurred at two public events in the spring of 2008. On April 30, the Plan Facilitator and the Steering Committee Chair participated in the County-wide Emergency Preparedness Fair, which was sponsored by the City of Seaside at the Seaside Civic and Convention Center. The Fair offered 20 informational booths, two panel discussions, CERT demos, five workshops and other ways to bring disaster preparedness to the public. The two Steering Committee members occupied a booth which focused on presenting the initial list of proposed mitigation actions and asking the public to prioritize the actions they think the County should focus on implementing. In addition, suggestions for other mitigation actions were gladly accepted. The Plan Facilitator also participated in the two panel discussions which allowed for a brief explanation of the pre-disaster mitigation plan and was followed by a question and answer session. The Fair was well attended and a lot of public feedback on the mitigation actions was recorded for future use in prioritizing the completed mitigation action list.

On the very next day, May 1, a stand alone meeting was conducted at the Performing Arts Center of Clatsop Community College in Astoria. A nice article on the Emergency Preparedness Fair and notice for the Astoria event was published in the Daily Astorian on May 1. The event consisted of a PowerPoint presentation by the Plan Facilitator followed by questions

and answers. Those that attended were asked to go through the same prioritization and mitigation action identification as was at the Fair. This event was not well attended; none-the-less, some good mitigation action ideas were received. Representatives from the City of Astoria and CERT were also present to address the City's recently completed Addendum and received public input on their plan.

The County's project webpage located on *The Partnership* website (www.OregonShowcase.org) will serve as an outreach tool to the communities. The webpage will be used to provide local contact information and updates on the planning process. The final adopted and approved plan will be posted on the University of Oregon Libraries' Scholar's Bank Digital Archive.

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

The Partnership, with a commitment from the Institute for Business & Home Safety (IBHS) provided individuals in the region with access to, and use of, the IBHS interactive, web-based *Open for Business* property protection and disaster recovery planning tool. The purpose of the planning tool is to: (1) create understanding of the importance of disaster planning; (2) teach local businesses how to navigate the interactive, web-based *Open for Business* property protection and disaster recovery planning tool; (3) Assist small businesses in developing their own plans during the training; and (4) teach businesses how to communicate the importance of developing and utilizing plans for property protection and recovery from business interruption. An Open for Business workshop was held in Seaside on February 12, 2008. See Appendix B for more information.

Phase II: Risk Assessment

The Oregon coast is a dynamic place and one that has its fair share of disastrous events. They can come from floods, tsunamis, earthquakes, severe winter storms, landslides, wildfires, coastal erosion, volcanoes, and yes, even drought. On behalf of the pre-disaster planning effort, Clatsop County has analyzed each one of these natural hazards against their potential impacts to human life and property in order to develop a complete risk assessment. The risk assessment is broken down by hazard into nine Hazard Annexes. These can be found in this plan under Volume II: Hazard-Specific Annexes.

In order to complete the vulnerability assessments and risk analyses for each hazard, many different methods were used. The analyses began by

consulting the Oregon Land Conservation and Development Commission's Technical Resource Guide: Planning for Natural Disasters, the State's Natural Hazards Mitigation Plan Risk Assessment and Regional Profile: Region 1. In addition, comparative analyses were employed through GIS technology to perform tasks such as comparing the number of dwelling units within a flood hazard overlay zone. Many of the hazards utilized this type of GIS analysis. The maps were either locally developed or came from state and federal sources, such as DOGAMI. Furthermore, local experts were used to identify vulnerable populations and critical infrastructure. This information could then be compared against the areas affected by each hazard. Finally, all of this information was gathered and consolidated in the Hazard Annexes.

The second Steering Committee meeting took place during phase two on February 14, 2008 from 1pm to 3pm at the Bob Chisholm Community Center in Seaside. At this meeting, the Committee went over:

- The draft Community Profile,
- The initial drafts of the Hazard Annexes,
- Discussion of the requirements for the City Addendums,
- A presentation on the draft GIS hazard and vulnerability maps
- The initial development of the Stakeholder List
- Planning out the details of the public forums

After the second meeting, the County Planning staff worked with OPDR and the Plan Facilitator to further develop and complete the Hazard Annexes. The city representatives used the templates developed by OPDR to build the risk assessment portion of their City Addendums. This included reviewing each of the hazards identified in the County's Plan to highlight the unique risks that each city faces. After continued input from Committee members following the second meeting, the Community Profile was finalized during this phase of the process. The Committee members continued building the Stakeholder List throughout this phase as well. Through this process, it was determined through group consensus that the best use of the Stakeholders' time would be to ask them about the goals and mitigation actions and thus the stakeholder interviews did not take place until phase three. These interviews will be discussed below. Finally, the planning team decided upon having two public forum events to disseminate the Plan's information and solicit public input. Further details of these events can be found in the "Public Involvement" portion of this plan section.

Phase III: Developing a Mission, Goals and Action Items

The third phase was ushered in with the third Steering Committee meeting which took place on April 16, 2008, from 1pm to 3pm, in the City Commissioners Room at the Warrenton City Hall building. The focus of this meeting was:

- To finalize the Mission Statement
- To finalize the Plan Goals
- Develop the initial list of mitigation actions for the County Plan
- Meet with each of the city representatives to discuss their progress on the Addendums

The Mission Statement was developed by the Plan Facilitator upon consultation with OPDR and other resources. It was presented to the Steering Committee and adopted with no corrections requested. The Mission Statement is:

- "To create a disaster resilient Clatsop County"

The Plan Goals were developed using a variety of sources. The initial list of goals were researched and created by the Plan Facilitator. The information for doing so was found in the OPDR plan support documents, FEMA support documents and from reviewing the completed Pre-Disaster Mitigation Plans of other jurisdictions. This initial list was then presented to the Steering Committee during the third meeting. The Committee members reviewed all of them and provided feedback. The changes requested were minor and no new goals were added after much discussion over potential new goals. All of the new goals proposed were determined to be included in the list of goals already created. Here is the finalized list of Plan Goals:

- Protect life
- Minimize damage to public and private buildings and infrastructure
- Reduce economic loss
- Decrease disruption to critical services
- Protect natural and cultural resources
- Increase education and awareness of the risks and hazards in Clatsop County
- Increase cooperation and collaboration among County partners

The mitigation actions generated during this phase of the planning process used a diverse array of methods in order to maximize input. The initial list of mitigation actions was born out of a work session during the third Steering Committee meeting. The Plan Facilitator went around the room and asked all of the Steering Committee members to contribute their ideas. This session generated the largest share of mitigation actions, about 35. Another major contribution of potential actions came from the two public forums in which the public was given blank action forms and asked to offer any mitigation project ideas they may have. Additionally, over the course of phase three, more mitigation ideas were submitted to the planning team from Committee members, local officials, and the general

public. The complete list of mitigation actions for the County can be found in Appendix A.

Stakeholder Interviews

Once the Stakeholder List was finalized by the Steering Committee, it was sent to OPDR for review. The OPDR review team prioritized the list, based on past experience and Clatsop County's identified hazards, to come up with a list of interviewees who could provide the greatest amount of information to the planning process. Stakeholder input was compiled in two ways. The main mode for receiving input was through phone interviews. A total of eleven interviews took place by phone and were conducted by a graduate student with University of Oregon in collaboration with OPDR. The other way for gathering input was through an online survey developed by OPDR and reviewed and approved by the Plan Facilitator. The survey contained basically the same questions asked during the phone interviews. All of the stakeholders on the County's list, who were not phone interviewed, were given the opportunity to complete the online survey. OPDR received five online survey responses. These responses were compiled with the phone interview responses and summarized in a Stakeholder Report found in Appendix B. In addition, the list of phone interviewees and their individual interviews are also found in Appendix B.

Phase IV: Plan Implementation and Maintenance

The forth and final phase of the plan's development began with the forth Steering Committee meeting. The meeting took place on August 7th, 2008, at the Clatsop County Public Services Building in Astoria, Oregon. During the meeting the following subjects were discussed: future convener, future coordinating body, future public involvement, plan maintenance duties, prioritizing county mitigation actions, and it finished with a discussion of the timeline involved in plan adoption and grant cycles.

Convener

CREST's contract to manage the planning process ends when the plan is adopted and thus a new convener is needed and will be included in the plan. After a brief discussion, the committee agreed that the County's Planning Department should oversee the plan during the next 5 years in cooperation with Clatsop County Emergency Management. They will operate as co-conveners.

Coordinating Body

The coordinating body's duties are to convene every year to work on implementation of the plan and oversee the updating process. The group decided to keep, at the least, the same people as are on the Steering Committee, but with possibly a few additions. Suggestions were to add more school districts, and more members of the business community.

Public Involvement

Next the group discussed the options for pubic involvement in the future. The following suggestions were offered: County-wide Hazard Preparedness Fair, National Night Out, Astoria Service Fair, County Fair, and Cannon Beach Tsunami Fair. The coordinating body will decide which of these options they'll focus on each year.

Plan Maintenance

The schedule for plan maintenance was next discussed. The main issue was how many times the group would like to meet during the next 5 years to go over the plan's implementation and eventual update. After a discussion of the merits of one or two meetings, the group chose to meet twice a year. The first meeting will be around May, before the end of the fiscal year, in order to allow the jurisdictions amply time in which to decide which mitigation actions should be pursued during the fall's grant cycle. The next meeting will happen around November. This meeting can focus on the other aspects of plan maintenance and implementation.

County Mitigation Actions

The final major item on the agenda was to prioritize the County's mitigation actions and come up with a list of top candidates to recommend to the County Commission. All of the proposed County mitigation actions were presented to the group and then voted upon. The voting focused on the actions which FEMA can fund through one of its grant programs. The results of the voting created three top choices. The following action items were determined to be the most important to pursue at this time as determined by the steering committee:

1. Establish a new and improved Emergency Operations Center
2. Consolidate 911 services in the County
3. Retrofit county bridges which are identified by a seismic vulnerability assessment

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 County citizens, businesses, and the environment. Combined, the sections work in synergy to create a mitigation plan that furthers the community's mission to create a disaster resilient Clatsop County. This plan structure enables stakeholders to use the section(s) of interest to them.

Volume I: Multi-jurisdictional Natural Hazard 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 Overview

This section provides an overall description of Clatsop County. The section includes a brief community profile, discussion of the government structure, listing of existing plans, policies, and programs, listing of community organizations, 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: Mission, Goals and Action Items

This section documents the plan 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 that can 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 describe the risk assessment process and 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.

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

- Coastal Erosion;
- Drought;
- Earthquake;

- Flood;
- Landslide/Debris Flow;
- Tsunami;
- Volcanic Event;
- Wildfire;
- Windstorm/Winter Storm.

Volume III: City/Special District Addendums

Volume III of the plan is reserved for city or special district addendums developed through this multi-jurisdictional planning process.

Volume IV: Resource Appendices

The resource appendices are designed to provide the users of the Clatsop 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: Economic Analysis of Natural Hazards Mitigation Projects

This appendix describes the Federal Emergency Management Agency's (FEMA) requirements for benefit cost analysis in natural hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities. This appendix was developed by *The Partnership*. 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 D: Regional Profile and Risk Assessment

This report was developed by *The Partnership* and it serves as the nexus between the State Natural Hazard Mitigation Plan and local plans. A component of the State Plan, the report is utilized by local communities to identify specific issues locally and to develop potential action items. Communities review and update the data in the report based on their best

available local data. The updates are then incorporated into the State Plan, creating a state level plan that is built upon information and data from the local level. Using the best available data, the regional profile includes a *Demographic Profile* that discusses the population in the region, an *Infrastructure Profile* that addresses the region's critical facilities and transportation and power transmission systems, and an *Economic Profile* that discusses the scale and scope of the regional economy with a focus on the key industries. In addition to describing characteristics and trends, each profile section identifies the traits that indicate sensitivity to natural hazards.

This report also includes the regional risk assessment that describes historical impacts, general location, extent, and severity of past natural hazard events as well as the probability of future events. This information is aggregated at the regional level and provides counties with a baseline understanding of past and potential natural hazards.

These assessments were based on best available data from various state agencies related to historical events, repetitive losses, county hazard analysis rankings, and general development trends. The risk assessment was written in 2003 by *The Partnership* as part of the State Natural Hazards Mitigation Plan.

Appendix E: Regional Household Preparedness Survey

This appendix includes the survey instrument and results from the regional household preparedness survey implemented by *The Partnership*. 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: Community Organizations

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The County can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on a number of issues, one of which could be natural hazard preparedness and mitigation. This appendix lists community organizations that are active within Clatsop County.

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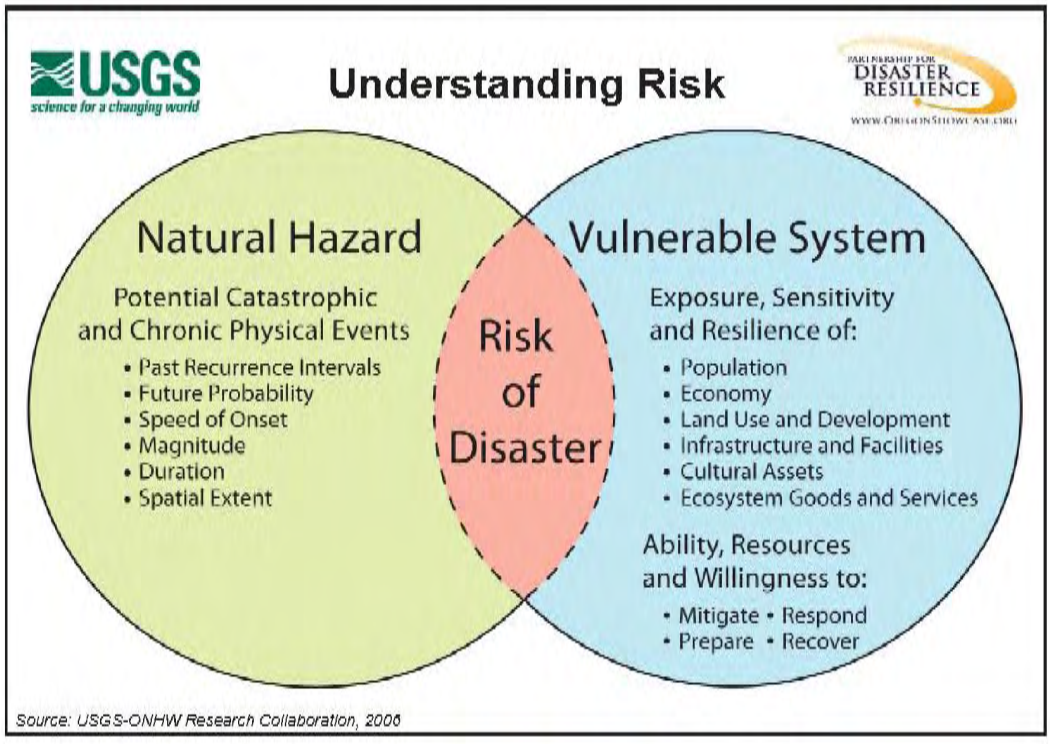
[i] National Institute of Building Science's Multi-hazard Mitigation Council. "Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities" 2005.

Section 2:
Community Overview

The following section describes Clatsop County from a number of perspectives in order to help define and understand the County's sensitivity and resilience to natural hazards. 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 (e.g., governmental structure, agency missions and directives, and plans, policies, and programs). The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the County when the plan was developed. The information documented below, along with the hazard assessments located in the Hazard Annex, should be used as the local level rationale for the risk reduction actions identified in Section 3 – Mission, Goals, and Action Items. The identification of actions that reduce the County's sensitivity and increase its resilience assist in reducing overall risk, or the area of overlap in Figure 2.0 below.

Figure 2.0 Understanding of Risk



Source: USGS - Partnership for Disaster Resilience Research Collaborative, 2006.

Community Profile

Geography and Climate

Clatsop County, the most northwest county in Oregon, has a land area of 1,085 square miles, including 873 square miles of land and 212 square miles of water. It is bordered on the north by the Columbia River, on the west by the Pacific Ocean, south by Tillamook County, and on the east with the Oregon Coast range.[i]

Much of Clatsop County is dominated by coastal terrain, and features include a coastal plain (extending from just less than a mile to a few tens of miles in width), numerous coastal valleys, and the Coast Range, whose peaks range from 2,000 to 5,500 feet above sea level and extend down the full length of the state.[ii]

The largest incorporated cities in Clatsop County are Astoria (population 9,813[iii]), Seaside (population 5,900[iv]), Warrenton (population 4,096[v]), Cannon Beach (population 1,588[vi]), and Gearhart (population 995[vii]).

Figure 2.1 Clatsop County, Oregon

Source: US Census Factfinder, 2000

Clatsop County is characterized by wet winters, relatively dry summers, and mild temperatures throughout the year. The area's heavy precipitation results from moist air masses moving off the Pacific Ocean onto land, especially during winter months. Along the lower elevations of the immediate coast, normal annual precipitation is between 65 and 90 inches. However, spots high on the west slopes of the range may get up to 200

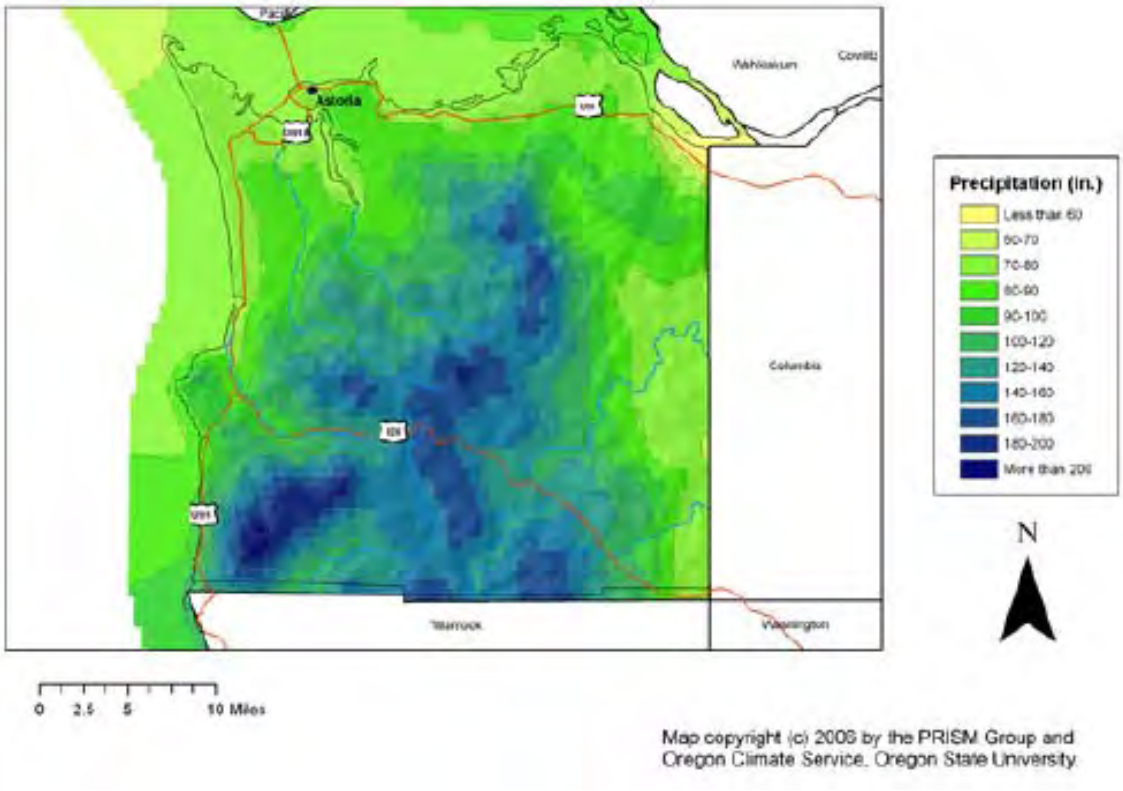
inches per year. Several days of abundant rainfall can cause strong flood events. As is typical of western Oregon, the highest monthly precipitation values for the coast occur in the winter months of November, December, and January. Table 2.1 is a summary of mean monthly and annual precipitation for recording stations in the coastal zone. Figure2.2 shows the Clatsop County region from the Oregon annual precipitation map.

Table 2.1 Precipitation, Monthly and Annual Averages (1971-2000)

Name	Number	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Astoria WSO Airport	328	9.62	7.87	7.37	4.93	3.28	2.57	1.16	1.21	2.61	5.61	10.5	10.4	67.13
Seaside	7641	10.27	9.57	8.44	5.74	3.96	3	1.63	1.34	3	6.07	11.38	11.34	75.74

Source: Oregon Climate Service, 2005

Figure 2.2 Average Annual Precipitation, Clatsop County, Oregon



Source: Oregon Climate Service, 2005

Clatsop County is coldest in January with an average temperature of 41.9 degrees and warmest in July, with an average temperature of 60.1 degrees Fahrenheit. Extremely high or low temperatures are rare, and the annual temperature range is lower than any other Oregon climate zone. Temperatures of 90 degrees Fahrenheit or above occur, on average, less than once per year, and freezing temperatures are infrequent.

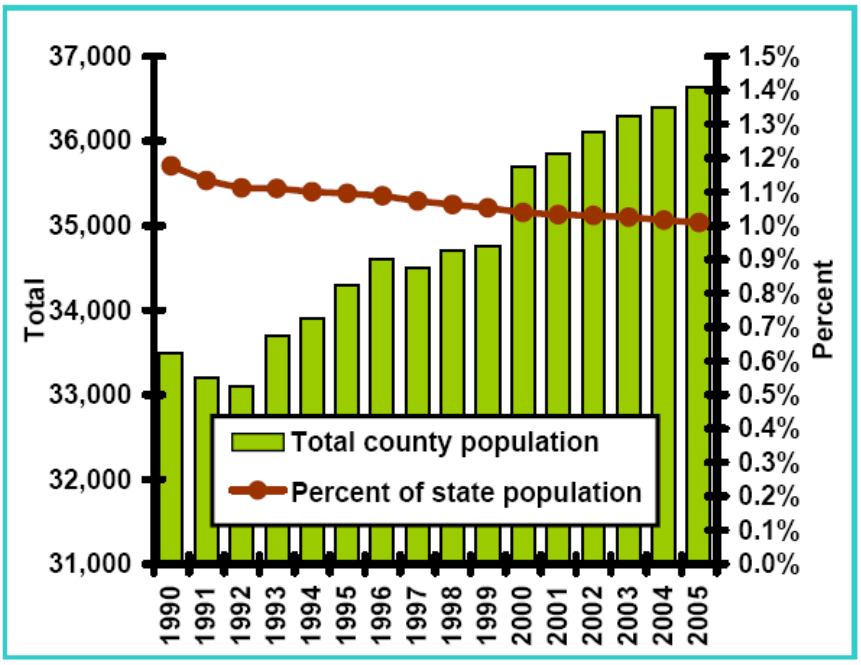
Occasional strong winds strike the Oregon Coast, usually in advance of winter storms. Wind speeds can exceed hurricane force, and in rare cases have caused significant damage to structures or vegetation. Skies are likely to be cloudy during winter and only partly cloudy during summer. In Astoria, average winter cloud cover is over 80 percent, dropping only to about 65 percent in summer. Summer cloud cover is due mostly to fog and low clouds. As a result of the persistent cloudiness, total solar radiation is lower here than in any other part of the state.[viii]

Population and Demographics

Population growth is a factor in a community's vulnerability to disaster. This is because development patterns, economic development characteristics, and so on may contribute to vulnerability. Most importantly, a rapid growth rate may stress a local government's ability to plan, regulate and serve the new population.

Using the census data from 1990 and 2000, Clatsop County's average annual growth rate (AAGR) was calculated to be 0.68%, less than half of Oregon's AAGR for that same period, 1.87%.[ix] The County has a population density of 44/sq mi with a total population of 35,630 as of the 2000 Census.

Figure 2.3 Population Growth in Clatsop County, 1990-2005



Source: ORDHS, Office of Community Health and Health Planning, 2007

Incorporated Cities[x]

Astoria – 9,970 (2006 population estimate)
Cannon Beach – 1,665
Gearhart – 1,095
Seaside – 6,165
Warrenton – 4,460

County Population[xi]

Population 2000: 35,630
Population change 1990 – 2000: 7.0%
Population 2006: 37,045

Vulnerable Populations

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.

Non-English speaking and special cultural characteristics

According to the 2000 census estimates, approximately 7.1% of the Clatsop County population over the age of five speaks a language other than English at home.[xii] 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 are usually provided only in English. The non-English speaking population would be uninformed unless they have assistance from friends or service providers who may provide them with instruction and information in English. In certain areas of Clatsop 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 2000 Census figures, persons 65 and older made up 15.6% of the total Clatsop County population.[xiii] Nationwide, as the baby boomer generation enters their 60's the senior population is expected to dramatically increase. Elderly populations are typically more vulnerable to temperature extremes than other residents.

Tourists

Tourists are particularly vulnerable during natural hazard events. This is because tourists 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 tourist, unfamiliar with Clatsop County, may have difficulty using evacuation routes, or finding shelters. A light traveling tourist 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, tourists usually do not have a local support structure of family, friends, and neighbors.

Due to its proximity to the Oregon Coast and the Columbia River, Clatsop County is considered a major Northwest tourist destination. Because of the tourist destinations in Clatsop County, there is a large transient population during the summer, when most visitors come into the County. Of the 19,685 households, over 16% (3,297) are used for seasonal, recreational or occasional use. Points of Interest include: Astoria Column, Port of Astoria, Flavel House, Liberty Theatre, Fort Clatsop National Memorial, Lewis and Clark salt cairn, Fort Stevens State Park, Columbia River Maritime Museum, Tillamook Head, Ecola State Park, Jewell elk refuge, Young's River falls, Twilight Eagle Sanctuary, and the Port of Astoria that caters to cruise ships.[xiv]

Physically Disabled

According to 2000 census estimates 3.8% of the population of Clatsop County over the age of 16 has a mobility limitation. These disabilities may or may not be permanent.[xv]

Developmentally Disabled

There is a wide variation in the vulnerability of the developmentally disabled population. Some developmentally disabled individuals may have strong support structures and a high level of care provided to them by friends, neighbors, and care providers. Others may not have such a high level of support. Some individuals may be largely self-reliant. Some may have additional disabilities in additional to their developmental disabilities.

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. A case study of this phenomenon from Clark County, Washington showed that 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. 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.[xvi]

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 tend to have the greatest difficulty recovering from a disaster. According to 1999 estimates approximately 13.2% of the total population and 9.1% of all families have incomes below the national poverty level.[xvii]

Table 2.2 Poverty Rates in Clatsop County, 1999

% of Total Population	Children under 18	Seniors over 65
13.20%	16.80%	8.00%

Source: US Census, 2000

Land and Development

Clatsop County has a total area of 1,085 square miles – 873 square miles of land and 212 square miles of water. The latter represents about 20% of the County's total area.[xviii] This includes a large area within the Columbia River. Land ownership within Clatsop County is primarily private. More than 80% of the land is forested, and much of this is privately owned industrial forest land. At present, the major private timber landowners are Weyerhaeuser Company, Longview Fibre and Hampton Affiliates.[xix] Most of the development in Clatsop County is in or around Astoria, Cannon Beach, Gearhart, Seaside or Warrenton.

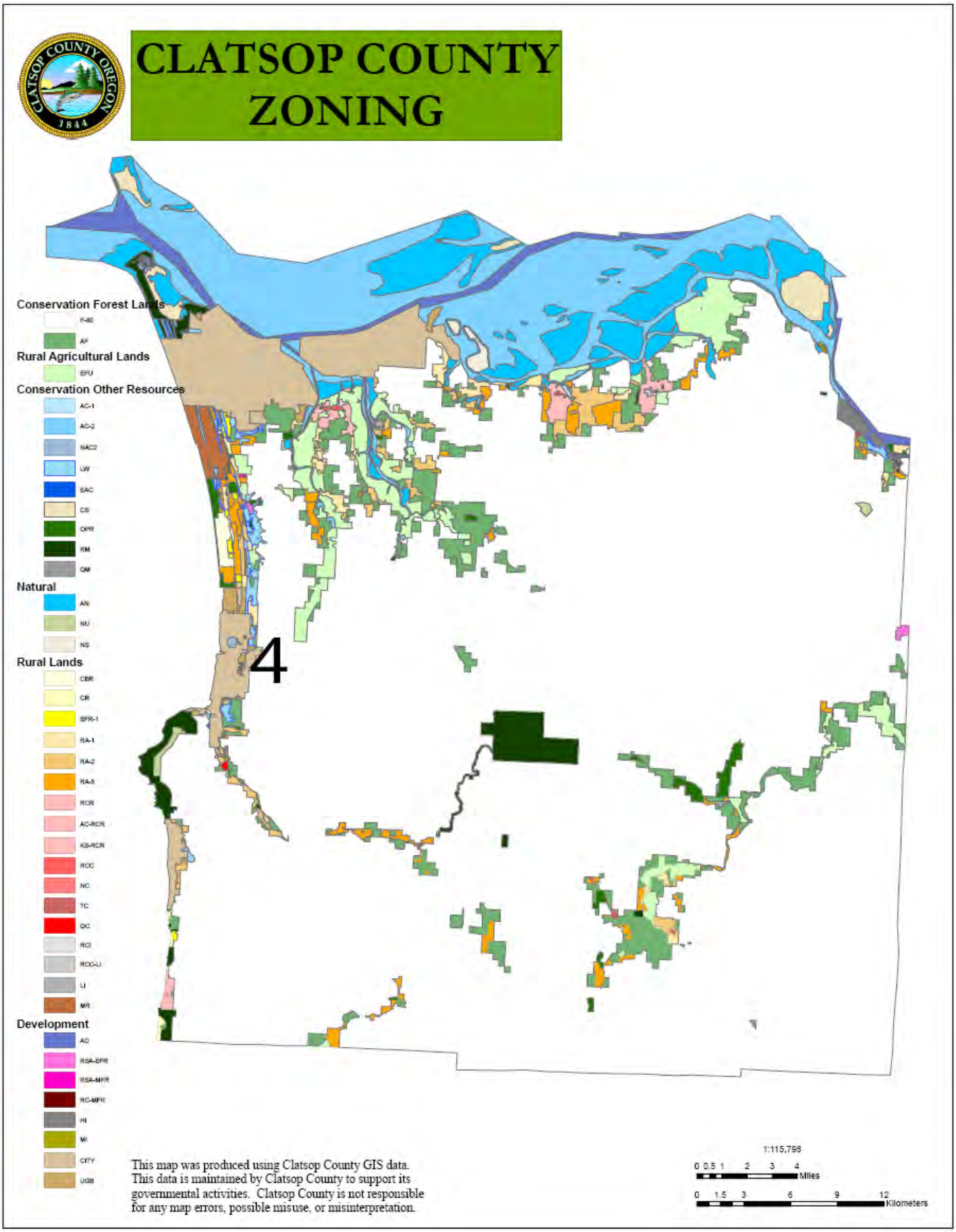
Total lands: 694,400 acres /1,085 square miles
Public ownership: 83,328 acres / 130 square miles (12%)
Private ownership**:** 611,072 acres / 955 square miles (88%)

Table 2.3 Building Permits Issued in Clatsop County

Year	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996
Permits Issued	251	232	270	208	159	140	145	151	170	201	199

Source: US Census, 2000 < http://censtats.census.gov/cgi-bin/bldgprmt/bldgdisp.pl>

Figure 2.4 Zoning Map, Clatsop County



Housing and Community Development

Housing development types 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 ordinances that required homes in the floodplain to be elevated to one foot above Base Flood Elevation. Housing characteristics for Clatsop County are provided in the tables below.

In 2000, Clatsop County had 19,685 housing units. Of those, 48% (9,437) were owner occupied, 27% (5,266) were renter occupied, and 4,982 (25%) were vacant. Of the vacant homes almost three-quarters of the city's housing stock was built prior to 1980, before stronger seismic building codes were put into place. Other housing characteristics for Clatsop County are provided in Tables 2.4 through 2.6.

Table 2.4 Housing Characteristics

Households 2000	Household Change 1990-2000
19,685	47%

Source: US Census, 2000

Table 2.5 County Housing Development

Single-Family	Multi-Family	Mobile Homes	Boat, RV, Van, etc.
69.2%	22%	8.3%	0.5%

Source: US Census, 2000

Table 2.6 Housing Year Built

Pre 1959	1960-1979	1980-2000
47.1%	26.1%	26.7%

Source: US Census, 2000

Typical move-in costs are in the range of $500 for a two-bedroom apartment. According to the Clatsop County Association of Realtors®, MLS, Inc., database, in Clatsop County on November 6, 2003, 587 listings were found, including the following single family homes for sale: 15 priced under $100,000; 45 priced from $100,000 to $150,000; 38 priced from $150,000 to $200,000; 19 priced from $200,000 to $250,000; 24 priced from $250,000 to $350,000; and 57 priced above $350,000. The majority of those

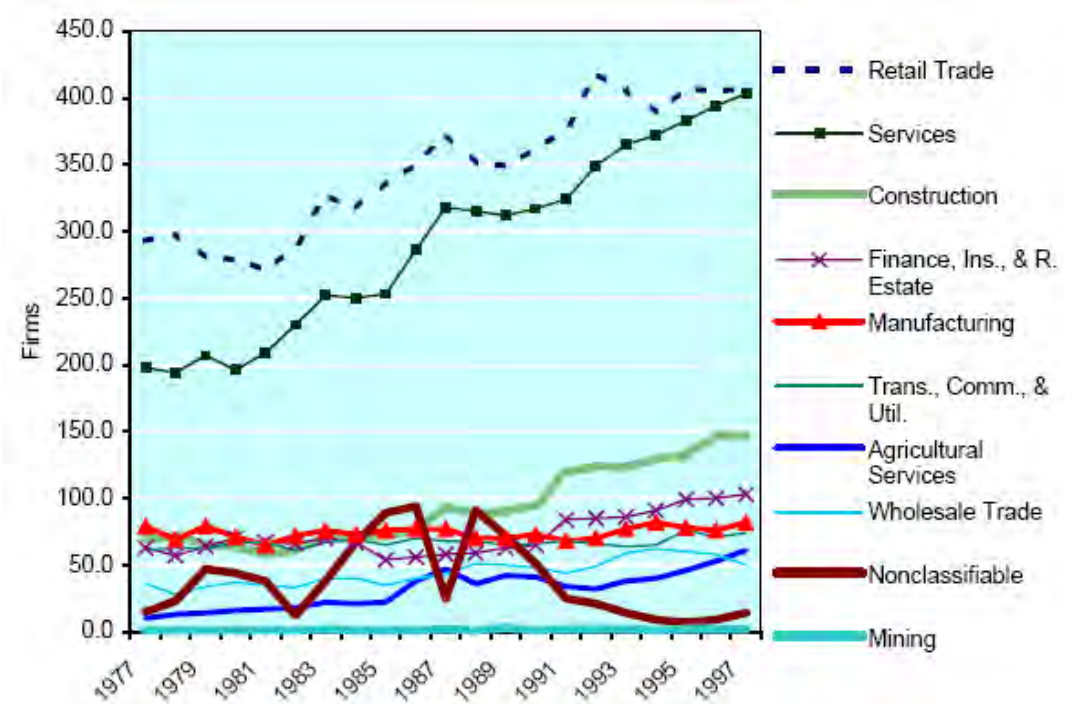
priced over $250,000 were in the oceanfront communities located in the southern portion of the County. The approximate average single family home "sold" price for 2003 was $193,000.[xx]

Local government revenues are largely derived from a tax levied on real property. In 1997, voters approved Measure 50, which changed Oregon's tax system from levy-based to rate-based. It created fixed tax rates and limited assessed value growth to three percent a year, except for new construction.

Growth pattern of Clatsop County

Clatsop County's economy relies on government-related activity, service businesses, retail sales, forestry, forest products processing, fishing and seafood processing, and tourism. The growth and decline of various sectors are shown in Figure 2.5. As the County's economy experiences growth in service industries, the region's income has fallen significantly below that of both the state and the nation, despite general growth in the economy.

Figure 2.5 County Business Patterns Number of Establishments

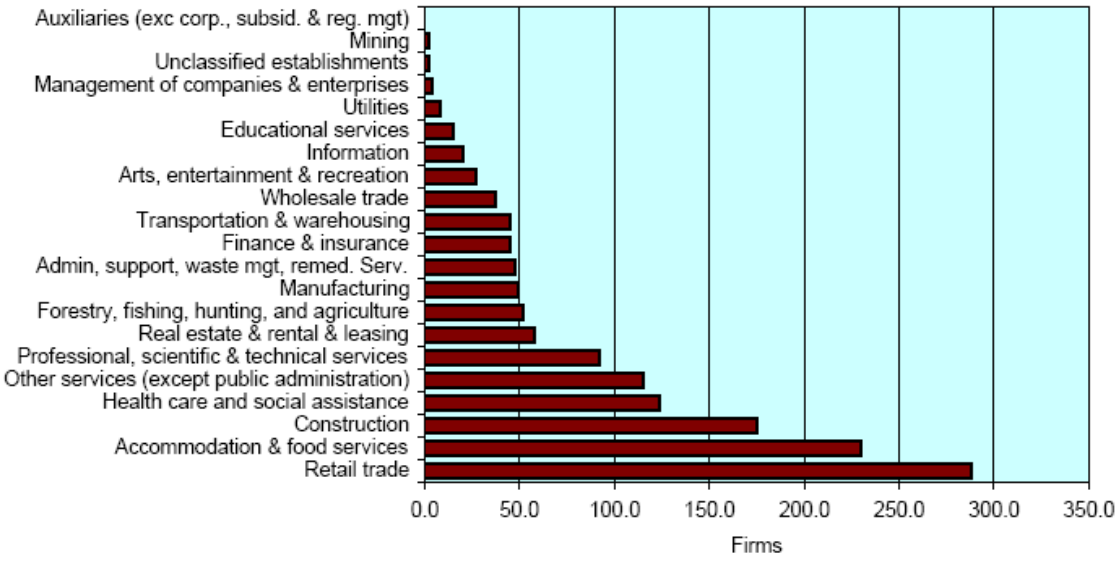


Source: EPS, 2006 <http://www.coastrange.org/Clatsop_County_EP.pdf>

Clatsop County's nonfarm employment grew by an impressive 6.5 percent or 1,010 jobs from 2001 through 2005. In contrast, the nation managed only 1.2 percent growth. Clatsop County's manufacturing employment grew 7.4 percent whereas the nation's manufacturing employment declined by 13.4 percent. If Clatsop County had followed the nation, it would have lost 273 manufacturing jobs over the period instead of adding 150.[xxi] Figures 2.6

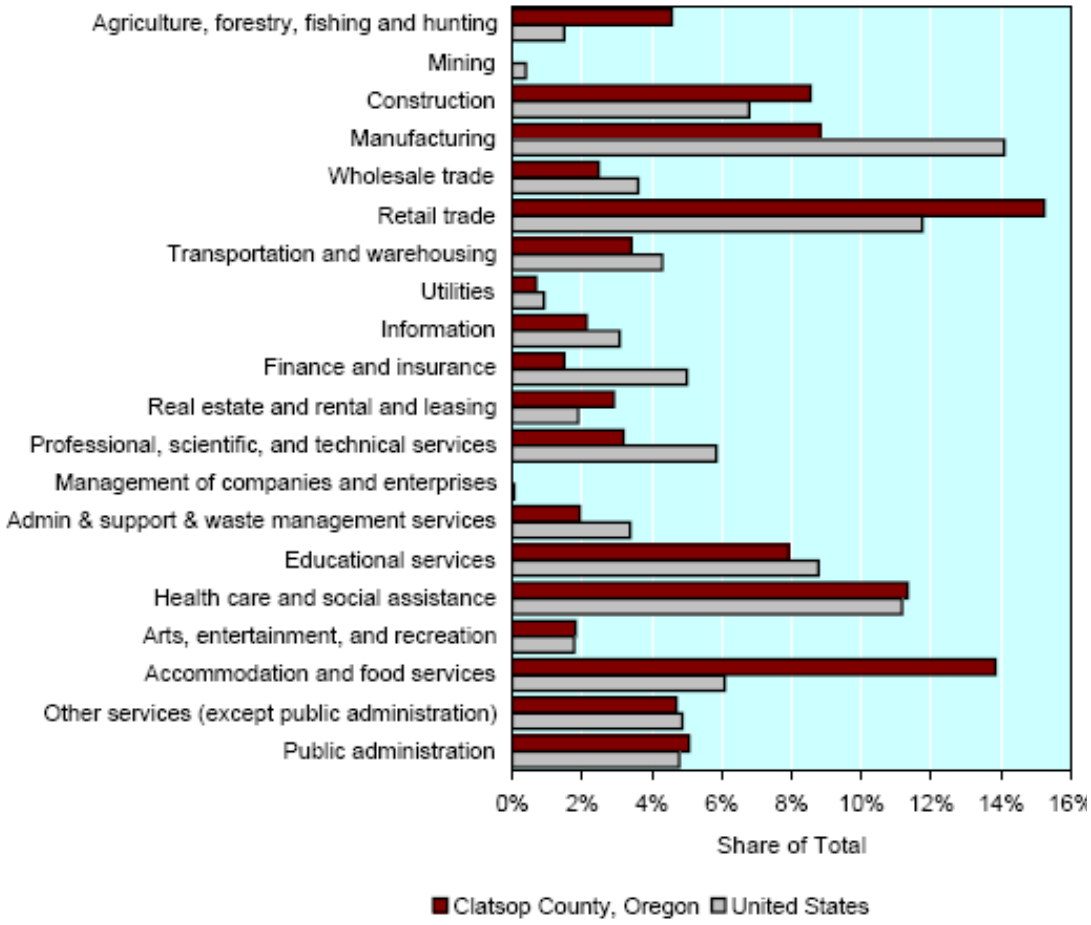
and 2.7 show the number of firms in Clatsop County by industry and the share of employment per industry, respectively, versus the United States.

Figure 2.6 Firms by Industry in 2004



Source: EPS, 2006 <http://www.coastrange.org/Clatsop_County_EP.pdf>

Figure 2.7 Employment Share of Total (2000 Census)

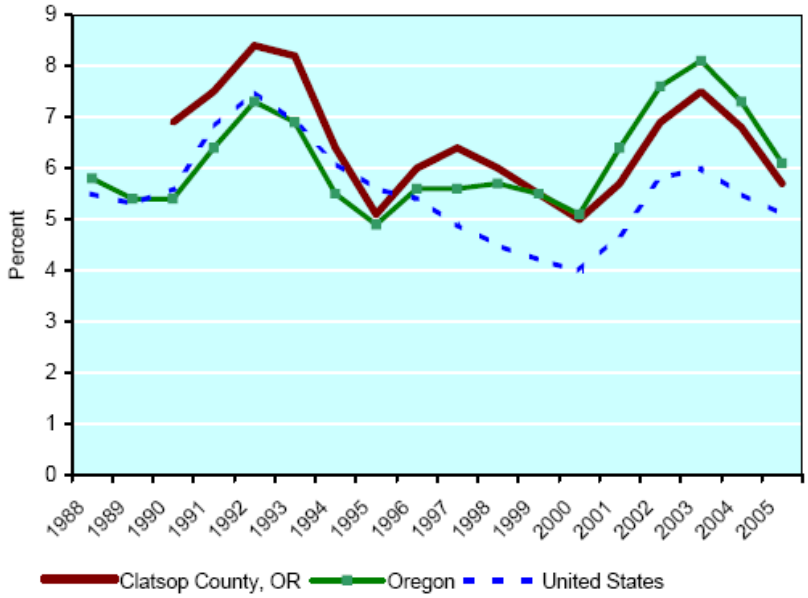


Source: EPS, 2006 <http://www.coastrange.org/Clatsop_County_EP.pdf>

Like other Norwest Coastal resource-based communities, Clatsop County is working to diversify its economy to offset the loss of family-wage jobs in the timber and fishing industries. Major employers currently include Georgia Pacific, Columbia Memorial Hospital, Providence Seaside Hospital, Management Training Corporation, State of Oregon, U.S. Coast Guard, Fred Meyer, Safeway, Steve Martin Management (visitor accommodations), Clatsop County government, and the Astoria School District.

The 2006 annual average unemployment rate in Clatsop County was 5.0%, below Oregon's 5.4% and above the nation's 4.6%. Clatsop County's unemployment rates from 1988-2005 compared to Oregon's and the United States is shown in Figure 2.8.

Figure 2.8 Unemployment Rates



Source: EPS, 2006 <http://www.coastrange.org/Clatsop_County_EP.pdf>

Wage Rates

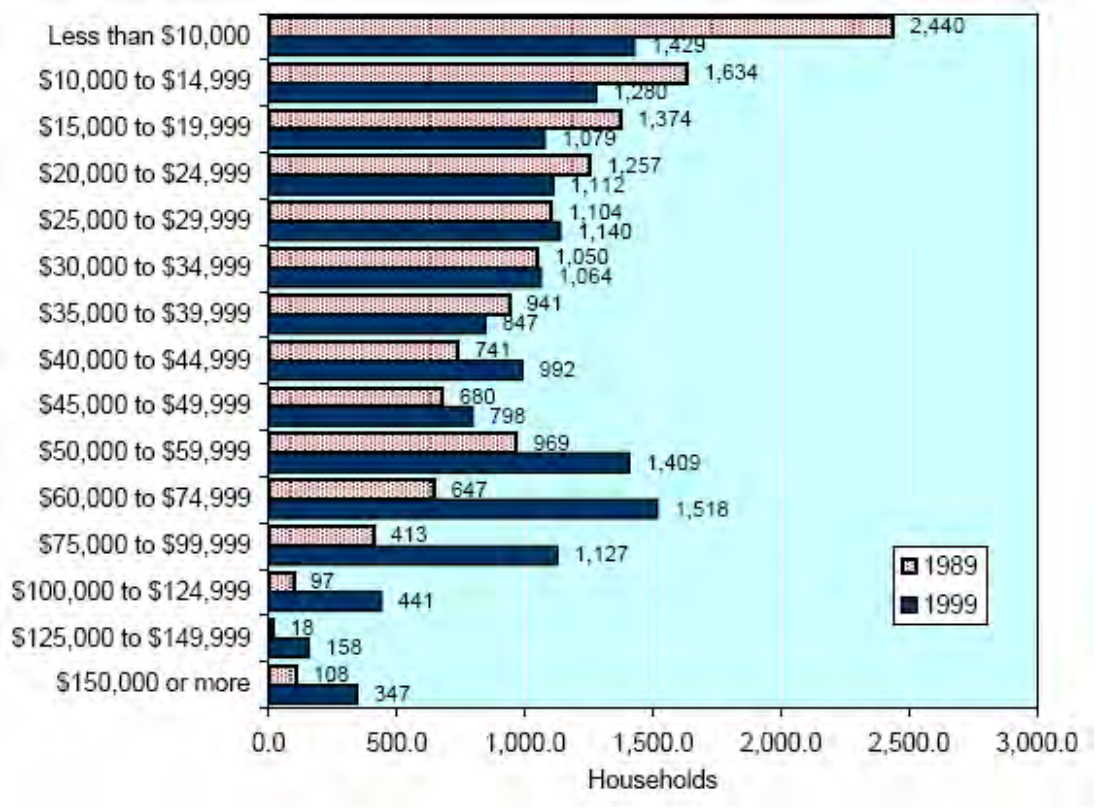
Clatsop County salaries on average are lower than salaries in the state for comparable work. The 2002 average covered wage was $25,196, based on a 40-hour week. The Per Capita Incomes related to Oregon and the United States are shown in Table 2.7. Figure 2.9 displays that distribution of incomes throughout the County.

Table 2.7 Per Capita Incomes, 2002

Place	Average Income
Clatsop County	$25,196 (13th of Oregon's 36 counties)
Oregon 2002	$28,792
United States 2002	$30,906
Oregon 2003	$29,340
United States 2003	$31,632

Source: qualityinfo.org, 2007

Figure 2.9 Household Income Distribution (Not adjusted for inflation)



Source: EPS, 2006 <http://www.coastrange.org/Clatsop_County_EP.pdf>

Transportation and Commuting Patterns

Three major highways converge in Clatsop County: Highway 101 (Pacific Coast Scenic Byway), Highway 26, and Highway 30. The Interstate I-5 four-lane, north-south freeway is at Longview, Washington, about 50 minutes east of Astoria.

Clatsop County is served by the Sunset Empire Transportation District, which provides intra- and intercity transit service. Transit routes and schedules are established to best serve the needs of residents and employers. The Astoria-Warrenton area currently is served with nearly hourly transit service from 7:00 a.m. to 6:00 p.m. Monday through Saturday. The Sunset Empire Transportation District Executive Director has assured that the District would work with private employers to make sure transit needs are met and to determine whether employer tax credits, shared costs, etc. are appropriate. The District's new Intermodel Transit Facility is located at the corner of 9th and Marine in Astoria.

The Astoria Regional Airport is located on 870 acres in Warrenton, four miles south of downtown Astoria. The facility has a 5,796-foot runway serviced by ILS and VOR and an additional 4,990-foot VFR runway. This enables the facility to handle air traffic under all weather conditions. Fixed-base operators with fuel and tie-downs spaces are available. Coast Guard

Group Astoria Headquarters, Coast Guard Air Station is located at the airport. The airport is supported by a NWS - ASOS automated weather Station. There is no scheduled passenger service at this time. United Parcel Service has twice-daily service to and from the airport and Federal Express uses the airport as demand warrants.

Portland International Airport is located approximately 96 miles from Astoria, the drive is just about an hour and 57 minutes from Astoria and about 90 minutes from the County line and is only 40 minutes by air from Astoria Regional Airport.

Rail service is available in Clatsop County. Portland & Western Railroad, Inc. owns the track that runs along the Columbia River between Portland and Tongue Point in east Astoria. The City of Astoria owns the line west of Tongue Point to the Port of Astoria (Clatsop County Community Profile, March 2005). A $2 million federal grant was received last year for improvements to this line, which is Class 2 between Longview, Washington, and Tongue Point, in Astoria. Freight service is now open, and passenger service began in the summer of 2003.

Clatsop County is bordered by the Columbia River on the north and the Pacific Ocean on the west. The Port of Astoria is located at Columbia River Mile 13 from the open sea and less than 10 minutes from either the North Coast Business Park or the Airport Industrial Park. The Port's facilities are the first on the Columbia River and include three piers with five deepwater ship berths and a barge ramp.

The Port of Astoria has been a port of call for cruise ships since 1982, and has invested $10 million in pier improvements to accommodate cruise vessels.[xxii] Sixteen cruise ships are scheduled visit the Port of Astoria in 2008.

Critical Facilities and Infrastructure

Critical facilities are those that 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. Clatsop County has 11 fire station, 2 hospitals, 5 school districts and one community college.

Critical transportation infrastructure is also necessary in preparation for and action after an emergency. Clatsop County's transportation system currently consists of approximately 250 miles of roads, 68 bridges and three ocean beach approaches.[xxiii]

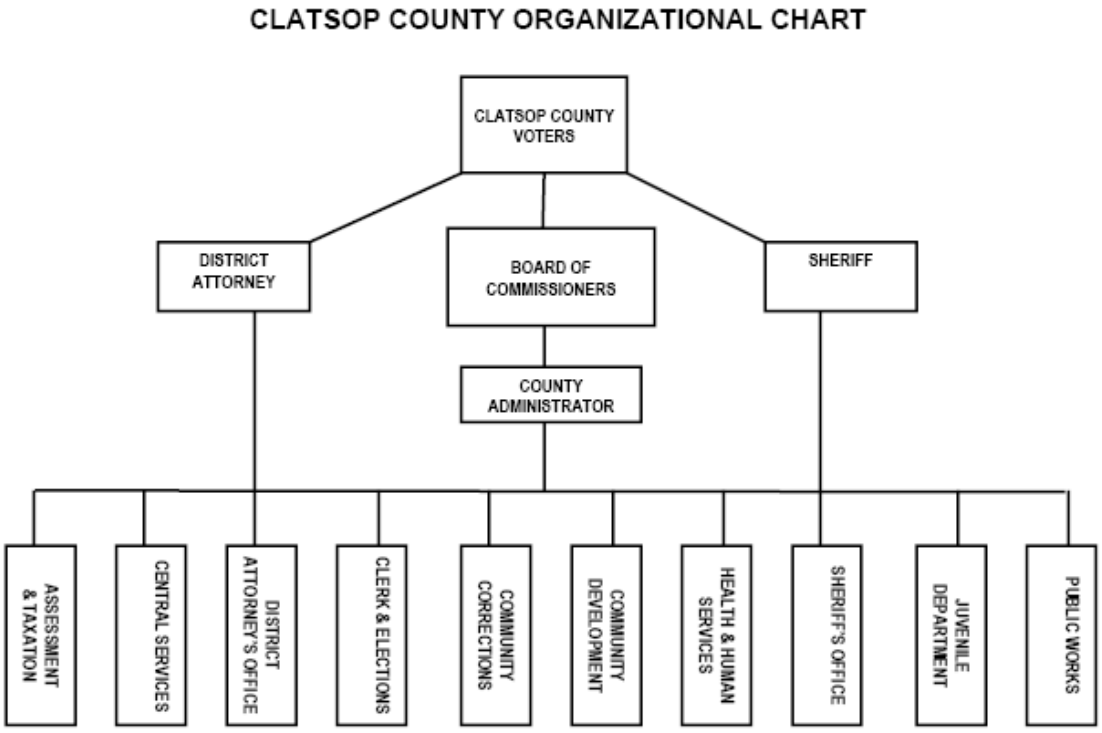
Construction of a telecommunications fiber ring and the electronics necessary to establish route diversity via fiber to and from the Portland metropolitan area was completed in September 2002. DSL (Digital Subscriber Line) equipment was installed at the same time. A mini-ring to

serve the North Coast Business Park and other Warrenton businesses and residences with full route diversity within the City was completed shortly thereafter, as well.

Government Structure

Clatsop County currently uses the following organizational chart:

Figure 2.10 Clatsop County Organizational Chart



Source: Clatsop County, <http://www.clatsopcounty.us/%5CAssets%5Cdept_6%5Cpdf%5CDocs%5CORGCHART-DH.pdf>

The voters of Clatsop County currently elect the District Attorney, the Sheriff and the Board of Commissioners. The Board of Commissioners consists of five volunteer elected Commissioners to establish policies and set the vision of the County. The Commissioners are elected by geographic districts to four-year terms. The Board hires the County Manager / Administrator to carry out its policies and oversee the day-to-day operations of the County government. Each year, the Commissioners choose a Chairperson and a Vice Chairperson. An organization chart of Clatsop County's government is seen in Figure 2.10 above.

Clatsop County currently has ten departments:

- **Assessments and Taxation**: The Clatsop County Department of Assessment and Taxation determines the value of all property

according to state law. The department sends billing statements and collects all property taxes and penalties in the County and distributes the tax money to the appropriate taxing districts.

- **Central Services**: Central Services is responsible for the finance, treasurer, payroll, data processing, mail room, telecommunications, and office automation needs of Clatsop County. In addition, Central Services oversees building and grounds maintenance and is responsible for maintaining the County's parks. Central Services handles the banking and investments of County funds as well as several other taxing districts. It works with the County Administrator in the preparation of the County Budget and with the monitoring of revenues and expenditures of all funds. This office also develops and plans for data processing and communication needs for all the County Departments.

- **District Attorney's Office**: The District Attorney's Office is responsible for reviewing, preparing and prosecuting all criminal cases brought in the state courts of Clatsop County, including juvenile court and dependency cases. The District Attorney's Office supervises the investigation of child abuse and death investigations. The office advises the grand jury as to the law and presents cases to the grand jury for consideration. The office provides 24-hour legal assistance to all local law enforcement agencies.

- **Clerk and Elections**: The Clerk, Records and Elections Division encompasses three functions.

    - The County Clerk is the official record keeper for Clatsop County. The Records Division administers public records, legal recordings, marriage licenses, passports, OLCC licenses, County archives and abandoned personal property in accordance with federal, state and local laws. The division records the following documents for public record: deeds, mortgages, military discharges, marriage licenses, town and partition plat maps. County records include: Board of County commissioners, County Planning Commission, and special district and cities.

    - The County Clerk issues marriage licenses, County park passes, accepts applications for passports and OLCC licenses; performs marriages; and coordinates and records Board of Property Tax Appeal hearings.

    - The County Clerk is the chief election official of the County. The County Clerk conducts all elections within Clatsop County and registers voters, insuring compliance with federal, state and local laws. The office checks ballot measures for timeliness and to make sure they are worded

accurately as required by law. The office prepares and maintains records related to voting activities and candidate services. The clerk provides uniformity in the application, operation and interpretation of election laws and ensures that the public is provided with complete and accurate information.

- **Community Corrections**: Community Corrections supervises adult criminal offenders living in Clatsop County who have been sentenced to probation by the court or released to post-prison supervision from a correctional facility. The County-administered, state-funded program offers an array of program services, supervision and sanctions to reform offenders and enhance safety of the community. Community Corrections operates using state grants via an intergovernmental agreement between Clatsop County and the State of Oregon. Clatsop County has administered the Community Corrections program since 1997.

- **Community Development**: The Community Development Division reviews and issues permits for land use development throughout rural Clatsop County, including zoning subdivisions and land partitions. It is responsible for developing, maintaining, updating and implementing the County's comprehensive land use plan in compliance with Oregon's statewide land use goals and planning laws. The Planning Commission, a citizen panel appointed by the Board of Commissioners, reviews applications and recommends changes in the County's comprehensive land use plan.

- **Health and Human Services:** The Health and Human Services Division provides immunizations, communicable disease control, HIV counseling and testing and sexually-transmitted disease testing and services, vital statistics, maternal and child health, WIC nutrition program, family planning, education and community outreach.

- **Sheriff's Office:** The Clatsop County Sheriff's Office is the primary criminal investigation and law enforcement agency for rural Clatsop County. The Sheriff's Office includes several divisions and programs: the Correctional Facility, Countywide Inter-agency Narcotics Task Force, Marine Patrol, High Angle Rescue, Search and Rescue and the Underwater Recovery (Dive) Team. The Sheriff is responsible for Emergency Services planning and response to disasters and alerts.

- **Juvenile Department:** The Clatsop County Juvenile Department is responsible for the supervision of juvenile offenders younger than 18 years old upon apprehension. The department provides intake screening, restitution and assistance to victims, programs to divert youth from the formal court process (when appropriate), due-

process in the preparation of legal documents that initiate court action, adjudication and disposition of allegations of delinquent behavior, and supervision of those youth on probation. State agencies such as the Oregon Youth Authority and Department of Family Services provide institutional care and supervision of youth.

- **Public Works**: The Public Works Department is responsible for the creation, improvement and maintenance of services and infrastructure. Public Works consists of the following divisions:

  - The Road division of the Department of Transportation and Development houses the offices of the Roads, County Engineer, County Surveyor, Parks and Westport Sewer Service District.

  - The administrative staff plans and administers the budget and contracts for the department and represents Clatsop County on federal, state and local transportation issues.

  - The Roads Maintenance section provides brush control, pot hole patching, culvert cleaning and replacement, shoulder and ditch maintenance, oiling, road rebasing and grading. Improvements include contracted bridge replacement and A.C. paving and major road construction and reconstruction.

  - The County Engineer plans, designs and coordinates projects for the County's road system, consisting of approximately 250 miles of roads, 68 bridges and three ocean beach approaches.

  - The office of the Surveyor is responsible for checking, filing and indexing boundary surveys by private and public surveyors. The office maintains all records of surveys and provides means by which the public can use these records. The surveyor checks and approves subdivisions, condominiums and land partitions. The surveyor surveys County owned land and County roads. The surveyor is responsible for the recovery, restoration and preservation of public Land corners. These are section corners, quarter corners and donation land claim corners.

  - **Parks:** The Parks program is responsible for the operation and maintenance of the County's parks and recreational areas.

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.[xxiv]

The Clatsop County multi-jurisdictional 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 table documents the plans and policies already in place in Clatsop County.

Table 2.8 Clatsop County Plans and Policies

Name	Last Revision	Author
Clatsop County Comprehensive Plan	September 1980	Clatsop County Community Development
Clatsop County Comprehensive Plan Goals and Policies	May 2004	Clatsop County Community Development Department Planning Division
Clatsop County : Transportation System Plan	November 2003	Clatsop County (Or.) CH2M Hill, inc. Angelo Eaton & Associates
Clatsop County : Parks and Recreation plan	March 2006	Clatsop County

Community Organizations and Programs

More information on community organizations and programs can be found in Appendix F.

Existing Mitigation Activities

Existing mitigation activities that are being implemented by the community are documented in each Hazard Annex.

Hazard Summary

The following is a brief overview of the hazards that can impact Clatsop County. Each of the hazards is described in more detail in Volume II Hazard Annexes.

- **Coastal Erosion**: Coastal erosion is a natural process that continually affects the entire coast. Erosion becomes a hazard when human development, life and safety are threatened. Coastal erosion processes create special challenges for people living near the ocean, requiring sound planning in order to minimize the potential dangers to life and property. Attempts to stabilize the shoreline or beach are often futile because the forces that shape the coast are persistent and powerful. Inadequate understanding of the complex interaction of coastal land forms and waters and the various types of coastal erosion can result in serious threats to people, communities and infrastructure.

- **Drought**: Droughts are not uncommon in the State of Oregon, nor are they just an "east of the mountains" phenomenon. They occur in all parts of the state, in both summer and winter. There are no records of a severe drought in Clatsop County. Drought is averted as a result of the County's high rainfall from moist air masses moving onto land from the Pacific Ocean, especially during winter months.

- **Earthquake**: Seismic events were once thought to pose little or no threat to Oregon communities. However, recent earthquakes and scientific evidence indicate that the risk to people and property is much greater than previously thought. Oregon is rated third highest in the nation for potential losses due to earthquakes. This is due in part to the fact that until recently Oregon was not considered to be an area of high seismicity, and consequently the majority of buildings and infrastructure were not designed to withstand the magnitude of ground shaking that would occur in conjunction with a major seismic occurrence.

- **Flood**: Oregon has a detailed history of flooding with flood records dating back to the 1860s. The principal types of flood that occur in Clatsop County include: (1) riverine and (2) ocean flooding from high tides and wind-driven waves or tsunami event. There are two distinct periods of riverine flooding in this region, winter and late spring. The most serious flooding occurs during December, January, and February. The situation is especially severe when

riverine flooding, caused by prolonged rain and melting snow, coincides with high tides and coastal storm surges.

- **Landslide**: Landslides are a major geologic threat in almost every state in the United States. In Oregon, a significant number of locations are at risk from dangerous landslides and debris flows. While not all landslides result in property damage, many landslides do pose serious risk to people and property. Rain-induced landslides and debris flows can potentially occur during any winter in Clatsop County.

- **Tsunami**: Tsunamis have historically been rare in Oregon. Since 1812, Oregon has experienced about a dozen tsunamis with wave heights greater than 3 feet; some of these were destructive. The City of Seaside is the most vulnerable city due to its low elevation and high number of residents and tourist population within the predicted inundation zone. Although many communities have evacuation maps and evacuation plans, many casualties are expected. The built environment in the inundation zone will be especially hard hit.

- **Volcano**: The Cascade Range of the Pacific Northwest has more than a dozen active volcanoes. These snow-clad peaks are part of a 1,000 mile-long chain of mountains, which extend from southern British Columbia to northern California. Although there are no active volcanoes in Clatsop County it is important for counties to know the potential impacts of nearby volcanoes. While immediate danger area around a volcano is approximately 20 miles, ash fall problems may occur as much as 100 miles or more from a volcano's location; therefore, ash fall my affect Clatsop County.

- **Wildfire**: Fire is an essential part of Oregon's ecosystem, but it is also a serious threat to life and property particularly in the state's growing rural communities. Wildfires are fires occurring in areas having large areas of flammable vegetation that require a suppression response. Areas of wildfire risk exist throughout the state with areas in central, southwest and northeast Oregon having the highest risk.

- **Windstorms & Winter Storms:** Destructive wind and winter storms that produce ice, rain and freezing rain, and high winds have a long history in Clatsop County. Severe storms affecting Oregon with snow and ice typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March. Destructive windstorms are less frequent, and their pattern is fairly well known. They form over the North Pacific during the cool months (October through March), move along the coast and swing inland in a northeasterly direction. Wind

speeds vary with the storms. Gusts exceeding 100 miles per hour have been recorded at several coastal locations

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[i] Clatsop County, County *Info 2008*, *http://www.co.clatsop.or.us/default.asp?deptid=0&pageid=42*

[ii] Oregon State University. 1993, *Oregon Climate Service. The Climate of Oregon: Climate Zone 1*, *http://ir.library.oregonstate.edu/dspace/bitstream/1957/5908/1/SR+no.+913_OCR.pdf.*

[iii] United States Census Bureau. 2000, *Fact Sheet: Astoria*, *www.census.gov.*

[iv] United States Census Bureau. 2000, *Fact Sheet: Seaside*, *www.census.gov.*

[v] United States Census Bureau. 2000, *Fact Sheet: Warrenton, www.census.gov.*

[vi] United States Census Bureau. 2000, *Fact Sheet: Cannon Beach*, *www.census.gov.*

[vii] United States Census Bureau. 2000, *Fact Sheet: Cannon Beach, www.census.gov.*

[viii] Oregon Climate Service. February 2005, *Climate of Clatsop County, <http://ocs.orst.edu/county_climate/Clatsop_files/Clatsop.html.*

[ix] Portland State University Population Research Center. 2006, *2006 Oregon Population Report,* http://www.pdx.edu/prc/annualorpopulation.html.

[x] Portland State University Population Research Center. 2006, *2006 Oregon Population Report, http://www.pdx.edu/prc/annualorpopulation.html*

[xi] Portland State University Population Research Center. 2006, *2006 Oregon Population Repor, http://www.pdx.edu/prc/annualorpopulation.html.*

[xii] United States Census Bureau. 2000, *Fact Sheet: Cannon Beach, www.census.gov*.

[xiii] United States Census Bureau. 2000, *Fact Sheet: Cannon Beach*, *www.census.gov.*

[xiv] Clatsop County Information. 2008, *http://www.co.clatsop.or.us/default.asp?deptid=0&pageid=42.*

[xv] United States Census Bureau. 2000, *Fact Sheet: Cannon Beach*, *www.census.gov.*

[xvi] Resource Assistance for Rural Environments. August 2006. *Hood River County Natural Hazards Mitigation Plan.*

[xvii] United States Census Bureau. 2000. *County QuickFacts: Clatsop County*, *http://quickfacts.census.gov/qfd/states/41/41007.html.*

[xviii] Clatsop County Information. 2008, *http://www.co.clatsop.or.us/default.asp?deptid=0&pageid=42.*

[xix] Clatsop County. 2003. *Clatsop County Recreational Lands Master Plan*, *http://www.co.clatsop.or.us/Assets/Dept_10000/PDF/plan%203%20demand.pdf*

[xx]Clatsop County Department of Community Development. *Clatsop County Community Profile*, http://www.co.clatsop.or.us/Docs/pdf/dept/4/demographics%20&%20overview.pdf.

[xxi] Oregon Employment Department, *qualityinfo.org.*

[xxii] www.portofastoria.com

[xxiii] Clatsop County Roads Division, *http://www.co.clatsop.or.us/default.asp?deptid=8&pageid=13.*

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

Section 3: Mission, Goals, and Action Items

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 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. Documentation of how actions will be implemented through existing plans and policies within cities and/or special districts is located in Volume III: City/Special District Addendums.

- 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.

Methods

The Mission Statement was developed by the Plan Facilitator upon consultation with OPDR and other resources. It was presented to the Steering Committee and adopted with no corrections requested.

The Plan Goals were developed using a variety of sources. The initial list of goals were researched and created by the Plan Facilitator. The information

for doing so was found in the OPDR plan support documents, FEMA support documents and from reviewing the completed Pre-Disaster Mitigation Plans of other jurisdictions. This initial list was then presented to the Steering Committee during the third meeting on [April 16, 2008]. At the meeting, Committee members reviewed the goals and provided feedback. A few minor changes in the language of the goals resulted from this discussion. There was some discussion over adding more goals to the list; however, the group decided that all of the new goals proposed were included within the scope of the goals already listed.

The mitigation actions generated during this phase of the planning process came from a variety of sources. The initial list of mitigation actions was born out of a work session during the third steering committee meeting. The Plan Facilitator went around the room and asked all of the Steering Committee members to contribute their ideas. This session generated the largest share of mitigation actions, about 35. Another major contribution of potential actions came from the two public forums in which the public was given blank action forms and asked to offer any mitigation project ideas they may have. Additionally, over the course of phase three, more mitigation ideas were submitted to the planning team from Committee members, local officials, and the general public. The complete list of mitigation actions for the County can be found in Appendix A.

Mitigation Plan Mission

The Mission Statement is:

"To create a disaster resilient Clatsop 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.

Here is the finalized list of Plan Goals:

- Protect life
- Minimize damage to public and private buildings and infrastructure
- Reduce economic loss
- Decrease disruption to critical services
- Protect natural and cultural resources
- Increase education and awareness of the risks and hazards in Clatsop County
- Increase cooperation and collaboration among County partners

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.

Figure 3.1 Action Item Sources

Source: Oregon 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.

Actions listed in **bold** below indicate County action priorities.

Multi-Hazard

- **Build new centralized Emergency Operations Center**
- **Centralize Countywide 911 system**
- Develop a pre-plan of how to accommodate visitors to the coast following a major disaster.
- Evaluate the vulnerability of wastewater treatment facilities in the County.
- Evaluate the feasibility of undergrounding utilities where appropriate.
- Identify and develop emergency shelter facilities throughout the County.
- Develop secondary back-up power, communication, and lighting for the Port of Astoria airport.
- Develop Post-Disaster Recovery Plans for communities in Clatsop County.
- Encourage residents to maintain and update 72 hour kits.
- Harden the Wickiup repeater site.
- Develop an inventory of available generators and fuel distribution.
- Partner with Clatsop County Community College on mitigation efforts.
- Post-disaster pet/animal shelter.
- Emergency Preparedness CDs.
- Food and Emergency Supply Stations.
- Relocate Lewis and Clark RFPD – Station #1.
- CERT Program support.
- Upgrade Wickiup Grange to become shelter for both short and long term disasters.
- Public Emergency Information Boards.
- Outreach and education to volunteer organizations that may be designated relief sites in a disaster regarding safe food, water, and sanitation practices.
- Mitigating the risk of communicable disease in vulnerable, congregate settings.
- Develop a disaster debris management plan.
- Increase public education and outreach in natural hazards which affect the north coast.

Tsunami

- Rebuild four Seaside School District schools outside of the tsunami inundation zone.
- Build "tsunami towers" in coastal cities.

- Complete tsunami risk assessment for Clatsop County.
- Improve public notification and warning system.
- Relocate Arch Cape Fire Station out of the tsunami inundation and flood zones.
- Elevate Brownsmead Rural Fire District Station.
- Establish long term supply and assembly areas outside of inundation zones.
- Upgrade and improve evacuation routes as well as assembly areas outside of tsunami inundation zones.
- Seismic vulnerability assessment/vertical evacuation routes.
- Conduct preliminary research on the development of a County Land Use Ordinance relating to Tsunami Hazards.
- Establish high ground commercial districts (above tsunami lines).

Winter/Windstorm

- Develop and implement hazard tree program.
- Promote tree planting projects on private and public properties.
- Have one to three ISA-certified arborists in each community that know how to properly prune storm damaged trees.
- Heightened awareness by First Responders and appropriate staff of the factors contributing to tree stability.
- Educate homeowners about methods to tie down metal roofs and metal sheds.
- Identify major transportation routes that are at risk during a major winter storm event.

Earthquake

- **Retrofit County bridges that are identified by a seismic vulnerability assessment.**
- Complete assessment of County owned bridges.
- Seismic upgrades for the Ecola Creek Bridge in Cannon Beach (Hwy 101).
- Complete a seismic vulnerability assessment for Port of Astoria facilities.
- Develop incentive programs to encourage homeowners to do seismic retrofits.
- Seismic retrofitting of old Hamlet Fire Station.

Flood

- Partner with Oregon Department of Transportation to elevate Highway 101 roadbed to an elevation sufficient to avoid annual winter flooding on multiple sections between City of Seaside and the junction of Highways 101 and 26.

- Elevate runway at Port of Astoria airport and improve diking around the airport.
- Complete a risk assessment related to levees in the County and adjacent development.
- Westport Railroad Bridge (71.3) replacement.
- Provide support and assistance to Diking Districts in respect to accreditation of the County's levees.
- Continue compliance with the National Flood Insurance Program (NFIP).

Landslide

- Build new access road on east side of Astoria from Hwy 30.
- Continue upgrading and enhancing GIS data in order to more efficiently identify areas prone to landslide and mass movement.
- Develop alternative transportation routes around slide-prone areas in County.

Drought

- Investigate the viability of county wide public awareness activities regarding water conservation.

Wildfire

- Development and Implement the Community Wildfire Protection Plan.

Section 4: Plan Implementation and Maintenance

This section details the formal process that will ensure that the Clatsop 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 Clatsop County Planning Department, within the Transportation and Development 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 acceptance by FEMA, the County will adopt the plan via resolution. At that point the County will gain eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds. Following County adoption, the participating jurisdictions should adopt their addendums.

Convener

The Clatsop County Planning Department along with the Sheriff's Emergency Management Department will serve as co-conveners and are responsible for the implementation and maintenance of the plan. Their roles and responsibilities of the convener include, but are not limited to, the following:

- Coordinate Steering Committee meeting dates, times, locations, agendas, and member notification;
- Document outcomes of Committee meetings;
- Serve as a communication conduit between the Coordinating Body and key plan stakeholders;
- Identify emergency management-related funding sources for natural hazard mitigation projects;

- Incorporate, maintain, and update the County's natural hazard risk GIS data elements; and
- Utilize the Risk Assessment as a tool for prioritizing proposed natural hazard risk reduction projects.

Coordinating Body

The Steering Committee will serve as the coordinating body for the life of the mitigation plan. The Coordinating Body will include, at the minimum, the members of the Steering Committee, as well as those individuals identified by the Coordinating Body as critical to the Body's duties. Examples of additions to the Coordinating Body include school district representatives that were not included in the original Steering Committee, and additional members from the business community. The roles and responsibilities of the Coordinating Body include, but are not limited to:

- Serving as the local evaluation committee for funding programs such as the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program, and Flood Mitigation Assistance program;
- 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 people and their respective organizations were represented on the Steering Committee during the development of the Clatsop County multi-jurisdictional Natural Hazards Mitigation Plan:

- CREST
- Clatsop County Emergency Management
- Clatsop County Planning Department
- Clatsop County Planning Commissioner
- Clatsop County Public Health
- City of Astoria
- City of Warrenton
- City of Seaside

- City of Cannon Beach
- City of Gearhart
- OSU Sea Grant Extension, Clatsop County
- Columbia Memorial Hospital
- Coast River Business Journal
- Port of Astoria
- Seaside School District
- Fire Defense Board
- Clatsop Community College

To make the coordination and review of the Clatsop County multi-jurisdictional Natural Hazard Mitigation Plan as broad and useful as possible, the Steering Committee 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.

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.

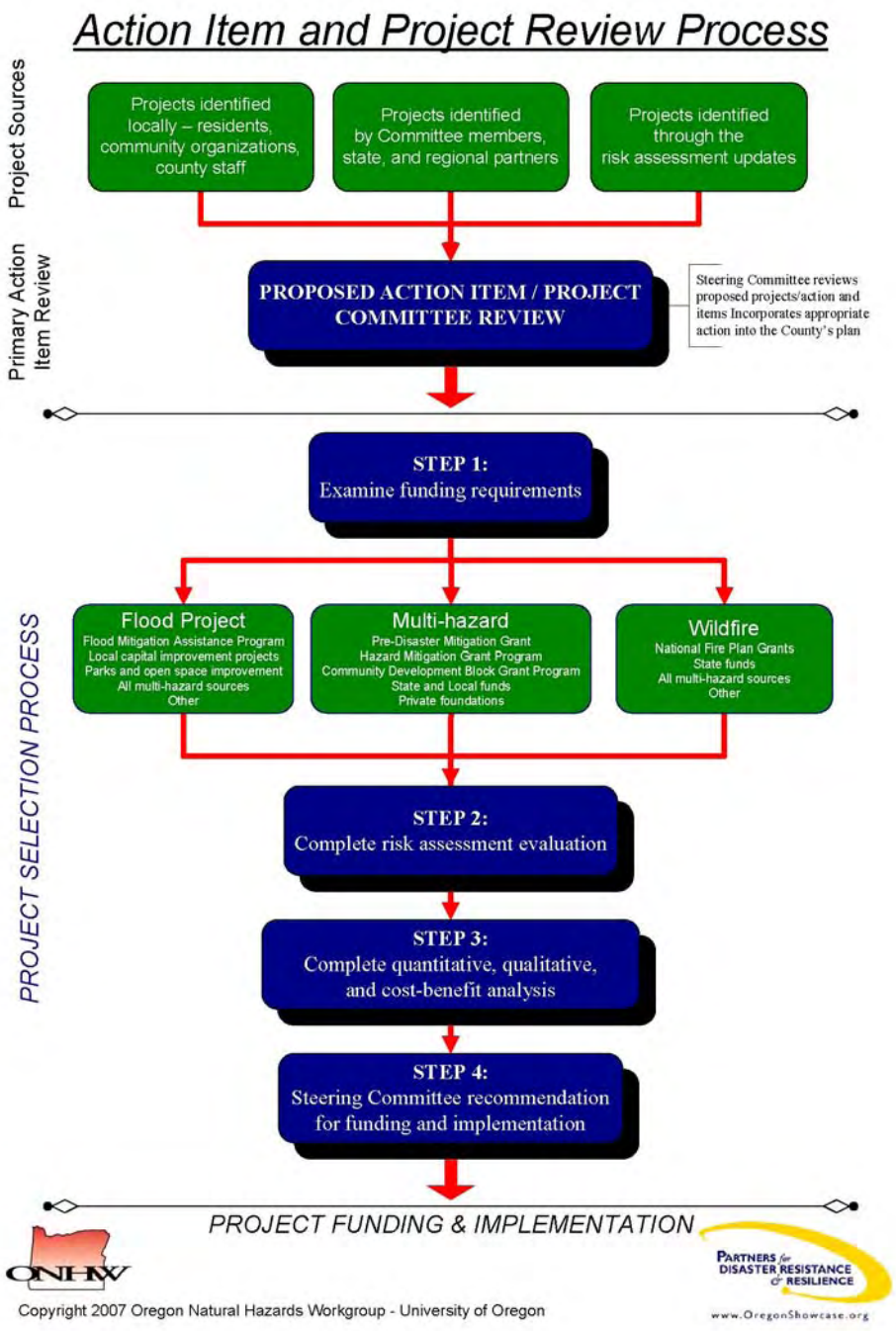
The convener will be responsible for documenting the outcome of the semi-annual meetings in Appendix B. The process the Committee will use to prioritize mitigation projects is detailed in the section below. The plan's format allows the County and participating jurisdictions to review and update sections 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 (via the Pre-Disaster Mitigation Program) 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.

Depending on the potential project's intent and implementation methods, several funding sources may be appropriate. Examples of mitigation funding sources include, but are not limited to: FEMA's Pre-Disaster Mitigation competitive grant program (PDM), Flood Mitigation Assistance program (FMA), National Fire Plan (NFP), Community Development Block Grants (CDBG), local general funds, and private foundations. Some of these examples are used in Figure 4.1 on the next page to illustrate the project development and prioritization process.

Figure 4.1: Project Prioritization Process



Source: Partnership for Disaster Resilience, 2006.

Step 1: Examine funding requirements

The Steering Committee will identify how best to implement individual actions within the appropriate existing plans, policies, or programs. The committee will examine the selected funding stream's requirements to ensure that the mitigation activity would be eligible through the funding source. The Committee may consult with the funding entity, Oregon

Emergency Management, or other appropriate state or regional organizations about the project's eligibility.

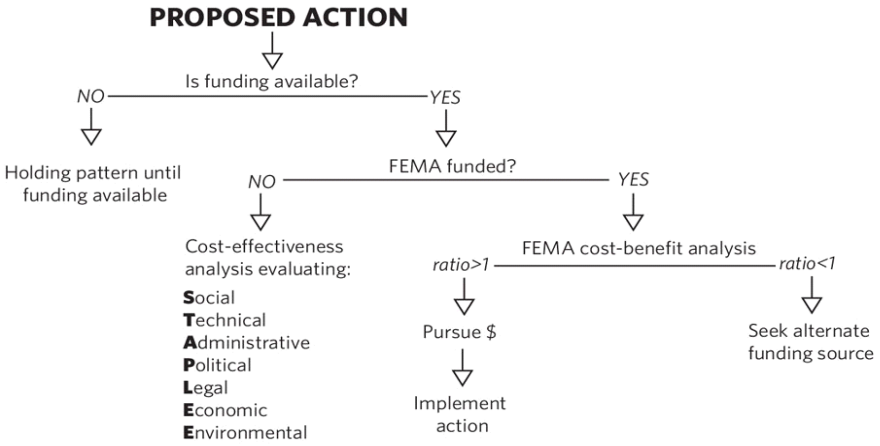
Step 2: Complete risk assessment evaluation

The second step in prioritizing the plan's action items is to examine which hazards they are associated with and where these hazards rank in terms of community risk. The Committee will determine whether or not the plan's risk assessment supports the implementation of the mitigation activity. This determination will be based on the location of the potential activity and the proximity to known hazard areas, historic hazard occurrence, vulnerable community assets at risk, and the probability of future occurrence documented in the plan.

Step 3: Complete quantitative and qualitative assessment, and economic analysis

The third step is to identify the costs and benefits associated with natural hazard mitigation strategies, measures or projects. Two categories of analysis that are used in this step are: (1) benefit/cost analysis, and (2) cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity 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 method of analysis.

Figure 4.2: Benefit Cost Decision Criteria



Source: Community Service Center's Partnership for Disaster Resilience at the University of Oregon, 2006.

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

For non-federally funded or nonstructural projects, a qualitative assessment will be completed to determine the project's cost effectiveness. The committee 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 C for a description of the STAPLE/E evaluation methodology.

Step 4: Committee Recommendation

Based on the steps above, the committee will recommend whether or not the mitigation activity should be moved forward. If the committee decides to move forward with the action, the coordinating organization designated on the action item form will be responsible for taking further action and documenting success upon project completion. The Committee will convene a meeting to review the issues surrounding grant applications and to share knowledge and/or resources. This process will afford greater coordination and less competition for limited funds. When the Committee selects a project for inclusion in the plan, the committee may write a letter of support signed by all members of the Committee. This letter can be utilized in grant applications to show community support for the mitigation action.

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

Continued Public Involvement & Participation

The participating jurisdictions are dedicated to involving the public directly in the continual reshaping and updating of the Clatsop County multi-jurisdictional Natural Hazard 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.

During plan development, public participation was incorporated into every stage of the plan and development process. To ensure that these opportunities will continue, the County and participating jurisdictions will provide for public participation at one or more of the following events each year: the County-wide Hazard Preparedness Fair, National Night Out, Astoria Service Fair, Clatsop County Fair, and the Cannon Beach Tsunami Fair. In addition, the Clatsop County Planning Department will post interactive GIS maps of hazards affecting the County on its website, as well as subsequent updates to the plan.

In addition to the involvement activities listed above, the County's multi-jurisdictional Natural Hazard 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. During this plan update, the following questions will be asked to determine what actions are necessary to update the plan. The convener will be responsible for convening the Committee to address the questions outlined below.

- Are the plan's goals still applicable?
- Do the plan's priorities align with State priorities?
- Are there new partners that should be brought to the table?
- Are there new local, regional, state or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Do existing actions need to be reprioritized for implementation?
- Are the actions still appropriate, given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

The Committee will be responsible for updating any deficiencies found in the plan based on the questions above.

Volume II:
Hazard Annexes

Volume II: Hazard Annex
Coastal Erosion

Causes and Characteristics of the Hazard

Coastal erosion is a natural process that continually affects the entire coast. Erosion becomes a hazard when human development, life and safety are threatened. Beaches, sand spits, dunes and bluffs are constantly affected by waves, currents, tides and storms resulting in chronic erosion, landslides and flooding. Changes may be gradual over a season or many years. Changes may also be drastic, occurring during the course of a single storm event.

Erosion may be caused by large waves, storm surges, rip cell embayments, high winds, rain, runoff, flooding, or increased water levels and ocean conditions caused by periodic El Niños. Coastal dunes and bluffs comprised of uplifted marine terrace deposits are especially vulnerable to chronic and catastrophic hazards.

Natural hazards that cause erosion and other impacts on coastal areas can be divided into two general classes, chronic and catastrophic.

Chronic hazards are those that we can often see clear evidence of along the ocean shore and include the following:

- Periodic high rates of beach, dune and bluff erosion;
- Mass wasting of sea cliffs in the form of landslides and slumps due to wave attack and geologic instability;
- Storm surges, high ocean waves and the flooding of low-lying lands during major storms;
- Sand inundation;
- Erosion due to the occurrence of El Niños and from rip embayments; and
- Recession of coastal bluffs due to long-term changes in mean sea level and the magnitude and frequency of storm systems.

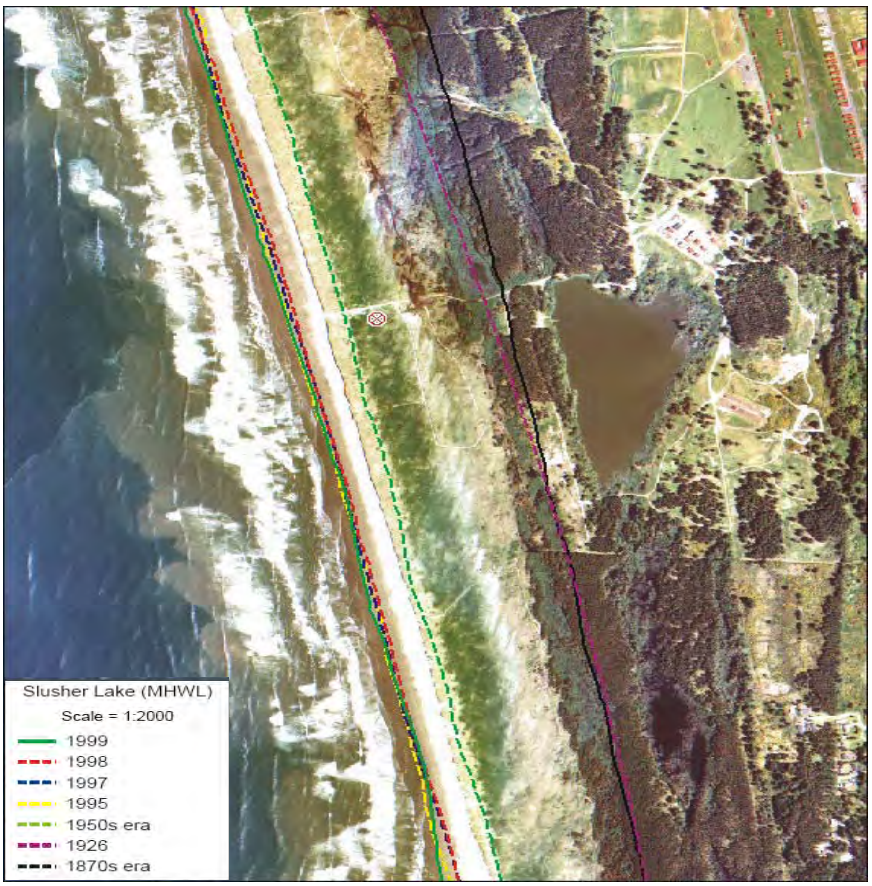
Chronic hazards are usually local in nature, and the threats to human life and property that arise from them are generally less severe than those associated with catastrophic hazards. However, wide distribution and frequent occurrence of chronic hazards makes them more of an immediate concern.

The damage caused by chronic hazards is usually gradual and cumulative. However, storms that produce large winter waves, heavy rainfall and/or high winds may result in very rapid erosion or other damage that can affect properties and infrastructure over a matter of hours. The regional, oceanic and climatic environments that result in intense winter storms determine the severity of chronic hazards along the Oregon coast.

Catastrophic hazards are regional in scale and scope. Though very infrequent, Cascadia Subduction Zone earthquakes, and the ground shaking, subsidence, land sliding, liquefaction and tsunamis that accompany them are very destructive in their effect causing extensive property losses and high numbers of deaths and injuries, both on the coast and inland.

History of the Hazard in Your Community

Coastal erosion is constantly shaping the coastal shoreline environment. The map below illustrates the erosion patterns of one section of coastal land which lies within Clatsop County. This type of erosion is indicative of the County's entire coast line.



Source: OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES Report on Coastal Erosion from Clatsop Spit to Gearhart (2001).

Risk Assessment

How are Hazard Areas Identified?

In 2001, The Oregon Department of Geology and Mineral Industries mapped the location and extent of coastal erosion zones. Additionally, the Clatsop County Planning Department developed a *Beaches and Dunes Overlay* that is identified as being between Highway 101 and the beach. Developments are required to submit erosion control plans; no removal of soil or sand is allowed in order to maintain the integrity of the dune system.

An example of coastal erosion near Arch Cape. (2008 Clatsop County photo)

Probability of Future Occurrence

Coastal erosion is a chronic hazard along the Clatsop County Coast, especially on sand spits, bluffed coastline, and dune-backed beaches. The damage caused by chronic hazards is usually gradual and cumulative. The regional, oceanic, and climatic environments that result in intense winter storms determine the severity of chronic hazards along the coast. Based on the chronic nature of coastal erosion, the Clatsop County Steering Committee estimates a 'high' probability that coastal erosion will occur.

Vulnerability Assessment

A number of buildings, parks, infrastructure, and critical facilities in Region 1 are vulnerable to coastal erosion. This is most obvious in low-

lying areas adjacent to bays or the ocean; it is also evident at higher elevations where buildings and infrastructure have been located on readily erodible materials (e.g., consolidated sand, weakly cemented sandstone, siltstone, etc.). The problem is historic. There are numerous examples of buildings and infrastructure destroyed by wave attack/erosion --- some of which are classic (e.g., Bay Ocean development, Salishan Spit, Jumpoff Joe, Rogue Shores, The Capes development, etc.). Buildings and infrastructure probably will continue to be built in harm's way despite stringent building requirements and enlightened planning commissions.

Few of Oregon's coastal developments are within FEMA-designated Velocity (V) zones. Those that are appear to be constructed according to V-zone standards. A number of coastal developments are protected by primary frontal dunes (as defined in 44 CFR) that are in various stages of accretion or erosion. In some situations, FEMA has allowed accreting dunes to be lowered in order for property owners to retain unobstructed ocean views. The vulnerability of the homes has not been increased. This policy would change, however, should erosion surpass accretion.

Coastal highways are always problematic. In Clatsop County much of the problem is linked to the local geology. This has been mapped as part of DOGAMI's environmental geology series. Bedrock conditions can and do change abruptly within very short distances. This results in an inconsistent highway foundation; some sections are more susceptible to erosion than others and require continuous maintenance. There is no practical solution outside of relocation of the highway; this option is not financially feasible at this point in time. On the positive side, the State Highway Division and Region 1 counties are adept in rerouting traffic. This will continue to be part of the solution.

The Clastop County Steering Committee estimates a 'high' vulnerability coastal erosion, meaning more than 10% of the population or regional assets are likely to be affected by this hazard. The vulnerability of occurrence is high due to the large amount of coastal land area and the amount of dwellings in or near erosion zones.

Risk Analysis

Approximately 807 dwellings are within the Beaches and Dunes Overlay. This makes them susceptible to coastal erosion.

Community Hazard Issues

What is susceptible to damage during a hazard event?

Coastal erosion processes create special challenges for people living near the ocean, requiring sound planning in order to minimize the potential dangers to life and property. Attempts to stabilize the shoreline or beach are often futile because the forces that shape the coast are persistent and powerful. Inadequate understanding of the complex interaction of coastal

land forms and waters and the various types of coastal erosion can result in serious threats to people, communities and infrastructure.

The degree of damage to structures, as well as injury and death to people caused by coastal erosion and related hazards (e.g., ocean, urban and riverine flooding, landslides and slumping, storm surges and high ocean wave action, sand inundation, wind storms, tsunamis and earthquakes, etc.) will depend upon: 1) whether the hazard events are catastrophic or chronic in nature and, 2) the proximity of people and property to the event and its magnitude and duration.

The effects from more frequent chronic hazards will in most instances be much less severe than catastrophic events and cover a much smaller area. However, a significant chronic hazard can still result in dangerous slides, flooding, high winds and dangerous wave effects causing major damage to roads, bridges, homes, schools, businesses and infrastructure. Such impacts can be particularly hard on smaller-sized communities, isolated rural homes and farms, and large residential, resort, tourist and commercial developments located in or near areas of known hazards due to erosion, slides and slumping, high wave action and storm surges and ocean or river flooding.

Human activities also influence, and in some cases, intensify the effects of erosion and other coastal hazards. Major actions such as jetty construction and maintenance dredging can have long-term effects on large sections of the coast. This is particularly true along dune-backed and inlet-affected shorelines such as the Columbia River littoral cell. The planting of European bunchgrass since the early 1900s has locked up sand in the form of high dunes. This in turn has contributed to the net loss of beach sand and increased beach erosion. Residential and commercial development can affect shoreline stability over shorter periods of time and in smaller geographic areas. Activities such as grading and excavation, surface and subsurface drainage alterations, vegetation removal, and vegetative as well as structural shoreline stabilization can all reduce shoreline stability. Finally heavy recreational use in the form of pedestrian and vehicular traffic can affect shoreline stability over shorter time frames and smaller spaces. Because these activities may result in the loss of fragile vegetative cover they are a particular concern along dune-backed shorelines. Graffiti carving along bluff-backed shorelines is another byproduct of recreational use that can damage fragile shoreline stability.

Obviously, as compared to the lesser impacts from a chronic hazard, a rare catastrophic event striking the coast will likely result in much more extensive property damage and higher numbers of dead and injured people. A catastrophic incident potentially can seriously damage, disrupt and destroy large numbers of homes, buildings, schools, utilities, infrastructure, boats and port facilities, roads and bridges, and communication and other lifeline systems. Such damage also can seriously impede or prevent the movement of people and goods and may disrupt the

response of police, fire and emergency services. Such consequences in turn can produce serious impacts on community and regional economic activity by disconnecting people from home, jobs, school, food and needed commercial, medical and social services. On the coast, the interruption of the tourist industry for any prolonged time could have very dire economic effects.

There is no location on the Oregon coast that is immune to coastal hazards. Clatsop County is especially vulnerable given the amount of land considered in the coastal zone (Fig 1). Without question, the most important natural variables for coastal change are the beach sand budget (balance of sand entering and leaving the system) and processes (waves, currents, tides, and wind) that drive the changes.

Furthermore, human influences associated with jetty construction, dredging practices, and coastal engineering have affected the shoreline profile and the amount of sand on a number of Oregon's beaches, ultimately influencing the stability or instability of these beaches.

Existing Hazard Mitigation Activities

Clatsop County, working with DLCD and DOGAMI, amended and upgraded all of its local plan policies, zoning ordinances and hazard maps associated with coastal erosion through the periodic review process. This project was completed in 2003.

Oregon Parks and Recreation Department (OPRD)

The Oregon Parks and Recreation Department (OPRD) is responsible for protecting the scenic, recreational, and natural resource values of the Oregon coast. OPRD accomplishes this through an extensive permitting program for shoreline protection under the authority of The Ocean Shores Statutes (ORS 390.605 - 390.770), also known as the Beach Bill. OPRD is the permitting authority for actions affecting the ocean shorelands up to the statutory vegetation line. The Ocean Shores Statutes require that a permit be obtained from the OPRD for all "beach improvements" seaward of the Statutory Vegetation Line or the actual vegetation line, whichever is farther inland. Permits for shoreline protective structures may be issued only for developments that existed prior to January 1, 1977.

OPRD approval is also required for dune management plans and subsequent dune management, resloping or other alterations of bluff slopes below the vegetation line, alteration of stream channels on the ocean shore, and other ocean shore alterations associated with hazard mitigation.

Permit Requirements

The Department of State Lands (DSL) regulates removal and filling of the seabed (seaward of the extreme low tide line) and estuaries, including any dredged materials or seabed materials. DSL manages the state-owned seabed within three nautical miles of the low tide line. In some instances, a

permit may also be required from the U.S. Army Corps of Engineers. When a Corps permit is required, the Oregon Department of Environmental Quality may also need to issue a water quality certification and the Department of Land Conservation and Development (DLCD) a coastal zone concurrence before the Corps can issue a final permit. The U.S. Army Corps of Engineers is responsible for the protection and development of the nation's water resources to ensure that they are used in the public interest (Figure CE-5). Any person, firm, or agency planning work in the waters of the United States must first obtain a permit from the Corps.

Permits are required even when land next to or under the water is privately owned. Examples of activities in waters that may require a permit include: construction of a pier, placement of intake and outfall pipes, dredging, excavation and depositing of fill. Permits are generally issued only if the activity is found to be in the public interest. DLCD reviews and certifies that Corps permits and other federal activities are consistent with state and local requirements for protecting coastal resources.

- Erosion control plans are required for all excavation activities in the coastal area. The County has an identified *Beaches and Dune Overlay*, which prohibits removal of soil and sand from the overlay area. This is intended to maintain the integrity of the coastal dune system.
- Continuing coordination between Clatsop County, OPRD, and DLCD, on all development activities effecting ocean beaches.
- The Clatsop County Dredged Material Disposal plan identifies specific areas that are appropriate for disposal of materials for beneficial use; such as coastal erosion.

The County also requires a 50-foot setback for riparian vegetation in order to maintain naturally occurring erosion control.

Hazard Mitigation Action Items

- Increase public education and outreach in natural hazards which affect the north coast – Multi-hazard action

Volume II: Hazard Annex
Drought

Causes and Characteristics of the Hazard

Drought can be defined in several ways. The American Heritage Dictionary defines drought as "a long period with no rain, especially during a planting season." Another definition of drought is a deficiency in surface and sub-surface water supplies. In socioeconomic terms, drought occurs when a physical water shortage begins to affect people, individually and collectively and the area's economy.

Drought is typically measured in terms of water availability in a defined geographical area. It is common to express drought with a numerical index that ranks severity. The Oregon Drought Severity Index is the most commonly used drought measurement in the state because it incorporates both local conditions and mountain snow pack. The Oregon Drought Severity Index categorizes droughts as mild, moderate, severe, and extreme.

History of the Hazard in Your Community

Droughts are not uncommon in the State of Oregon, nor are they just an "east of the mountains" phenomenon. They occur in all parts of the state, in both summer and winter. They appear to be cyclic, and can have a profound effect on the State's economy, particularly the hydropower and agricultural sectors. The environmental consequences also are far-reaching, including insect infestations in Oregon forests and a reduction in the stream flows that support endangered fish species.

There are no records of a severe drought in Clatsop County. Drought is averted as a result of the County's high rainfall from moist air masses moving onto land from the Pacific Ocean, especially during winter months. Table 1 describes drought that affected the entire state of Oregon, but no recorded damages in Clatsop County could be found.

Due to low rainfall in the winter of 2000-01 a drought-like event resulted in summertime water rationing in the incorporated areas of Clatsop County.

Table 1 Historic Droughts in Oregon

DATE	DESCRIPTION
1904-1905	A drought period of about 18 months throughout Oregon
1917-1931	A very dry period, punctuated by brief wet spells in 1920-21 and 1927 throughout Oregon
1939-1941	A three-year intense drought in Oregon
1976-1981	Intense drought in western Oregon; 1976-77 single driest year of century
1985-1997	Generally a dry period, capped by statewide droughts in 1992 and 1994
2000-2001	General statewide drought

Source: Taylor, George H., and Ray Hatton, 1999, *The Oregon Weather Book*.

Risk Assessment

How are Hazard Areas Identified?

In recent years, the State has addressed drought emergencies through the Oregon Drought Council. This interagency (state/federal) council meets to discuss climate outlooks, water and soil conditions, and advise the Governor as the need arises. At the time the plan was developed, no data existed to assist in identifying the location or extent of the drought hazard in Clatsop County. In general, drought hazards tend to affect an entire community; therefore, the location and extent for the hazard can be considered to be the whole of the County.

Probability of Future Occurrence

Due to the extensive rainfall (100+ inches) received each year, the Clatsop County Steering Committee estimates a 'low' probability that drought will occur. A 'low' ranking indicates that no more than one incident is likely within a 75-100 year period.

Vulnerability Assessment

The Clatsop County Steering Committee estimates a 'low' vulnerability to drought hazards. A 'low' ranking indicates that less than 1% of the population or regional assets would be affected by a major drought event.

Risk Analysis

No data is available to analyze the losses and damages from drought hazards for Clatsop County.

Community Hazard Issues

What is susceptible to damage during a hazard event?

Drought is frequently an "incremental" hazard; the onset and end are often difficult to determine. Also, its effects may accumulate slowly over a considerable period of time and may linger for years after the termination of the event.

Droughts are not just a summer-time phenomenon; winter droughts can have a profound impact on agriculture, particularly east of the Cascade Mountains. Also, below average snowfall in higher elevations has far-reaching affect, especially in terms of hydroelectric power, irrigation, recreational opportunities and a variety of industrial uses.

Drought can affect all segments of a jurisdiction's population, particularly those employed in water-dependent activities (e.g., agriculture, hydroelectric generation, recreation, etc.). Also, domestic water-users may be subject to stringent conservation measures (e.g., rationing) and could be faced with significant increases in electricity rates. In addition, water-borne transportation systems (e.g., ferries, barges, etc.) could be impacted by periods of low water.

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

For more information on the drought hazard, please visit the state plan's Drought chapter.

Existing Hazard Mitigation Activities

- In the summer of 2001, due to a drought-like event several incorporated cities instituted water-rationing programs.
- Several of the cities have developed Water System Master Plans and Capital Improvement Projects that include the adding or construction of water storage facilities.

Hazard Mitigation Action Items

- Investigate the viability of county wide public awareness activities regarding water conservation.
- Increase public education and outreach in natural hazards which affect the north coast.

Volume II: Hazard Annex
Earthquake

Causes and Characteristics of the Hazard

Seismic events were once thought to pose little or no threat to Oregon communities. However, recent earthquakes and scientific evidence indicate that the risk to people and property is much greater than previously thought. Oregon and the Pacific Northwest in general are susceptible to earthquakes from three sources: 1) the off-shore Cascadian Subduction Zone; 2) deep intra-plate events within the subducting Juan de Fuca Plate; and 3) shallow crustal events within the North American Plate.

While all three types of quakes possess the potential to cause major damage, Subduction zone earthquakes pose the greatest danger. The source for such events lies off the Oregon coast and is known as the Cascadia Subduction Zone (CSZ). A major CSZ event could generate an earthquake with a magnitude of 9.0 or greater resulting in devastating damage and loss of life.

The specific hazards associated with an earthquake include the following:

Ground Shaking

Ground shaking is defined as the motion of seismic waves felt on the Earth's surface caused by an earthquake. Ground shaking is the primary cause of earthquake damage.

Ground Shaking Amplification

Ground shaking amplification refers to the soils and soft sedimentary rocks near the surface that can modify ground shaking from an earthquake. Such factors can increase or decrease the amplification (i.e., strength) as well as the frequency of the shaking.

Surface Faulting

Surface faulting are planes or surfaces in Earth materials along which failure occurs. Such faults can be found deep within the earth or on the surface. Earthquakes occurring from deep lying faults usually create only ground shaking.

Earthquake-Induced Landslides

These landslides are secondary hazards that occur from ground shaking.

Liquefaction

Liquefaction takes place when ground shaking causes granular soils to turn from a solid into a liquid state. This in turn causes soils to lose their strength and their ability to support weight.

Tsunamis

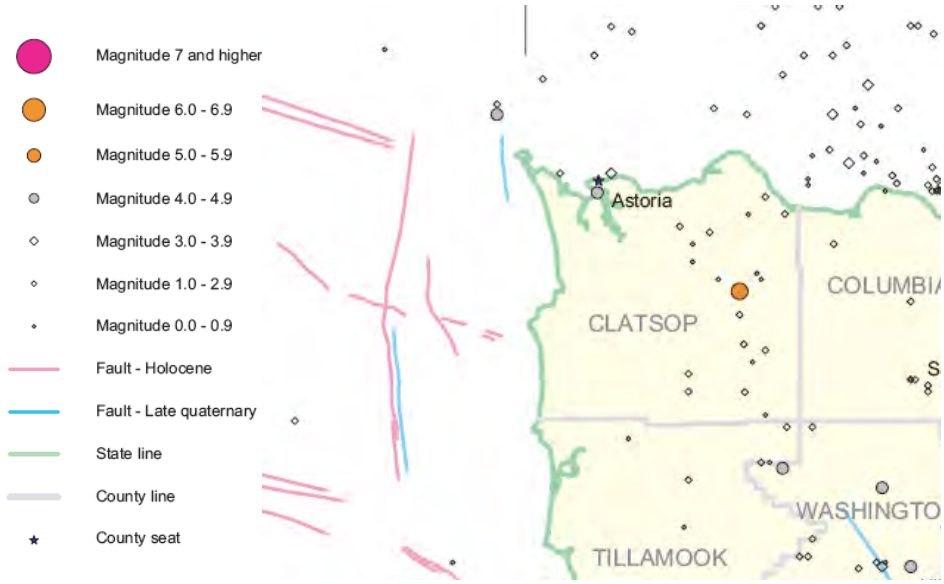
Tsunamis are another secondary earthquake hazard created by events occurring under the ocean. A tsunami, often incorrectly referred to a "tidal wave," is a series of gravity-induced waves that can travel great distances from the earthquake's origin and can cause serious flooding and damage to coastal communities. There are two sources of tsunamis that can affect Clatsop county: earthquakes in or near the County (CSZ) or earthquakes from distant areas (e.g., Japan).

The severity of an earthquake is dependent upon a number of factors including: 1) the distance from the quake's source (or epicenter); 2) the ability of the soil and rock to conduct the quake's seismic energy; 3) the degree (i.e., angle) of slope materials; 4) the composition of slope materials; 5) the magnitude of the earthquake; and 6) the type of earthquake.

History of the Earthquakes in Clatsop County

Although Clatsop County has not been the center point of any recorded earthquakes, on April 13, 1949, a major earthquake (magnitude 7.0) caused eight deaths and estimated $25 million damage at Olympia, Washington, and a broad area around the capital city. The depth was greater than normal, which, in part, accounted for the large felt area - 388,000 square kilometers in the United States. In Oregon, widespread damage was observed, including injuries in Astoria.[i] Figure EQ.1 shows the locations of past earthquakes in Clatsop County from 1841-2002.

Figure EQ.1 Map of Selected Earthquakes for Oregon, 1841 through 2002



Source: DOGAMI, 2003. <http://www.oregongeology.com/sub/earthquakes/images/EpicenterMap.pdf>

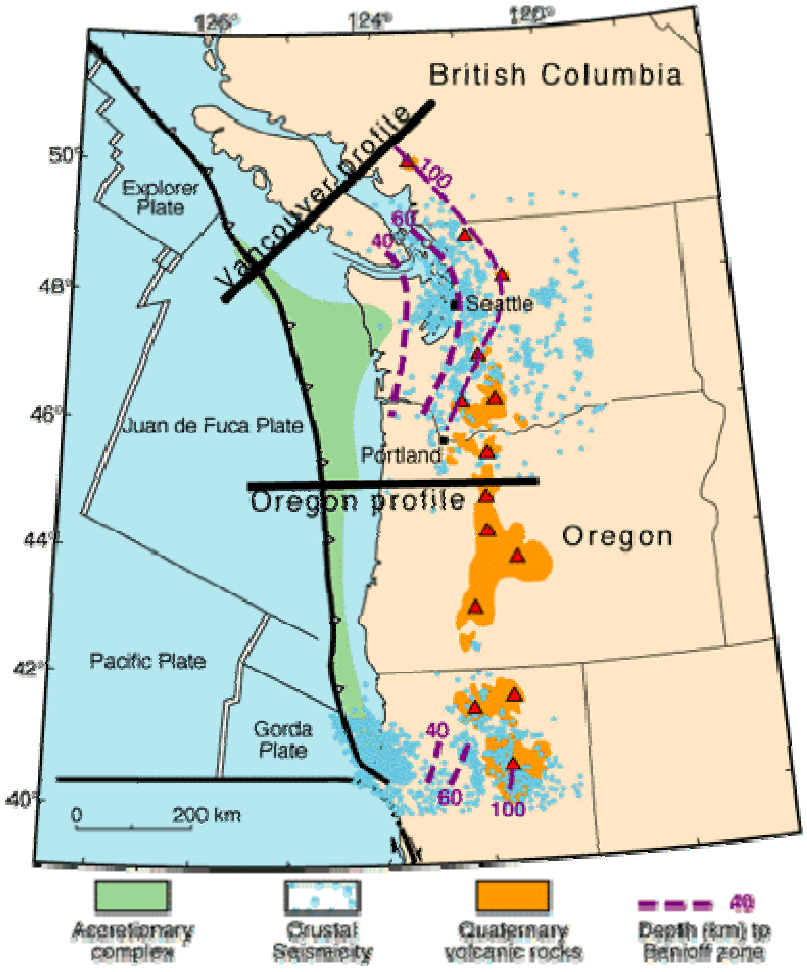
Risk Assessment

How are Hazard Areas Identified?

DOGAMI has developed city-specific earthquake hazard maps for the majority of cities in Clatsop County. These maps are included in the city addendums and highlight the location and extent of the earthquake hazard in each city. Similar maps at the County level have not been identified.

The Clatsop County Land and Water Development and Use Ordinance (LWDUO) contains a Geological Hazard Overlay (GHO) District used to recognize potentially hazardous areas. The ordinance identifies several geological studies for use in determining such hazards. These hazards include but are not limited to: Mass Movement Topography, Active and Inactive Faults, Active and Inactive Landslides. The ordinance also identifies standards for geotechnical reports required to develop lands located within the GHO.

Map: Showing Cascadian Subduction Zone off Oregon Coast



Probability of Future Occurrence

It is difficult to estimate recurrence intervals from available data. Paleoseismic studies along the Oregon coast indicate that the state has experienced seven Cascadia Subduction Zone (CSZ) events possibly as large as M9 in the last 3500 years. These events are estimated to have an average recurrence interval between 500 and 600 years, although the time interval between individual events ranges from 150 to 1000 years. The last CSZ event occurred approximately 300 years ago. Scientists estimate that there is a 10-20% probability that a subduction zone earthquake will occur within the next 50 years.[ii] Based on this information, Clatsop County estimates a 'high' probability than an earthquake will occur in the future.

Vulnerability Assessment

Clatsop County's Hazard Analysis Report (July 2003) ranked Clatsop County's vulnerability to future earthquakes as high due to the proximity to the CSZ. A 'high' vulnerability ranking indicates that more than 10% of the County's population or regional assets are likely to be affected by a major earthquake. The Clatsop County Steering Committee agrees with the County's Hazard Analysis Report ranking.

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

The degree of damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event. Buildings, ports, dams, levees and lifelines including water, sewer, storm water and gas lines, transportation systems, and utility and communication networks are particularly at risk. Also, damage to roads and water systems will make it difficult to respond to post-earthquake fires. Clatsop County is especially vulnerable to earthquake hazards. This is because of the development near the Cascadia Subduction Zone (CSZ), regional seismicity, topography, bedrock geology and local soil profiles. For example, a large number of buildings are constructed of unreinforced masonry (URM) or are constructed on soils that are subject to liquefaction during severe ground shaking. Also, some principal roads and highways are susceptible to earthquake induced landslides. Bridges and tunnels need to be retrofitted to withstand ground shaking and the ability of dams to withstand earthquake forces should be considered. This is especially important as three dams in Clatsop County have been designated as "high hazard:" Bear Creek (Astoria), Middle Reservoir, and Wickiup Lake.[iv] Tables EQ.1 and EQ.2 and Figure EQ.2 describe the major bridges along Highway 101 in Clatsop County. These bridges, among others, will be vulnerable from an earthquake and may cut communities off.

Table EQ.1 Bridges in Clatsop County

County	State Highway Bridges	State Highway Culverts	County Highway Bridges	County Highway Culverts	City/ Municipal Highway Bridges	City/ Municipal Highway Culverts	Historic Covered Bridges	2006 Total
Clatsop	109	72	65	78	12	4	0	340

Source: Oregon Department of Transportation, 2006, Oregon Department of Fish and Wildlife, Statewide Culvert Inventory

Table EQ.2 Bridges in Clatsop County on Highway 101

Mile Post Location (along Hwy 101)	Name	Year Built
0.00	Junction	
0.17	Skipanon River	1978
1.55	Junction	
1.75	Warrenton	
4.78	Lewis and Clark River, Hwy 105	1924
6.8	Youngs Bay, Hwy 105	1921
7.06	Astoria	
7.10	Hwy 105 over Port of Astoria (Abandoned)	1921
7.25	Junction	

Source: Oregon Department of Transportation
<http://www.oregon.gov/ODOT/HWY/BRIDGE/docs/brlog.pdf>

Figure EQ.2 Highway 101 Bridges of Clatsop County

1.Astoria - Megler Bridge
1966, MP 4.1. The longest three-span, continuous cantilever, through-truss bridge in the world. It crosses the Columbia River linking Oregon to Washington. It completed US 101 as an unbroken link between the Canadian and the Mexican borders. Designed by Washington State Bridge Engineer William A. Burgee.

2.Old Youngs Bay Bridge
1921, Warrenton Highway, Astoria, MP 6.89. This bridge is an example of a double leaf bascule drawspan. The large Art Deco Style wood and concrete pylons on both ends of the bridge are McCullough hallmarks. The buildings located at the bascules are the bridge operator's houses.

3.Lewis and Clark River Bridge
1924, Warrenton Highway, Astoria, MP 4.78. The only remaining single leaf bascule drawspan in Oregon. Four double leaf bascule bridges remain on Oregon's highway system.

Source: Oregon Department of Transportation
(http://www.oregon.gov/ODOT/HWY/BRIDGE/docs/SpanningOregonsCoast/newest_spanning_brochure.pdf)

In 2007, DOGAMI conducted a Statewide Seismic Needs Assessment Using Rapid Visual Screening (RVS) to assess public school buildings, acute inpatient care facilities, fire stations, police stations, sheriffs' offices and other law enforcement agency buildings. Buildings were ranked for the "probability of collapse" due to the maximum possible earthquake for any given area. The following map identifies the locations of the RVS Assessments. The complete report (and list of buildings at risk in Clatsop County) is available at http://www.oregongeology.com/sub/projects/rvs/county/county-clatsop.htm.

Risk Analysis

Problem areas within the region are readily identifiable on earthquake hazard maps prepared by the Oregon Department of Geology and Mineral Industries (DOGAMI). DOGAMI has developed two earthquake loss models for Oregon based on the two most likely sources of seismic events: (1) the Cascadia Subduction Zone (CSZ), and (2) combined crustal events (500-year Model). Both models are based on HAZUS, a computerized program, currently used by the Federal Emergency Management Agency (FEMA) as a means of determining potential losses from earthquakes. The CSZ event is based on a potential 8.5 earthquake generated off the Oregon coast. The model does not take into account a tsunami, which probably would develop from the event. The 500-Year crustal model does not look at a single earthquake (as in the CSZ model); it encompasses many faults, each with a 10% chance of producing an earthquake in the next 50 years. Neither model takes unreinforced masonry buildings into consideration. DOGAMI investigators caution that the models contain a high degree of uncertainty and should be used only for general planning purposes. Despite their limitations, the models do provide some approximate estimates of damage. Results are found in Tables EQ.3-6.

DOGAMI has calculated financial, human and operational risks associated with an M8.5 earthquake. Tables EQ.3 - 6 project the dollar losses, economic losses, human effects and the facilities that would be operational after an M 8.5 event

Table EQ.3 Projected dollar losses based on a M8.5 Subduction Event and a 500-year Model

County	Economic Base in Thousands (1999)	Greatest Absolute Loss in Thousands from a M8.5 CSZ Event[1]	Greatest Absolute Loss in Thousands from a 500-Year Model
Clatsop	$2,198,000	$549,000	$760,000

Source: DOGAMI. 1999. Special Paper 29. Earthquake Damage in Oregon

Table EQ.4 Estimated effects of a M8.5 Subduction Event in Clatsop County

	Injuries	Deaths	Displaced Households
Number	296	6	788
Percent of Residents / Households Effected	1%	0%	4%

Source: DOGAMI. 1999. Special Paper 29. Earthquake Damage in Oregon

Table EQ.5 Operational facilities in Clatsop County the day after a M8.5 Subduction Event

Fire Stations	Police Stations	Schools	Bridges
16%	15%	16%	58%

Source: DOGAMI. 1999. Special Paper 29. Earthquake Damage in Oregon

Table EQ.6 Economic Losses to Clatsop County after a M8.5 Subduction Event

Highways	Airports	Communications
$18 mil	$5 mil	$6 mil

Source: DOGAMI. 1999. Special Paper 29. Earthquake Damage in Oregon

Community Hazard Issues

What is susceptible to damage during a hazard event?

Earthquake damage occurs because we have built structures that cannot withstand severe shaking. Buildings, ports, and lifelines (highways, telephone lines, gas, water, etc.) suffer damage in earthquakes. Damage and loss of life can be very severe if structures are not designed to withstand shaking, are on ground that amplifies shaking, or ground which liquefies due to shaking. Unreinforced masonry buildings are known to be the most susceptible to damage. While it is not impossible to design structures to withstand earthquakes, it can be prohibitively expensive to design for significant events. Most buildings are designed with life-safety integrity for the occupants to safely survive the event and evacuate, but not necessarily to protect the building from damage. The advantage of improved seismic design requirements is that they can protect lives, and maintain the functionality of the structure in lesser magnitude events. Buildings that were not built to an adequate seismic standard often can be retrofitted and strengthened to help withstand earthquakes and provide life safety.

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

Clatsop County is also vulnerable because of the age of the homes. Table EQ.7 shows the age of homes in Clatsop County. 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 use earthquake resistant designs and construction techniques. Those built before 1960 (47.1% of homes in Clatsop County) are not likely to be earthquake resistant.

Table EQ.7 Housing Year Built

Pre 1959	1960-1979	1980-2000
47.1%	26.1%	26.7%

Source: US Census, 2000

Existing Hazard Mitigation Activities

- Clatsop County enforces International Building Codes and Oregon State Structural Specialty Code that addresses earthquake mitigation measures for new construction.
- In 2007, DOGAMI conducted a Seismic Needs Assessment in Clatsop County using Rapid Visual Screening on educational facilities and public buildings.
- Clatsop County requires a geotechnical investigation in areas identified as geological hazard areas prior to issuance of a development and building permits. This was adopted as part of Statewide Planning Goal #7.
- Clatsop County pubic service buildings have undergone major renovations in recent years. A large part of the renovation revolved around retrofitting to protect against earthquake damage.
- As County bridges are replaced, they are brought to seismic standards.

Hazard Mitigation Action Items

- **Retrofit County bridges that are identified by a seismic vulnerability assessment** (County priority action)
- Complete assessment of County owned bridges
- Seismic upgrades for the Ecola Creek Bridge in Cannon Beach (Hwy 101)
- Complete a seismic vulnerability assessment for Port of Astoria facilities.
- Develop incentive programs to encourage homeowners to do seismic retrofits.
- Seismic retrofitting of old Hamlet Fire Station

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[i] USGS. 2007. *Earthquake History: Oregon, http://earthquake.usgs.gov/regional/states/oregon/history.php*

[ii] Geologic Hazards on the Oregon Coast. Oregon Department of Geology and Mineral Industries. http://www.oregongeology.com/sub/earthquakes/Coastal/OrGeoEqNTsu.htm

[iii] State of Oregon Natural Hazard Mitigation Plan, Part 3: Hazard Chapters. Earthquakes, p. 2 (Wang and Clark, 1999).

[iv] Oregon Water Resources Department. *Dam Inventory: Clatsop County, http://apps.wrd.state.or.us/apps/sw/dam_inventory/dam_inventory.php*

Volume II: Hazard Annex
Flood

Causes and Characteristics of the Hazard

Characteristics and Brief History

Oregon has a detailed history of flooding with flood records dating back to the 1860s. The principal types of flood that occur in Clatsop County include: (1) riverine and (2) ocean flooding from high tides and wind-driven waves or tsunami event. There are two distinct periods of riverine flooding in this region, winter and late spring. The most serious flooding occurs during December, January, and February. The situation is especially severe when riverine flooding, caused by prolonged rain and melting snow, coincides with high tides and coastal storm surges. In short, the rivers back up and flood the lowlands. There are other circumstances as well. Several coastal rivers carry heavy silt loads from areas covered with volcanic ash during the Mt. St. Helens eruption (1980). Consequently, some rivers actually may be elevated above local floodplains, which increases flood hazards. The costs and long-term benefits of dredging these rivers have not been determined.

Riverine floods

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

The danger of riverine flooding occurs mainly during the winter months, with the onset of persistent, heavy rainfall, and during the spring, with melting of snow in the Coast Range.

Ocean Flooding / Wave Action

Flooding from wind-driven waves is a common event on the Oregon coast. This is particularly true during the winter storm season, during El Niño events, and when spring and perigean tides occur. The Federal Emergency Management Agency has identified and mapped coastal areas subject to direct wave action (V zones) and sand dune overtopping (AH and AO zones). Direct wave action was especially severe during the winter storm events of 1972 (Siletz Spit), 1978 (Nestucca Spit), and the El Niño events of 1982-83 and 1997-98. Beach and cliff erosion were significant during these periods and a number of homes were destroyed. The following lessons were learned (and oftentimes forgotten between damaging events):

• Oregon coastal processes are complex and dynamic, sometimes eroding, sometimes aggrading;

• Some sections of the Oregon coast are rising in relation to ocean levels, others remain fairly constant or are becoming lower (Komar 1992, 40-41);

• Primary frontal dunes provide protection from ocean storms;

• Sand spits are not permanent features;

• Erosion rates vary and are dependent on several factors including storm duration and intensity, composition of sea cliff, time of year, and impact of human activities (e.g., altering the base of sea cliffs, interfering with the natural movement of beach sand).

History of the Flooding in Clatsop County

Date	Location	Comments
March 1876	Columbia	
June 1880	Columbia	
May-June 1894	Columbia River Basin	Rain on snow pack
February-07	Western Oregon and John Day	
June-13	Columbia	
May-28	Columbia	
May-June 1948	Columbia River Basin	Rain on snow pack
March-64	Oregon Coast	
December 1964-January 1965	Pacific Northwest	Rain on snow; record flood on many rivers
January-72	Western Oregon and John Day	Record flows on coastal rivers
January-74	Western Oregon and John Day	$65 million in damages
November - December 1977	Western Oregon	Rain on snow event; $16.5 million in damages
November 27, 1995	Clatsop and Clackamas Counties	Road damage from landslides
February-96	Nearly Statewide	High velocity flows, damage from erosion and undermining of structures
November 5, 2006	Western Oregon	
December 1-3, 2007	Northwest Oregon	Heavy flooding in Clatsop

In addition, according to the National Climatic Data Center, Clatsop County experienced heavy rain events in: August 2001, January 2003, March 2003, December 2003, January 2004, November 2006, and December 2007.

Risk Assessment

How are Hazard Areas Identified?

FEMA Flood Insurance Rate Maps (FIRMs) are the most comprehensive resource for identifying hazards in Clatsop County. FIRMs depict flood

conditions; however, many old maps are inaccurate. Clatsop County's most recent FIRM was developed on June 16, 1999.

Map: **Federal Emergency Management Agency - National Flood Insurance Program**
Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

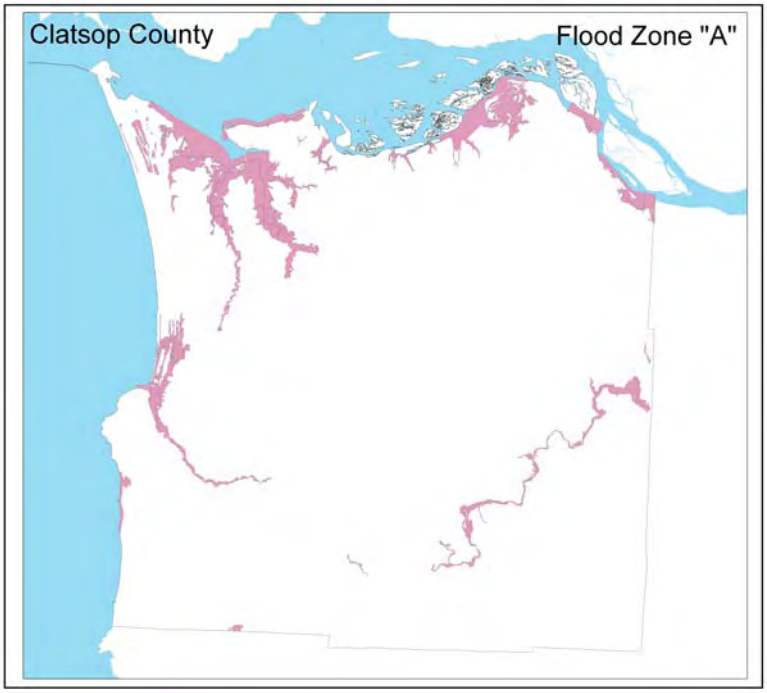

Table 1 Clatsop County Rivers & Streams prone to flooding

River & Stream Names	
Lewis & Clark River	Fishhawk Creek
Little Walluski River	Humbug Creek
Necanicum River	Little Creek
Nehalem River	Neacoxi Creek
Bear Creek	Neawanna Creek
Beerman Creek	Northrup Creek
Big Creek	Plymton Creek
Cow Creek	

Source: Federal Emergency Management Agency (FEMA), Clatsop County Flood Insurance Study (FIS), 7/17/01,

Probability of Future Occurrence

Clatsop County's Hazard Analysis Report (July 2003) ranked Clatsop County's probability for flooding as 'high.'[i] A 'high' ranking indicates that one incident is likely within a 10 to 35 year period. The Clatsop County Steering Committee agrees with this assessment.

FEMA has mapped the streams listed in Table 1 for 10, 50, 100, and 500-year flood events, with the probability of flooding in a year being 10%, 2%, 1%, and 0.2%, respectively. Areas subject to these floods are depicted on FEMA Flood Insurance Rate Maps (FIRMs), and profiled in an accompanying Flood Insurance Study (FIS). Recurrence intervals can differ between reaches of the same stream. For example, certain reaches of the Youngs River may experience a 100-year (1%) flood while other sections of the river may be having a 50-year (2%) or perhaps a 500-year (0.2%) flood event.

Ocean storms can be expected every year. El Niño effects, which tend to raise ocean levels, occur about every three to five years (Taylor and Hannan, 1999). V (wave velocity) zones, depicted on FEMA's Flood Insurance Rate Maps, are areas subject to 100-year events (i.e., 1% chance in any given year). The Flood Insurance Rate Maps show areas vulnerable to wave action (V zones), pounding and sheet-flow from waves over-topping dunes (AO and AH zones). Flood Hazard maps are available for viewing on the FEMA website or at County offices.

Vulnerability Assessment

Clatsop County's Hazard Analysis Report (July 2003) ranked Clatsop County's vulnerability to future flooding events as 'moderate.'[ii] A 'moderate' vulnerability ranking indicates that 1-10% of the population or regional assets are likely to be affected by a major flooding event. The Clatsop County Steering Committee agrees with this assessment.

Low-lying coastal areas are particularly vulnerable to flood hazards that can be exacerbated by high tides. The northern half of the County is more susceptible to riverine flood damage that that to the south. This is because the northern half of the region is more densely populated and consequently contains much of the region's infrastructure. Physical location also makes a difference. For example, the areas that empty into Young's Bay, Cathlamet Bay and other sections of the Columbia River, have increased risk from riverine flooding on the relatively flat valley floor.

In general, structures at-risk (excluding tidal / wind effects) include:

- Pre-FIRM structures (residential and commercial);
- Pre-FIRM structures (state-owned / occupied);
- Repetitive Loss structures;
- Manufactured Homes (inside and outside manufactured home parks);
- Critical Facilities At-Risk:

- Hospital, Police, Fire, National Guard, Emergency Management (Ingress /Egress);
- Transportation to include highway, rail, and airport;
- Sewer and water treatment plants;
- Energy facilities; and
- Communications infrastructure.

In general, economic activities at- risk from a 1% flood include:

- Motel / hotel operations;
- Highway oriented businesses (especially in Tillamook area);
- Buoyant materials storage (e.g., logs, fuel drums); and
- Food outlets (e.g., grocery stores).

Other special considerations to include:

- Special populations (e.g., minority, handicapped, non-English speaking);
- Institutions / incarceration facilities;
- Schools / Day-Care;
- Hazardous materials sites; and
- The physical condition of dams.

Few of Clatsop County's coastal developments are within FEMA-designated Velocity (V) zones. Those that are appear to be constructed according to V-zone standards. A number of coastal developments are protected by primary frontal dunes (as defined in 44 CFR) that are in various stages of accretion or erosion. In some situations, FEMA has allowed accreting dunes to be lowered in order for property owners to retain unobstructed ocean views. The vulnerability of the homes has not been increased. This policy would change, however, should erosion surpass accretion. Many residential structures are located in areas subject to flooding from wave over-topping (e.g., AO and AH zones). However, very few appear to have been flooded, probably because of elevation requirements.

Clatsop County has not inventoried all buildings that are vulnerable to wave action (i.e., in V zones); however some pertinent information is available from the National Flood Insurance Program (NFIP). This data is provided to the state and includes the addresses of buildings insured through the NFIP, flood zones in which they are located, claims, and location of repetitive loss structures.

Table 2 NFIP Coverage, Policies and Claims in Clatsop County

Community Name	Total Coverage	V-Zone[1]	A-Zone[2]	Number of Policies	Total Coverage	Total Claims Since 1978	Total Paid Since 1978
Astoria	$27,086	0	19	41	$9,759,500	4	$0
Cannon Beach	$325,581	113	124	487	$120,819,700	13	$157,247
Clatsop County	$364,992	17	331	569	$117,703,600	54	$967,175
Gearhart	$73,726	0	22	151	$38,442,300	4	$3,030
Seaside	$473,336	0	509	1,019	$189,496,000	19	$60,263
Warrenton	$87,414	0	93	180	$38,943,700	2	$20
County Total	$1,352,135	130	1,096	2,447	$515,164,800	96	$1,187,735

Source: Federal Emergency Management Agency - National Flood Insurance Program Report, 2008

[1] Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

[2] Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone. Mandatory flood insurance purchase requirements apply.

Below is a list of the types and number of repetitive loss properties located in the floodplain.

Clatsop County

- Building payments: $145,495.50
- Contents payments: $41,120.04
- Total payments: $186,615.54
- Average payment: $20,735.06
- Losses: 9
- Properties: 3

Source: Dept. of Land Conservation and Development (3/31/08)

Coastal highways are always problematic. In Clatsop County, much of the problem is linked to the local geology. This has been mapped as part of DOGAMI's environmental geology series. Bedrock conditions can and do change abruptly within very short distances. This results in an inconsistent highway foundation; some sections are more susceptible to wave action than others and require continuous maintenance. There is no practical solution outside of relocation of the highway; this option is not financially

feasible at this point in time. On the positive side, the State Highway Division and Clatsop County are adept in rerouting traffic. This will continue to be part of the solution.

Risk Analysis

Clatsop County residents* at risk for food hazard:

Dwelling Units in Flood Zone "A:	Average RMV of Improvements within flood zone
3,083 (17.88%)	$145,490

*Includes municipal and unincorporated areas based on FEMA Q3 maps.

Community Hazard Issues

What is susceptible to damage during a hazard event?

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

Homes in frequently flooded areas can also experience blocked sewer lines and damage to septic systems and drain fields. This is particularly the case of residences in rural flood prone areas who commonly utilize private individual sewage treatment systems. Inundation of these systems can result in the leakage of wastewater into surrounding areas creating the risk of serious water pollution and public health threats. This kind damage can render homes unlivable.

As was seen in Oregon's 1996 floods, many housing units that were damaged or lost were mobile homes and trailers. Many older manufactured home parks are located in floodplain areas. Manufactured homes have a lower level of structural stability than "stick-built" (standard wood frame construction) homes. Manufactured homes in floodplain zones must be anchored to provide additional structural stability during flood events. Lack of community enforcement of manufactured home

construction and anchoring standards in floodplains can contribute to severe damages from flood events.

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

Bridges are a major concern during flood events as they provide critical links in road networks by crossing watercourses and other significant natural features. However bridges and the supporting structures can also be obstructions in flood-swollen watercourses and can inhibit the rapid flow of water during flood events.

Existing Hazard Mitigation Activities

Flood Hazard Overlay District

The Clatsop County Land and Water Development & Use Ordinance (LWDUO) contains a Flood Hazard Overlay District. The purpose of the flood hazard overlay district is to identify those areas of the County subject to the hazards of periodic flooding and establish standards and regulations to reduce flood damage or loss of life in those areas. This district shall apply to all areas of special flood hazards within the unincorporated areas of Clatsop County as identified on Flood Insurance Rate Maps (FIRM) and Flood Boundary and Floodway Maps. In advancing these principles and the general purposes of the Clatsop County Comprehensive Plan, the specific objectives of the Flood Overlay District are:

- To promote the general health, welfare and safety of the County;
- To prevent the establishment of certain structures and land uses unsuitable for human habitation because of the danger of flooding, unsanitary conditions or other hazards;
- To minimize the need for rescue and relief efforts associated with flooding;
- To help maintain a stable tax base by providing for sound use and development in flood- prone areas and to minimize prolonged business interruptions;
- To minimize damage to public facilities and utilities located in flood hazard areas;
- To insure that potential home and business buyers are notified that property is in a flood area.

Public Meetings

In order to keep the citizens of Clatsop County informed of proposed changes in FEMA flood maps, the County held a public forum to discuss changes in the County's flood maps as part of FEMA's Map Modernization Project. In addition, County staff has met with individual property owners to discuss changes to specific properties. The proposed changes include the decertification of the County's levees, thus affecting the properties protected by these structures. County staff has also met with representatives of the local Diking Districts and are working in conjunction with the US Army Corps of Engineers and the State of Oregon Division of Land Conservation and Development to disseminate information to the residents of Clatsop County.

Building Codes

Clatsop County Building Codes adhere to the Oregon Structural Specialty Code and FEMA guidelines for new development.

Hazard Mitigation Action Items

- Partner with Oregon Department of Transportation to elevate Highway 101 roadbed to an elevation sufficient to avoid annual winter flooding on multiple sections between the City of Seaside and the Junction of Highways 101 and 26.
- Elevate runway at Port of Astoria airport and improve diking around the airport.
- Complete a risk assessment related to levees in the County and adjacent development.
- Westport Railroad Bridge (71.3) replacement.
- Provide support and assistance to Diking Districts in respect to accreditation of the County's levees.

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[i] Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

[ii] Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

Volume II: Hazard Annex
Landslide

Causes and Characteristics of the Hazard

Landslides are a major geologic threat in almost every state in the United States. In Oregon, a significant number of locations are at risk from dangerous landslides and debris flows. While not all landslides result in property damage, many landslides do pose serious risk to people and property. Increasing population in Oregon and the resultant growth in home ownership has caused the siting of more development in or near landslide areas. Often these areas are highly desirable owing to their location along the coast, rivers and on hillsides.

Landslides are fairly common, naturally occurring events in various parts of Oregon. In simplest terms, a landslide is any detached mass of soil, rock, or debris that falls, slides or flows down a slope or a stream channel. Landslides are classified according to the type and rate of movement and the types of materials that are transported.

In understanding a landslide, two forces are at work: 1) the driving forces that cause the material to move down slope, and 2) the friction forces and strength of materials that act to retard the movement and stabilize the slope. When the driving forces exceed the resisting forces, a landslide occurs.

Landslides can be grouped as "on-site" and "off-site" hazards. An "on-site" slide is one that occurs on or near a development site and is slow moving. It is slow moving slides that cause the most property damage in urban areas. On-site landslide hazards include features called slumps, earthflows and block slides. "Off-site" slides typically are rapid moving and begin on steep slopes at a distance from homes and development. A 1996 "off-site" slide in southern Oregon began a long distance away from homes and road, traveled at high velocity and killed five people and injured a number of others.

Landslides are classified based on causal factors and conditions and exist in three basic categories.

Falls

This type of landslide involves the movement of rock and soil which detaches from a steep slope or cliff and falls through the air and/or bounces or rolls down slope. This type of slide is termed a rock fall and is very common along highways where they have been cut through bedrock in steep canyons and along the coast.

Slides

This kind of landslide exists where the slide material moves in contact with the underlying surface. Here the slide moves along a plane and either slumps by moving along a curved surface (called a rotational slide) or along a flat surface (called a translational slide). While slow-moving slides that occur on relatively gentle slopes are less likely to cause serious injuries or fatalities, they can result in very significant property damage.

Flows

In this case the landslide is characterized as plastic or liquid in nature in which the slide material breaks up and flows during movement. This type of landslide occurs when a landslide moves down slope as a semi-fluid mass scouring or partially scouring rock and soils from the slope along its path. A flow landslide is typically rapid moving and tends to increase in volume as it moves down slope and scours out its channel.

Rapidly moving flow landslides are often referred to as a debris flow. Other terms given to debris flows are mudslides, mudflows, or debris avalanches. Debris flows frequently take place during or following an intense rainfall on previously saturated soil. Debris flows usually start on steep hillsides as slumps or slides that liquefy, accelerate to speeds as high as 35 miles per hour or more, and travel down slopes and channels onto gentle sloping or flat ground. Most slopes steeper than 70 percent are at risk from debris flows.

The consistency of debris flow ranges from watery mud to thick, rocky, mud-like, wet cement, which is dense enough to carry boulders, trees and cars. Separate debris flows from different starting points sometimes combine in canyons and channels where their destructive energy is greatly increased. Debris flows are difficult for people to outrun or escape from and present the greatest risk to human life. Debris flows have caused most of their damage in rural areas and were responsible from most landslide-related deaths and injuries during the 1996 storm in Oregon.

Conditions Affecting Landslides

Both natural conditions and human activities can play a role in causing landslides. Certain geologic formations are more susceptible to landslides than others. Locations with steep slopes are at the greatest risk of slides. However, the incidence of landslides and their impact on people and property can be accelerated by development. Developers who are uninformed about geologic conditions and processes may create conditions that can increase the risk of or even trigger landslides.

There are four principal factors that affect or increase the likelihood of landslides:

- Natural conditions and processes including the geology of the site, rainfall, wave and water action, seismic tremors and earthquakes and volcanic activity.

- Excavation and grading on sloping ground for homes, roads and other structures.
- Drainage and groundwater alterations that are natural or human-caused can trigger landslides. Human activities that may cause slides include broken or leaking water or sewer lines, water retention facilities, irrigation and stream alterations, and ineffective storm water management and excess runoff due to increased impervious surfaces.
- Change or removal of vegetation on very steep slopes due to timber harvesting, land clearing and wildfire.

History of the Hazard in Your Community

Landslides accompany nearly every major storm system that impacts western Oregon. In recent events, particularly noteworthy landslides accompanied storms in 1964, 1966, 1982, and 1996. Two major landslide producing winter storms occurred in Oregon during November 1996. Intense rainfall on recently and past logged land as well as previously un-logged areas triggered over 9,500 landslides and debris flows that resulted directly or indirectly in eight fatalities throughout the state. Highways were closed and a number of homes were lost. The fatalities and losses resulting from the 1996 landslide events brought about the passage of Oregon Senate Bill 12, which set site development standards, authorized the mapping of areas subject to rapidly moving landslides and the development of model landslide (steep slope) ordinances.

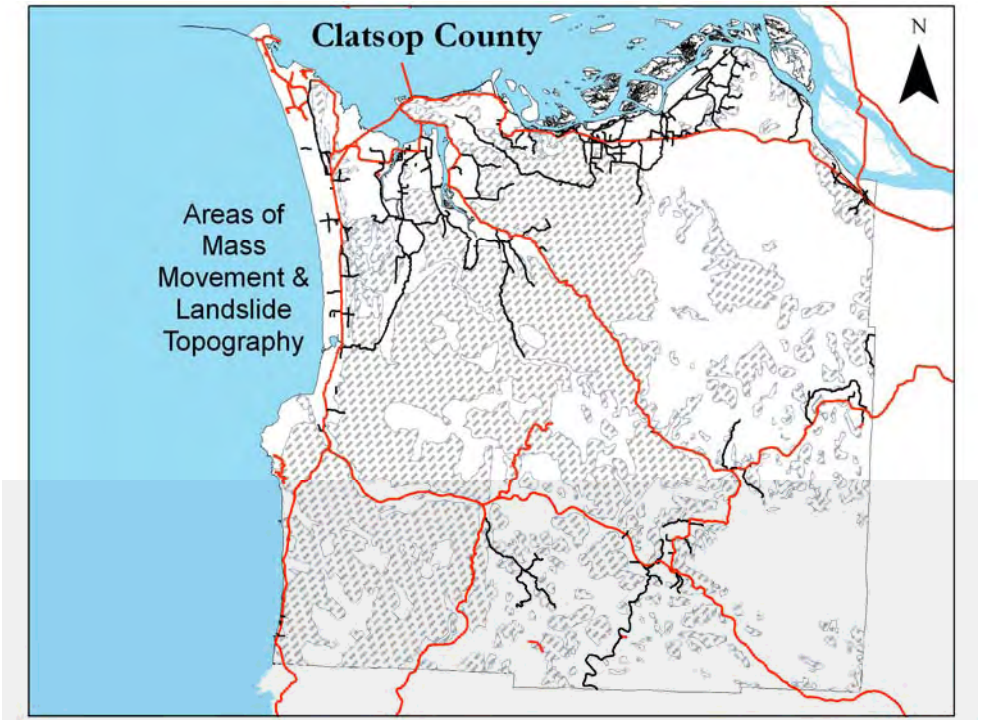
During the December 2007 storm, a landslide occurred near Woodson in neighboring Columbia County – only a few miles from the eastern border of Clatsop County. The slide sent a debris flow through the hamlet of Woodson, across Highway 30, and into Westport Slough, destroying several residential structures and covering the highway with mud and large woody debris[i].

Risk Assessment

How are Hazard Areas Identified?

A large portion of the County is at risk due to Mass Movement or Landslide Topography. County government used Geographic Information Systems (GIS) to identify potential hazard areas.

The following map shows the areas of mass movement and landslide topography as identified by Clatsop County. This map was created from data developed by DOGAMI in 1974 and 1979. Properties in these areas are subject to added requirements to mitigate for landslides. (See Existing Mitigation Activities below for more information).



Source: Clatsop County & DOGAMI Bulletins 74 & 79

Probability of Future Occurrence

Clatsop County's Hazard Analysis Report (July 2003) ranked Clatsop County's probability for landslides as 'high.'[ii] A 'high' ranking indicates that one incident is likely to occur within a 35-75 year period. The Clatsop County Steering Committee agrees with this assessment.

The probability of rapidly moving landslides occurring depends on a number of factors; these include steepness of slope, slope materials, local geology, vegetative cover, human activity, and water. There is a strong correlation between intensive winter rainstorms and the occurrence of rapidly moving landslides (debris flows); consequently, the Oregon Department of Forestry tracks storms during the rainy season, monitors rain gages and snow melt, and issues warnings as conditions warrant. Given the correlation between precipitation / snow melt and rapidly moving landslides, it would be feasible to construct a probability curve. The installation of slope indicators or the use of more advanced measuring techniques could provide information on slower moving slides.

Vulnerability Assessment

Rain-induced landslides and debris flows can potentially occur during any winter in Clatsop County. To minimize future landslide impacts to new development, hazards areas must be identified and siting standards applied.

Clatsop County's Hazard Analysis Report (July 2003) ranked Clatsop County's vulnerability to landslides as 'moderate.'[iii] A 'moderate' ranking

indicates that 1-10% of the population or county assets are likely to be affected by a major landslide emergency or disaster. The Clatsop County Steering Committee agrees with the Hazard Analysis Report ranking.

Risk Analysis

Approximately 4,809 existing dwelling units in the County are within a geological hazard area that is identified as Mass Movement or Landslide Topography.

Community Hazard Issues

What is susceptible to damage during a hazard event?

Depending upon the type, location, severity and area affected, severe property damage, injuries and loss of life can be caused by landslide hazards. Landslides can damage or temporarily disrupt utility services, roads and other transportation systems and critical lifeline services such as police, fire, medical, utility and communication systems, and emergency response. In addition to the immediate damage and loss of services, serious disruption of roads, infrastructure and critical facilities and services may also have longer-term impacts on the economy of the community and surrounding area.

Most slopes in Clatsop County steeper than 70% have a risk of rapidly moving landslide activity regardless of geologic unit. Areas directly below these slopes in the paths of potential landslides are at risk as well. The combination of steep slopes and geologic formation (sedimentary rock units) contributes to the increased hazard risk.

Existing Hazard Mitigation Activities

- Geotechnical site evaluations are required for new construction in geological hazard areas as required by the County's Land and Water Development and Use Ordinance. State of Oregon Building Code requirements are also enforced.
- Expansion of Geographic Information Systems has increased availability and accuracy in identifying hazard areas.
- Clustering of development is encouraged to minimize and reduce disruption of soil and thus maintain the integrity of soil composition.
- Lot size for specific zoning designations in Clatsop County are dependant upon the slope of the land. The greater the slope, the larger the lot size must be. This assists in creating smaller footprint on lands that may be prone to erosion or landslides.
- Erosion control plans are required for any development that requires the disturbance of soil. A brochure outlining erosion

control techniques and sample plans is made available to those applying for development permits.

- Clatsop County Public Works utilizes retaining walls and slope restoration techniques to stabilize areas prone to landslides. In addition, major excavation areas are hydro seeded and re-vegetated with native species. County roads have been realigned to move them away from slide prone areas.

Hazard Mitigation Action Items

- Build new access road on east side of Astoria from Hwy 30.
- Continue upgrading and enhancing GIS data in order to more efficiently identify areas prone to landslide and mass movement.
- Develop alternative transportation routes around slide-prone areas in County.

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[i] GeoScience, Inc,. 2008. Debris Flow Assessment Eilertsen Creek/Woodson.

[ii] Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

[iii] Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

Volume II: Hazard Annex
Tsunami

Causes and Characteristics of the Hazard

Tsunamis are induced hazards created by events occurring under the ocean. A tsunami, often incorrectly referred to a "tidal wave," is a series of waves that can travel great distances from the earthquake's origin and can cause serious flooding and damage to coastal communities.

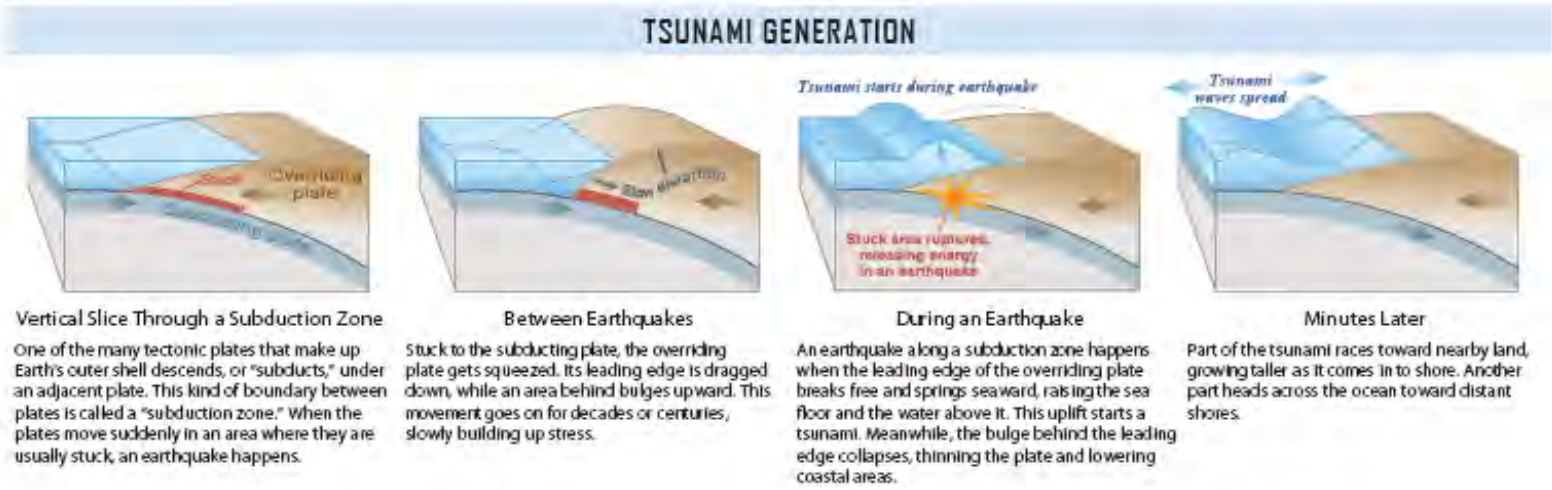
A tsunami usually begins as a single ocean wave but quickly becomes a series of waves, initiated by earthquakes, underwater volcanic eruptions, or landslides (including landslides that begin below the water surface or enter a deep body of water from above the water surface). It is also possible that a tsunami can be generated by a meteoroid, asteroid, or comet impacts that can be catastrophic to an entire ocean basin.

The wavelength of a tsunami may be 100 miles or more in the ocean, with a surface wave height of only a few feet or more. These waves have the potential to travel up to 500 m.p.h. As tsunamis approach shallow water, the speed of the tsunami will slow, but wave heights may increase to as much as 100 feet.

Tsunamis can be divided geographically into two categories: those of distant origin and those locally caused. The distant tsunami is generated by a subduction zone earthquake far out in the Pacific and takes up to 24 hours to reach the coast of Oregon. A local tsunami is generated by a subduction earthquake near the Oregon coastline and would take mere minutes to reach land. In the past, Oregon has experienced both types.[i]

While all types of quakes possess the potential to cause tsunamis, subduction zone earthquakes pose the greatest danger.[ii] The Cascadia Subduction Zone (CSZ) off the Oregon coast is a source for such events. More information on the CSZ can be found in the earthquake hazard annex. More details about the tsunami generation can be seen in Figure 1.

Figure 1. Tsunami Generation



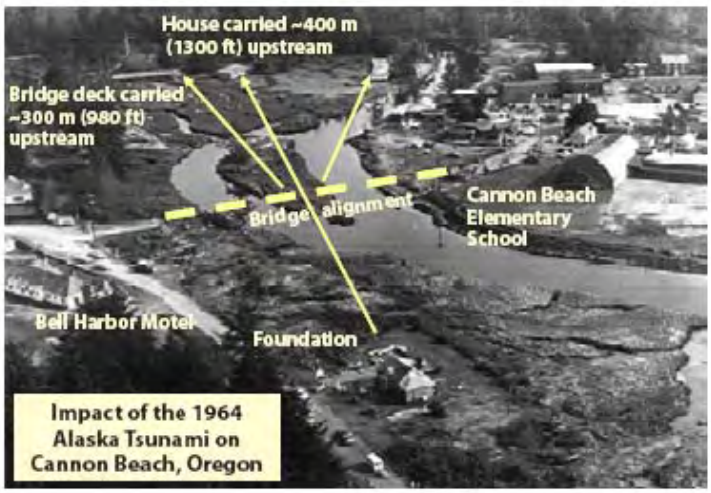
Source: U.S. Geological Survey Circular 1187

History of the Hazard in Your Community

Tsunamis have historically been rare in Oregon. Since 1812, Oregon has experienced about a dozen tsunamis with wave heights greater than 3 feet; some of these were destructive. Ten of these were generated by distant earthquakes near Alaska, Chile or Japan. The worst damage and loss of life resulted from the 1964 Alaskan earthquake.

The tsunami resulting from the 1964 earthquake killed four people (campers on a beach in Newport, OR) and caused around one million dollars in damage to bridges, houses, cars, boats, and sea walls.[iii] The greatest tsunami damage in Oregon occurred in the estuary channels located further inland, not along the coast as expected. The estuary channels amplified the tsunami wave heights and caused extreme flooding. Seaside, which was struck by a 10-foot wave, was the hardest hit city in Oregon due to its level topography and proximity to the ocean. Tsunami wave heights reached 10 to 11.5 feet in the Nehalem River, 10 to 11.5 feet at Depoe Bay, 11.5 feet at Newport, 10 to 11 feet at Florence, 11 feet at Reedsport, 11 feet at Brookings, and 14 feet at Coos Bay.[iv] For reference, the impact of the tsunami in Cannon Beach can be seen in Figure 2.

Figure 2. Impact of the 1964 Alaska Tsunami on Cannon Beach, OR



Source: Hillsboro Argus, March 30, 1964

A tsunami also struck the Oregon coast in 1700 and has been documented by Native American folklore. The 1700 tsunami was the last recorded tsunami triggered by a Cascadia subduction zone earthquake.[v]

Risk Assessment

How are Hazard Areas Identified?

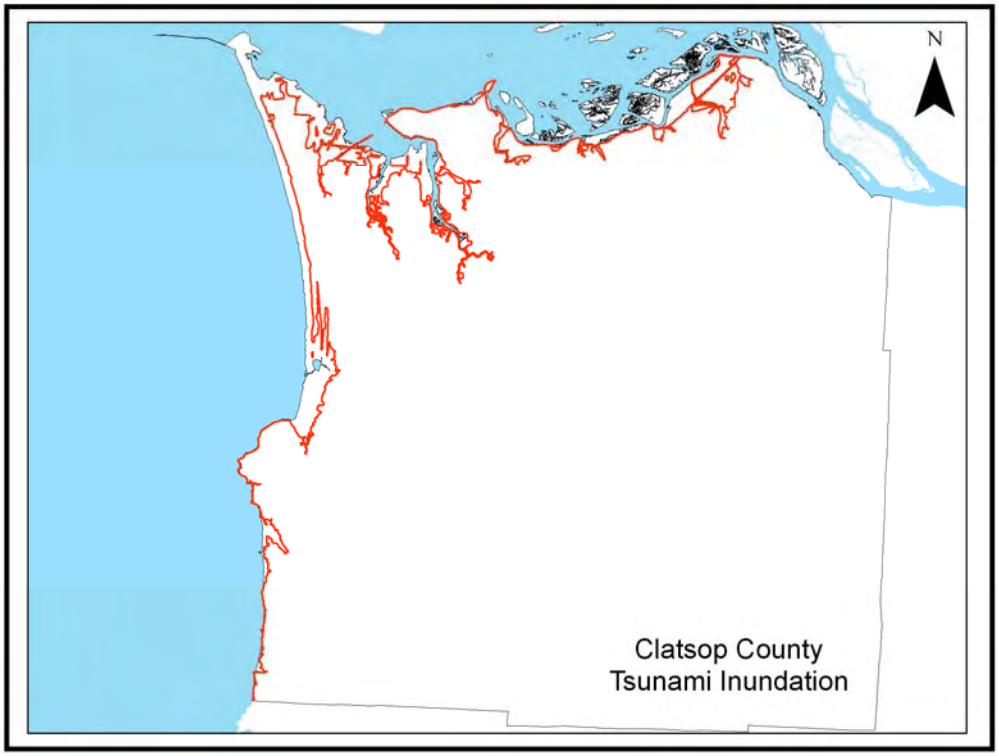
The Oregon Department of Geology and Mineral Industries (DOGAMI) has collaborated with the Oregon Graduate Institute and NOAA to create tsunami inundation maps for several areas in Clatsop County, including Seaside, and Warrenton/Astoria using regional tsunami simulations and professional judgment. These maps are used for emergency response planning. DOGAMI plans to produce these maps for other coastal communities in Oregon with the help of local steering committees.

These inundation maps are created with local emergency officials to confirm the boundaries' locations are accurate and meet the needs of local governments. DOGAMI works with local building code officials to administer ORS 455.446 and ORS 455.447 which limit construction of critical and essential facilities in designated tsunami inundation zones.

DOGAMI is currently working on using LIDAR, computer technology and computer modeling to map the tsunami inundation zones in Oregon. The tsunami inundation zones can't be 'mapped' by LIDAR, per se – but better mapping of coastal lands (i.e., surface, shape, height, etc.) can produce more accurate inundation maps. Cannon Beach is serving as the pilot project for this effort. This mapping method is scenario-based and attempts

to express what could be expected from a tsunami in the event of a Cascadia subduction zone earthquake or another distant earthquake.[vi]

Figure 3 Map of the Tsunami Inundation Zone for Clatsop County



Probability of Future Occurrence

Clatsop County has a "moderate" probability of experiencing a tsunami event. Given the past pattern of tsunami occurrence on the Oregon Coast, geologists predict a 10-14 percent chance that a Cascadia subduction zone earthquake will occur within the next 50 years, causing a tsunami that will affect the Oregon coast. This forecast comes from evidence for large but infrequent earthquakes and tsunamis that have occurred at the Oregon coast, on average, every 500 years.[vii]

Vulnerability Assessment

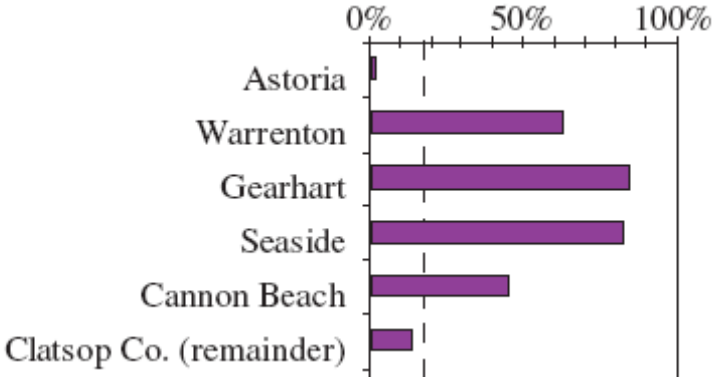
Clatsop County is "highly" vulnerable to a tsunami event. This score indicates that a minimum of 10% of the population or County assets are likely to be affected by a tsunami emergency or disaster.

Along the Oregon Coast there can be a moderate to high level of vulnerability to tsunamis below 100 feet above mean sea level. The County is vulnerable due the exposure of its population centers (and tourist

destinations) to the tsunami hazard. Likewise, County residents' abilities to escape the tsunami inundation zone post-earthquake are highly limited.

Clatsop County is especially vulnerable to tsunamis because of its large amount of coastline along with the fact that much of the development and population is near the coast and in tsunami inundation zones (See DOGAMI inundation zone maps above). Figure 4 shows the percentages of residents in Clatsop County that live within the Tsunami Inundation Zone.

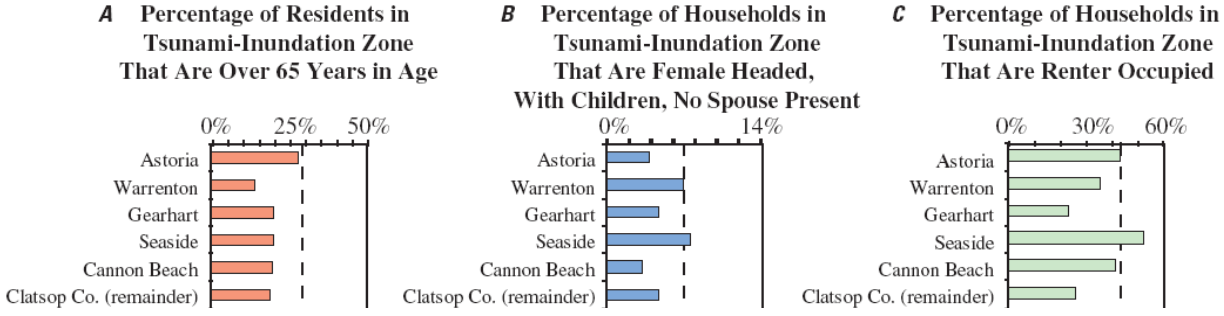
Figure 4 Percentage of Clatsop County Residents in Tsunami-Inundation Zone



Source: Wood, N. 2007. Variations in Community Exposure and Sensitivity to Tsunami Hazards in Oregon. U.S. Geological Survey Scientific Investigations Report 2007-5283.

In natural hazard situations, it is important to be aware of high-risk populations living within the hazard zone. Figure 5 shows three categories of high-risk residents - elderly, single mother households, and renters – and their presence within the tsunami inundation zone. Renters (including seasonal residents) are the most prevalent high-risk population within the inundation zone in Clatsop County and are a difficult population to address because they can move frequently and might not have community connections for information.

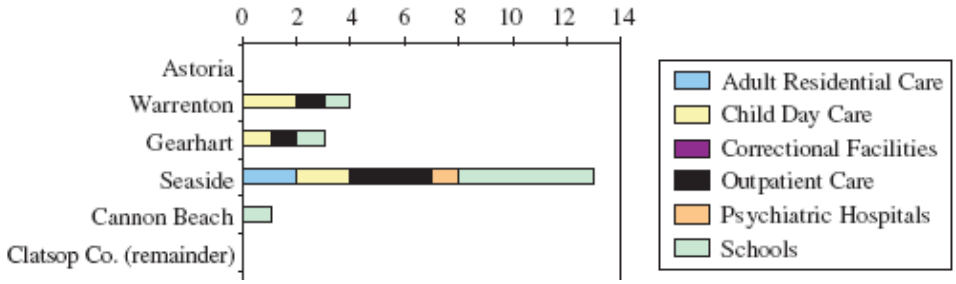
Figure 5 Percentage of high-risk populations within tsunami inundation zones



Source: Source: Wood, N. 2007. Variations in Community Exposure and Sensitivity to Tsunami Hazards in Oregon. U.S. Geological Survey Scientific Investigations Report 2007-5283.

Clatsop County has many dependent population care facilities within the tsunami inundation zone. Figure 6 shows the presence of these facilities; the majority of these facilities are schools and day care facilities.

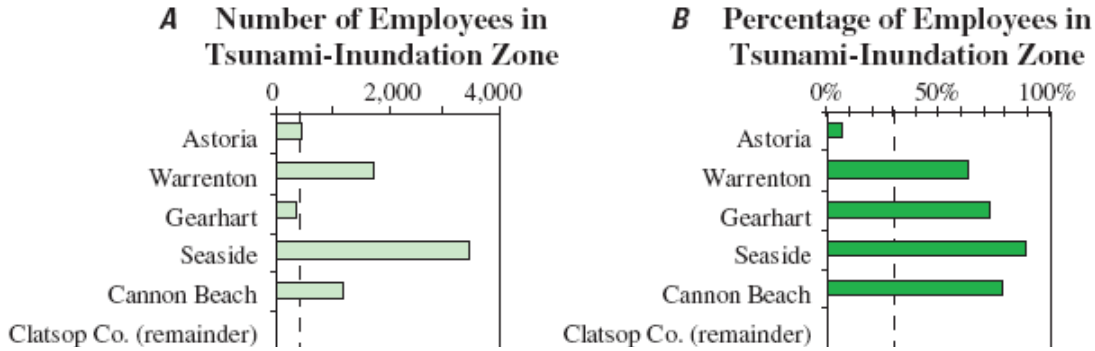
Figure 6 Number of Dependent-Population Facilities in Tsunami-Inundation Zone



Source: Wood, N. 2007. Variations in Community Exposure and Sensitivity to Tsunami Hazards in Oregon. U.S. Geological Survey Scientific Investigations Report 2007-5283.

Clatsop County is also economically vulnerable to tsunamis. As seen in Figure 7, a significant number and percentage of Clatsop County residents are employed in tsunami inundation zones. Employees in Warrenton, Gearhart, Seaside and Cannon Beach are especially vulnerable.

Figure 7 Number (A) and percentage (B) of employees in the Clatsop County tsunami-inundation zone.



Source: Wood, N. 2007. Variations in Community Exposure and Sensitivity to Tsunami Hazards in Oregon. U.S. Geological Survey Scientific Investigations Report 2007-5283.

The City of Seaside is the most vulnerable city due to its low elevation and high number of residents and tourist population within the predicted inundation zone. Although many communities have evacuation maps and evacuation plans, many casualties are expected. The built environment in the inundation zone will be especially hard hit.

Risk Analysis

Approximately 5,475 dwelling units are within the Tsunami Inundation Zone of Clatsop County. According to the Clatsop County Assessor the average Real Market Value of these dwellings is $223,261.

Community Hazard Issues

What is susceptible to damage during a hazard event?

The areas of Clatsop County along the coast and estuaries have the greatest risk of being damaged during a tsunami. An earthquake has the potential to drop low-lying coastal regions several feet below sea level. Tsunami waves could reach 80 ft, which would severely flood coastal communities near beaches, along with bay mouths and low-elevation coastal plains. In Oregon, these areas provide residences for about 40,000 people. This number excludes tourists and transient populations, which could increase the number significantly.[viii]

Tsunamis also have the potential to flood and damage important transportation networks. In Clatsop County, Highway 101 is the main road and is often the only route in and out of cities. Highway 101 runs along the coast and in some cases, is within the tsunami inundation zone. As a result, Highway 101 and connecting arterials have the potential to be damaged by tsunami floods as well as hinder transportation of goods throughout the region.

Existing Hazard Mitigation Activities

- Hazards Outreach Specialist – Oregon State University Clatsop County Extension office has a Hazards Outreach Specialist, Patrick Corcoran, who performs the following duties in the County on tsunami/natural hazards awareness: presentations for public and local officials, radio interviews, local capacity building, establishing partnerships between local officials and outside experts, etc.
- The Cities of Seaside and Warrenton have hired a hazards preparedness coordinator for a variety of local projects. This contractor, Deb Treusdell, has worked on tsunami hazard preparedness for Seaside as well as similar projects for Warrenton.
- The City of Cannon Beach has worked with DOGAMI to update their tsunami inundation lines following research collected from the 2004 Sumatra event.
- The City of Seaside has worked with OSU on tsunami wave modeling to research vertical evacuation route possibilities.
- USGS Scientist, Nate Wood, published a report on the vulnerability of coastal cities to a tsunami event. Clatsop County ranked as the most vulnerable coastal county based on the city rankings.

Hazard Mitigation Action Items

- Rebuild four Seaside School District schools outside of the tsunami inundation zone.
- Build "tsunami towers" in coastal cities
- Complete tsunami risk assessment for Clatsop County

- Improve public notification and warning system
- Relocate Arch Cape Fire Station out of the tsunami inundation and flood zones.
- Elevate Brownsmead Rural Fire District Station
- Establish long term supply and assembly areas outside of inundation zones.
- Upgrade and improve evacuation routes as well as assembly areas outside of tsunami inundation zones
- Seismic vulnerability assessment/vertical evacuation routes
- Conduct preliminary research on the development of a County Land Use Ordinance relating to Tsunami Hazards.

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[i] Partnership for Disaster Resilience, State of Oregon Natural Hazard Mitigation Plan (2002), http://www.oregonshowcase.org/downloads/pdf stateplan /OR-SNHMP_tsunami_chapter.pdf.

[ii] Oregon Department of Geology and Mineral Industries. Geologic Hazards on the Oregon Coast: Prehistoric and historic tsunamis, http://www.oregongeology.com/sub/earthquakes/Coastal/HistoricTsunamis.htm

[iii] Oregon Department of Geology and Mineral Industries. Geologic Hazards on the Oregon Coast: Prehistoric and historic tsunamis, http:// www. Oregongeology .com/

[iv] University of Southern California Tsunami Research Group. *1964 Alaskan Tsunami*. http://www.usc.edu/dept/tsunamis/alaska/1964/webpages /index.html.

[v] Oregon Department of Geology and Mineral Industries. *Oregon Geology Fact Sheet: Tsunami Hazards in Oregon*. http://www.oregongeology.com/sub/publications/tsunami-factsheet_onscreen.pdf.

[vi] Oregon Department of Geology and Mineral Industries, http://www.oregon.gov/DOGAMI/index.shtml Is this meant to reference a particular document on their webpage?

[vii] Oregon Department of Geology and Mineral Industries. *Oregon Geology Fact Sheet: Tsunami Hazards in Oregon*. http://www.oregongeology.com/sub/publications/tsunami-factsheet_onscreen.pdf.

[viii] Oregon Department of Geology and Mineral Industries. *Oregon Geology Fact Sheet: Tsunami Hazards in Oregon*. http://www.oregongeology.com/sub/ publications /tsunami-factsheet_onscreen.pdf.

Volume II: Hazard Annex
Volcano

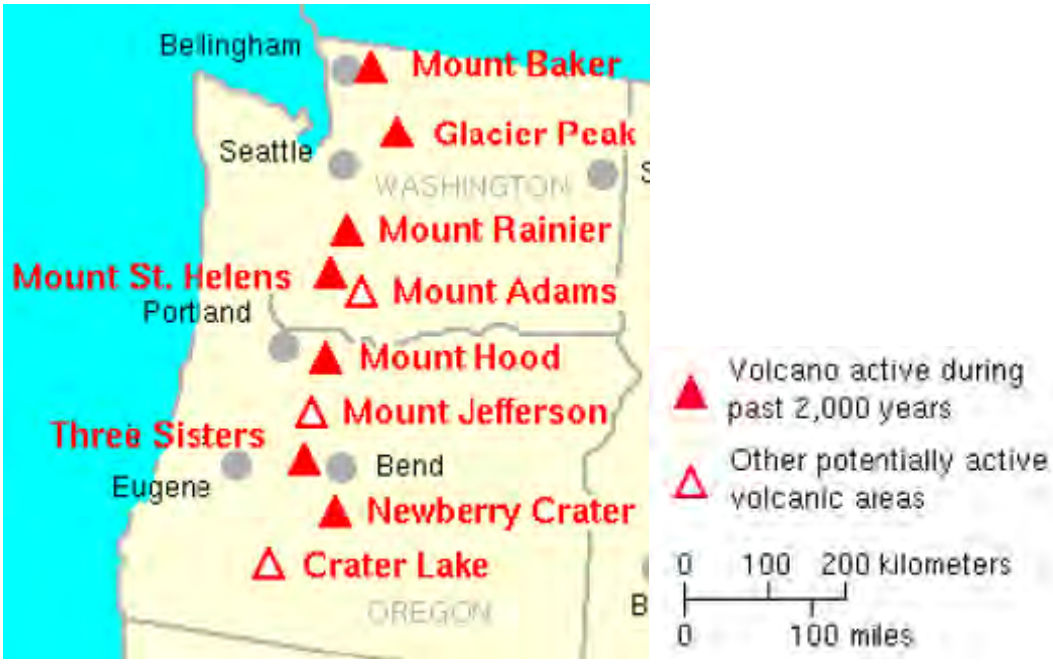
Causes and Characteristics of the Hazard

The Cascade Range of the Pacific Northwest has more than a dozen active volcanoes. These snow-clad peaks are part of a 1,000 mile-long chain of mountains, which extend from southern British Columbia to northern California. Cascade volcanoes tend to erupt explosively, and have occurred at an average rate of 1-2 per century during the last 4,000 years. Future eruptions are certain. Seven Cascade volcanoes have erupted since the first U.S. Independence Day slightly more than 200 years ago. Four of those eruptions would have caused considerable property damage and loss of life had they occurred today without warning. The most recent events were Mt. St. Helens in Washington (1980-86) and Lassen Peak in California (1914-1917). The existence, position and recurrent activity of Cascade volcanoes are generally thought to be related to the convergence of shifting crustal plates. As population increases in the Pacific Northwest, areas near volcanoes are being developed and recreational usage is expanding. As a result more and more people and property are at risk from volcanic activity.

The effects of a major volcanic event can be widespread and devastating. The Cascade Range in Washington, Oregon and northern California is one of the most volcanically active regions in the United States. Volcanoes produce a wide variety of hazards that can destroy property and kill people. Large explosive eruptions can endanger people and property hundreds of miles away and even affect the global climate. Some volcano hazards such as landslides can occur even when a volcano is not erupting.

Although there are no active volcanoes in Clatsop County (the closest volcano is Mt. Hood, Figure 1), it is important for counties to know the potential impacts of nearby volcanoes. While immediate danger area around a volcano is approximately 20 miles, ash fall problems may occur as much as 100 miles or more from a volcano's location; therefore, ash fall may affect Clatsop County. Table 1 displays the distances between Clatsop County and the nearest volcanoes.

Figure 1 Potentially Active Volcanoes in Oregon and Washington



Source: USGS, 1999 <http://vulcan.wr.usgs.gov/Volcanoes/WesternUSA/Maps/map_potentially_active.html>

Table 1 Volcanoes closest to Clatsop County

Volcano	Distance from Clatsop County	Last Event
Mt. Hood	95 mi	1790s
Mt. Jefferson	115 mi	Between 35,000 and 100,000 years ago
Mt. St Helens	60 mi	May 18, 1980
Mt. Adams	90.4	More than 3,500 years ago
Mt. Rainier		1882

Source: USGS

Eruption Columns and Clouds

An explosive eruption blasts solid and molten rock fragments called tephra and volcanic gases into the air with tremendous force. The largest rock fragments called 'bombs' usually fall back to the ground within two miles of the event. Small fragments (less than 0.1 inch across) of volcanic glass, mineral and rock (ash) rise high into the air forming a huge, billowing eruption column. Eruption columns creating an eruption cloud can grow rapidly and reach more than 12 miles above a volcano in less than 30 minutes. Volcanic ash clouds can pose serious hazards to aviation. Several commercial jets have nearly crashed because of engine failure from inadvertently flying into ash clouds.

Large eruption clouds can extend hundreds of miles downwind resulting in ash fall over enormous areas. Ash from the May 18, 1980 Mt. St. Helens eruption fell over an area of 22,000 square miles in the western U.S. Heavy

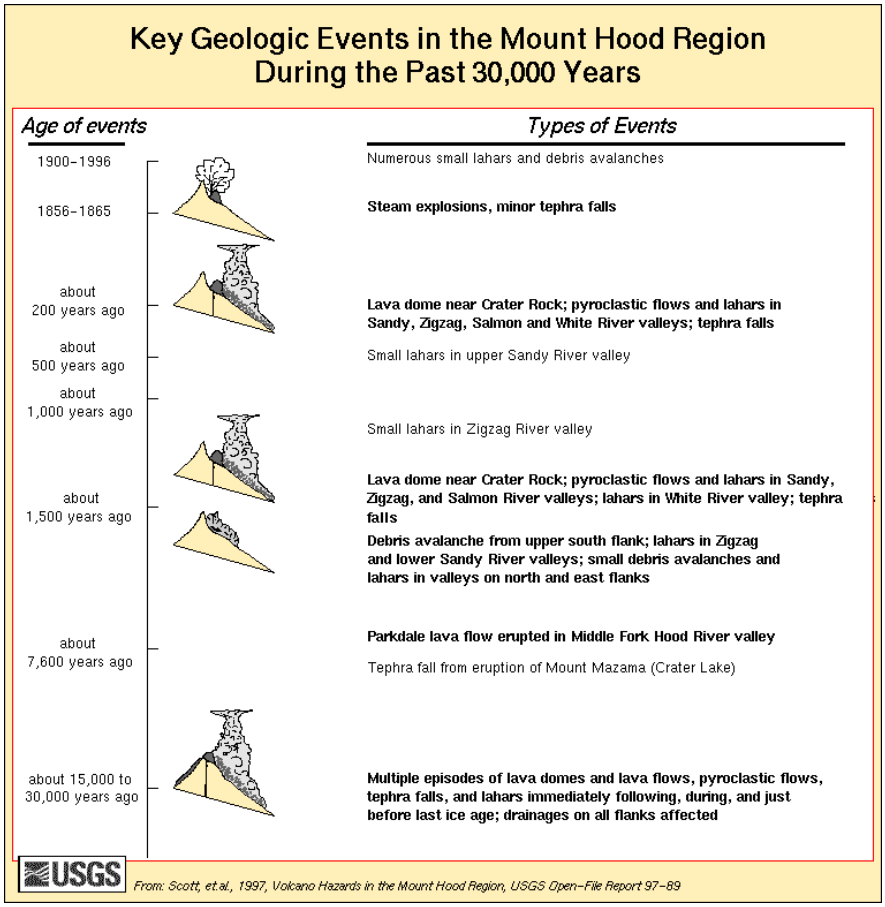
ash fall, particularly when mixed with rain, can collapse buildings and even a minor ash fall can damage crops, electronics and machinery.

For more information on the volcanic hazard, please visit the State Plan's Volcano chapter.

History of the Hazard in Your Community

According to the Department of Geology and Mineral Industries (DOGAMI), Mt. Hood and Mt. St. Helens are the volcanoes that could impact Clatsop County.[i] Mt. Hood is a volcano approximately 90 miles southeast of the southeastern corner of the County. Given that most of Clatsop County's population in located in the northern and western areas of the County and that volcanic ash would follow eastward wind patterns, it is unlikely that a volcanic event at Mt. Hood would significantly impact Clatsop County.[ii] There have been no recorded effects from eruptions of Mt. Hood. The history of Mt. Hood is detailed in Figure 2.

Figure 2 Key Geological Events in the Mt. Hood Region during the Past 30,000 Years



Source: *W.E. Scott et al., 1997*, http://vulcan.wr.usgs.gov/Volcanoes/Hood/Hazards/OFR97-89/key_geologic_events_30000yrs.html

Mt. St. Helens is a volcano in Washington State located about 60 miles to the east of Clatsop County. It is the most active volcano in the Cascade Range. Its last major eruption occurred on May 18th, 1980 when a large landslide and powerful explosive eruption created a large crater, and ended 6 years later after more than a dozen extrusions of lava built a dome in the crater.[iii] Larger, longer lasting eruptions have occurred in the volcano's past and are likely to occur in the future. Clatsop County was also impacted from the eruption of Mt St Helens on May 18th, 1980.

Risk Assessment

How are Hazard Areas Identified?

To identify the areas that are likely to be affected by future events, pre-historic rock deposits are mapped and studied to learn about the types and frequency of past eruptions at each volcano. This information helps scientists to better anticipate future activity at a volcano, and provides a basis for preparing for the effects of future eruptions through emergency planning.

Scientists also use wind direction to predict areas that might be affected by volcanic ash; during an eruption that emits ash, the ashfall deposition is controlled by the prevailing wind direction. The predominant wind pattern over the Cascades is from the west, and previous eruptions seen in the geologic record have resulted in most ashfall drifting to the east of the volcanoes. The potential and geographical extent of volcanic ashfall from Mt. Hood and Mt. St. Helens are depicted in Figures 3 and 4, respectively.

Figure 3 Map showing annual probability of 10 cm (~4 inches) or more tephra accumulation in Oregon and Washington from eruptions throughout the Cascade Range (Clatsop County is circled in red).

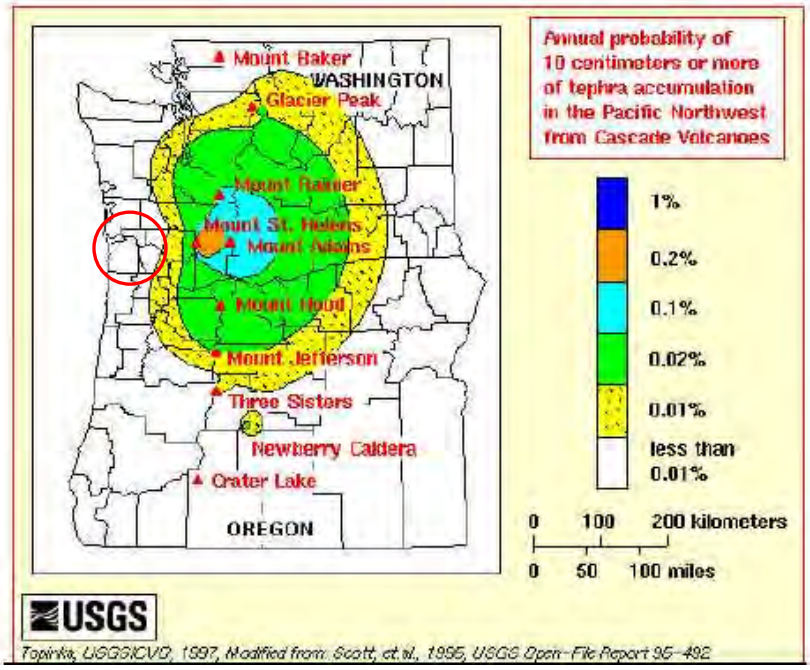
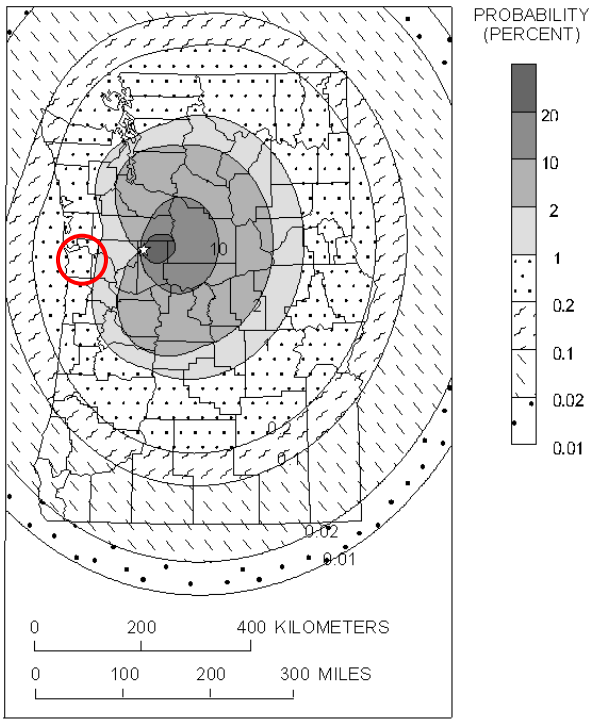


Figure 4 Map of Washington and Oregon showing the percentage probability of accumulation of ten or more centimeters (four or more inches) of tephra from a large eruption of Mount St. Helens



Source: USGS. <http://vulcan.wr.usgs.gov/Imgs/Gif/MSH/OFR95-497/figure2.gif>

Probability of Future Occurrence

Due to the distance from Cascadian volcanoes, there is a 'low' probability that Clatsop County will experience the effects of a volcanic event.[iv] The Clastop County Steering Committee agrees with this probability ranking. A 'low' ranking indicates that one event is not likely to occur more than once in a 75-100 year period.

Vulnerability Assessment

Due to the distance from Cascadian volcanoes the County Steering Committee estimates a 'low' vulnerability to volcanic events. A low ranking indicates that less than 1% of the population or regional assets are likely to be affected by a major event.

Risk Analysis

Because of the distance between Cascadian volcanoes and Clatsop County, there is not a significant volcanic risk. There is a slight chance of volcanic debris falling to the earth in Clatsop County due to a Cascadian volcanic eruption. Estimates of damages and losses resulting from volcanic ash are not available at this time.

Community Hazard Issues

What is susceptible to damage during a hazard event?

Structural damage can result from the weight of volcanic ash, especially if it is wet. Four inches of wet ash may cause buildings to collapse. A half-inch of ash can impede the movement of most vehicles and disrupt transportation, communication, and utility systems, and cause problems for human and animal respiratory systems. It is extremely dangerous for aircraft, particularly jet planes; volcanic ash can damage critical engine components, coat exposed electrical components, and erode exposed structure. Ashfall may severely decrease visibility, and can even cause darkness, which can further disrupt transportation and other systems.

Ashfall can severely degrade air quality, triggering health problems. In areas with considerable ashfall, people with breathing problems might need additional services from doctors or emergency rooms. In severe events, an air quality warning could be issued, similar to those given on poor air quality days during the summer. This would, for example, warn people with breathing problems not to go outside. On roads and streets, ashfall can create serious traffic problems as well as road damage. Vehicles moving over even a thin coating of ash can cause clouds of ash to swell. This results in visibility problems for other drivers, calling for speed restrictions, and often forcing road closures. It also adds to the potential for health problems for residents in the area.

Extremely wet ash creates very slippery and hazardous road conditions. Ash that fills roadside ditches and culverts can prevent proper drainage and cause shoulder erosion and road damage. Blocked drainages can also

trigger debris flows or lahars if they cause water to pool on or above susceptible slopes. Conventional snow removal methods do not work on dry ash, as they only stir it up and cause it to resettle on the roadway. When ash is pushed to the side of travel lanes, wind and vehicle movement continue to cause it to billow.

Existing Hazard Mitigation Activities

None exist.

Hazard Mitigation Action Items

- Increase public education and outreach in natural hazards which affect the north coast.

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[i] Personal Communication with Bill Burns, Engineering Geologist.
Oregon Department of Geology and Mineral Industries (DOGAMI). Feb 1, 2008.

[ii] U.S. Department of the Interior and U.S. Geological Survey. *Volcano Hazards in the Mount Hood Region, Oregon, http://vulcan.wr.usgs.gov/Volcanoes/Hood/Hazards/*

[iii] USGS. Mt. St. Helens Volcano. *http://vulcan.wr.usgs.gov/Volcanoes/MSH/framework.html.*

[iv] Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

Volume II: Hazard Annex
Wildfire

Causes and Characteristics of the Hazard

Fire is an essential part of Oregon's ecosystem, but it is also a serious threat to life and property particularly in the state's growing rural communities. Wildfires are fires occurring in areas having large areas of flammable vegetation that require a suppression response. Areas of wildfire risk exist throughout the state with areas in central, southwest and northeast Oregon having the highest risk. The Oregon Department of Forestry has estimated that there are about 200,000 homes in areas of serious wildfire risk.

The impact on communities from wildfire can be huge. In 1990, Bend's Awbrey Hall Fire destroyed 21 homes, causing $9 million in damage and costing over $2 million to suppress. The 1996 Skeleton fire in Bend burned over 17,000 acres and damaged or destroyed 30 homes and structures. Statewide that same year, 218,000 acres were burned, 600 homes threatened and 44 homes were lost. The 2002 Biscuit fire in southern Oregon affected over 500,000 acres and cost $150 million to suppress.

Wildfire can be divided into three categories: interface, wildland, and firestorms. Although Clatsop County is most susceptible to interface fires, wildland and firestorm events are also possible.

Interface Fires

Essentially an interface fire occurs where wildland and developed areas come together with both vegetation and structural development combining to provide fuel. The wildland/urban interface (sometimes called rural interface in small communities or outlying areas) can be divided into three categories.

- The classic wildland/urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas.
- The mixed wildland/urban interface is more typical of the problems in areas of exurban or rural development: isolated homes, subdivisions, resorts and small communities situated in predominantly wildland settings.
- The occluded wildland/urban interface where islands of wildland vegetation exist within a largely urbanized area.

Wildland Fires

A wildland fire's main fuel source is natural vegetation. Often referred to as forest or rangeland fires, these fires occur in national forests and parks, private timberland, and on public and private rangeland. A wildland fire can become an interface fire if it encroaches on developed areas.

Firestorms

Firestorms are events of such extreme intensity that effective suppression is virtually impossible. Firestorms often occur during dry, windy weather and generally burn until conditions change or the available fuel is consumed. The disastrous 1991 East Bay Fire in Oakland, California is an example of an interface fire that developed into a firestorm.

Conditions Contributing to Wildfires

Ignition of a wildfire may occur naturally from lightning or from human causes such as debris burns, arson, careless smoking, and recreational activities or from an industrial accident. Once started, four main conditions affect the fire's behavior: fuel, topography, weather and development.

Fuel is the material that feeds a fire. Fuel is classified by volume and type. As a western state, Oregon is prone to wildfires due to its prevalent conifer, brush and rangeland fuel types.

Topography influences the movement of air and directs a fire's course. Slope and hillsides are key factors in fire behavior. Unfortunately, hillsides with steep topographic characteristics are also desirable areas for residential development.

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

The increase in residential development in interface areas has resulted in greater wildfire risk. Fire has historically been a natural wildland element and can sweep through vegetation that is adjacent to a combustible home. New residents in remote locations are often surprised to learn that in moving away from built-up urban areas, they have also left behind readily available fire services providing structural protection.

History of the Hazard in Your Community

Clatsop County has not had many significant wildfires in the past. This is mostly due to its wet climate. The only urban recorded wildfire occurred in downtown Astoria in early December, 1922. According to the Oregon Department of Forestry, this fire was most likely a structural fire not related to a wildfire.[i]

In 1939, 207,000 acres burned on Saddle Mountain. That was the largest fire recorded over the past 100 years. In addition, the following table lists the

costliest fires in Clatsop County since 1960. This information was collected from the Clatsop County office of the Oregon Department of Forestry.

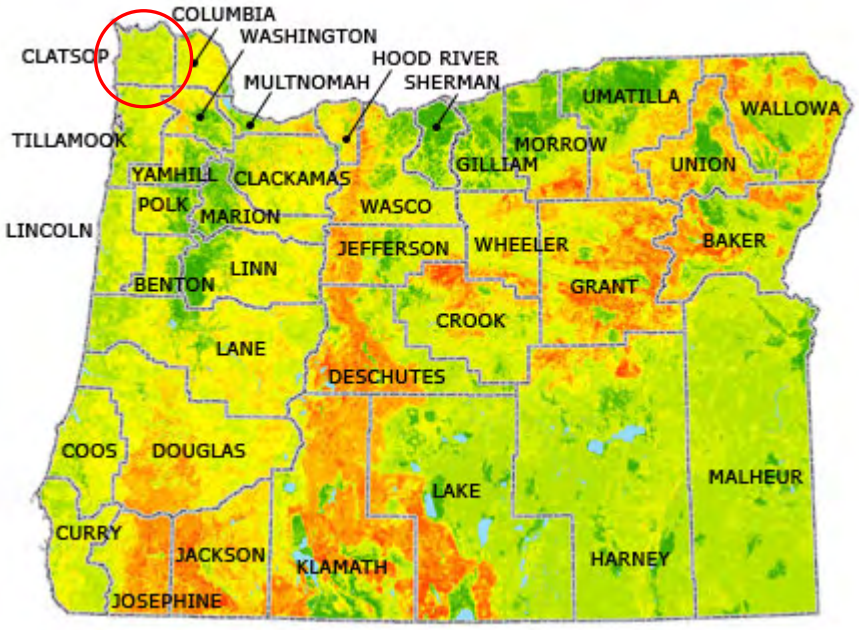
FireYear	FireName	Size_acres	TotalCost	GeneralDesc	Twn	Rng	Sec
1977	77521062	483	$443,101	Debris Burning	05N	08W	02
1988	88521198	45	$237,363	Debris Burning	05N	06W	04
1985	85521140	125	$87,257	Debris Burning	08N	06W	34
1973	73521128	112	$50,814	Smoking	06N	06W	31
1980	80521129	47	$49,354	Debris Burning	04N	10W	25
1989	89521241	64	$48,724	Debris Burning	07N	08W	13
1970	70521470	18	$44,461	Equipment Use	04N	10W	08
1993	HUMBUG MTN.	8	$33,586	Debris Burning	05N	08W	08
1977	77521350	18	$30,607	Debris Burning	06N	07W	25
1987	87521063	5	$26,912	Debris Burning	05N	08W	25
2003	NAVY HEIGHTS	2.5	$26,566	Miscellaneous	8N	9W	10
1986	86521128	12	$23,234	Debris Burning	06N	06W	29
2002	Elk Mtn	40	$22,989	Debris Burning	06N	07W	4
2005	WATERSHED FIRE	7.2	$21,252	Miscellaneous	8N	8W	34
1989	89521244	25	$18,408	Debris Burning	05N	06W	12
1981	81521180	15	$18,250	Equipment Use	08N	07W	29
2004	SOUTH JETTY	6	$17,366	Miscellaneous	9N	11W	26
2006	INDIAN BEACH	0.75	$14,529	Miscellaneous	5N	10W	18
1986	86521129	23	$13,067	Debris Burning	06N	06W	07
1995	West Sager	10	$12,317	Debris Burning	06N	06W	27
1981	81521037	6	$11,778	Smoking	06N	08W	17
1979	79521102	15	$11,768	Debris Burning	07N	07W	22
1982	82521089	10	$11,244	Debris Burning	08N	07W	32
1970	70521363	1	$10,661	Equipment Use	05N	09W	11
1993	HAGLUND ROAD	23	$10,576	Debris Burning	08N	07W	31
1987	87521058	0.7	$10,427	Debris Burning	06N	06W	22
2002	David Douglas	15	$10,242	Debris Burning	5N	8W	29
1989	89521054	80	$10,066	Debris Burning	07N	07W	29

Risk Assessment

How are Hazard Areas Identified?

In defining wildfire hazards, it is clear that one assessment technique is not universal. However, nearly all assessment models consider risk, hazard, protection capabilities and values protected. In addition, an assessment of the vulnerability of values at risk is needed for a community down to parcel level assessments. Complex assessment worksheets are available through Firewise, National Fire Protection Association (NFPA), Regional Atmospheric Modeling System (RAMS), Western Fire Chiefs Association, and the International Fire Code Institute.[ii] Risk Assessments throughout the state of Oregon are shown in Figure 1; Clatsop County has a low to moderate risk rating.

Figure 1 Wildfire Rating for Oregon



(Green-Low Rating; Yellow-Moderate Rating; Red-High Rating; Blue-Water)

Source: Oregon Department of Forestry. < http://egov.oregon.gov/ODF/FIRE/FirePlans.shtml#Community_Wildfire_Protection_Plans__CWPP_>

The Oregon Department of Forestry also determines Fire Weather Hazard Values, which are related to the number of days per season that forest fuels are capable of producing a significant fire. Hazard Values (HV) range from 1 to 12 with 1 being the lowest capacity to sustain a forest fire and 12 being the highest. Clatsop County is divided into Area 1 and Area 2; both these areas have very low hazard rankings, which indicate they are not in a wildfire hazard zone.[iii] HV 1 produces flame lengths up to five feet with little spotting, torching or crowning. HV 2 has flame lengths from 5-8 feet with sporadic spotting, torching or crowning.

Table 1 Fire Weather Hazard Values (OAR 629-44-0230)

COUNTY	HAZARD VALUE
Clatsop, Area 1 - All of Clatsop County except Area 2.	1
Clatsop, Area 2 - That portion of Clatsop County in Township 4 North Range 6 West.	2

Source: http://egov.oregon.gov/OSP/SFM/docs/Comm_Ed/WUI/WHZ.doc

Probability of Future Occurrence

Clatsop County's Hazard Analysis Report (July 2003) ranked Clatsop County's probability for wildfire as 'high.' This score indicates that one incident is likely within a 35 to 75 year period,[iv] and the Clatsop County Steering Committee agrees with this ranking. Wildfires result from natural causes (e.g., lightening strikes), mechanical failures (Oxbow Fire), or

human-caused (unattended campfire, debris burning, or arson); Most wildfires can be linked to human carelessness. The severe fire season of 1987 resulted in a record setting mobilization of fire fighting resources.

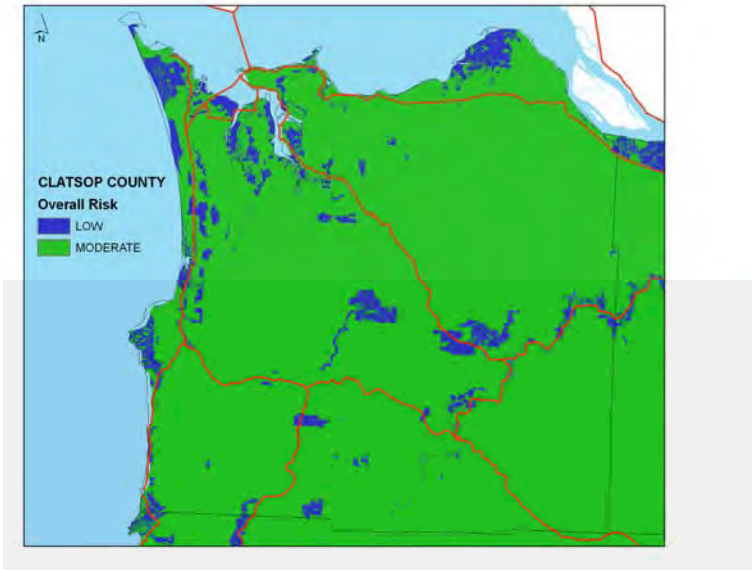
Vulnerability Assessment

Each year a significant number of people build homes within or on the edge of the forest (urban/wildland interface), thereby increasing wildfire hazards. Clatsop County is no exception to this trend. Because of this, Clatsop County is ranked "moderate" in wildfire vulnerability which indicates that 1-10% of the population or region assets are likely to be affected by a major wildfire emergency or disaster.[v] These incidents would most likely occur in the interface communities. The following communities within Clatsop County are considered "Interface Communities.[vi]"

- Arch Cape
- Astoria
- Brownsmead
- Cannon Beach
- Coastal Strip
- Elsie-Vinemaple
- Fern Hill
- Ft. Clatsop
- Hamlet
- Jewell
- Knappa-Svensen
- Lewis & Clark
- Necanicum
- Olney
- Westport

Risk Analysis

Figure 2 Wildfire risk in Clatsop County



Source: Oregon Department of Forestry

Approximately 90% of the land in Clatsop County is forested and susceptible to wildfire.

Community Hazard Issues

What is susceptible to damage during a hazard event?

The effects of fire on ecosystem resources can include damages, benefits, or some combination of both. Ultimately, a fire's effects depend largely on the characteristics of the fire site, the severity of the fire, its duration and the value of the resources affected by the fire.

The ecosystems of most forests and wildland depend upon fire to maintain various functions. These benefits can include, depending upon location and other circumstances, reduced fuel load, disposal of slash and thinned tree stands, increased forage plant production, and improved wildlife habitats, hydrological processes and aesthetic environments. Despite these potential benefits, fire has historically been suppressed for years because of its effects on timber harvest, loss of scenic and recreational values and the obvious threat to property and human life.

At the same time, the effects of a wildfire on the built environment, particularly in the face of a major wildfire event, can be devastating to people, homes, businesses and communities. As noted above, fuel, topography, weather and the extent of development are the key determinants for wildfires. A number of other factors also have been identified which affect the degree of risk to people and property in identified wildfire interface areas. These include:

- Combustible roofing material (for example cedar shakes)
- Wood construction
- Homes and other structures with no defensible space
- Roads and streets with substandard width, grades, weight-load and connectivity standards making evacuation and fire response more difficult
- Subdivisions and homes surrounded by heavy natural fuel types
- Structures on steep slopes covered with flammable vegetation
- Limited on-site or community water supply
- Locations with normal prevailing winds over 30 miles per hour

For more information on the wildfire hazard, please visit the State Plan's Wildfire chapter or the Oregon Technical Resource Guide.

Existing Hazard Mitigation Activities

- All new forest dwellings must meet specific construction, access, and property maintenance standards. These can be found in S3.512 of the Clatsop County Standards Document – *Sitting Requirements for Dwellings and Structure in Forest and Agriculture-Forest Zones.*
- Education and Outreach
- Road Standard requirements found in S6.050 – Table 1 – of the Clatsop County Standards Document. These standards were adopted from the Oregon Fire Code.
- Infrastructure Protection
- Emergency Services Enhancement

Hazard Mitigation Action Items

- Develop and implement the Community Wildfire Protection Plan.

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[i] Brian Ballou, 2002, A Short History of Oregon Wildfires, Oregon Department of Forestry, unpublished; and Oregon Emergency Management, State Natural Hazard Mitigation Plan, 2003, Wildland/Urban Interface chapter.

[ii] Oregon Department of Forestry. 2004. Identifying and assessment of communities at risk in Oregon. http://egov.oregon.gov/ODF/FIRE/docs/WildfireRiskAssessment.pdf.

[iii] Oregon Department of Forestry. 1996. Criteria for Determination of Wildfire Hazard Zones Administration Rules. http://egov.oregon.gov/OSP/SFM/docs/Comm_Ed/WUI/WHZ.doc

[iv] Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

[v] Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

[vi] *Federal Register*: August 17, 2001. V.66, N.160.

Volume II: Hazard Annex
Windstorms & Winter Storms

Causes and Characteristics of the Hazard

Destructive wind and winter storms that produce ice, rain and freezing rain, and high winds have a long history in Clatsop County. Severe storms affecting Oregon with snow and ice typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March.

Ice storms are comprised of cold temperatures and moisture, but subtle changes can result in varying types of ice formation that may include freezing rain, sleet and hail. Of these, freezing rain can be the most damaging of ice formations.

Outside of mountainous areas significant snow accumulations are much less likely in western Oregon than on the east side of the Cascades. However, if a cold air mass moves northwest through the Columbia Gorge and collides with a wet Pacific storm, then a larger snow fall may result in Clatsop County.

High winds can be expected throughout Clatsop County. Destructive windstorms are less frequent, and their pattern is fairly well known. They form over the North Pacific during the cool months (October through March), move along the coast and swing inland in a northeasterly direction. Wind speeds vary with the storms. Gusts exceeding 100 miles per hour have been recorded at several coastal locations (Table 20), but lessen as the storm moves inland. These storms can be very destructive as documented in the now infamous Columbus Day Storm of October 1962. Less destructive storms usually topple trees, power lines, and cause building damage. Flooding can be an additional problem. A large percentage of Oregon's annual precipitation comes from these events.[i]

A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. Although windstorms can affect the entirety of Clatsop County, they are especially dangerous in areas with significant tree stands, and areas with exposed property, major infrastructure, and above ground utility lines. A windstorm can knock down trees and power lines, damage homes, businesses, public facilities, and create tons of disaster related debris.

Though tornadoes are not common in Oregon, these events do occasionally occur and sometime produce significant property damage and even injury. Tornadoes are the most concentrated and violent storms produced by earth's atmosphere, and can produce winds in excess of 300 mph. They have been reported in most of the counties throughout the state since 1887,

but they are most prevalent in the northwest corner of the state, where Clatsop County is located. Most tornadoes are caused by intense local thunderstorms that are common between April and October.

History of the Hazard in Your Community

Clatsop County has had the following winter storms and windstorms during its history. Heavy precipitation aspects associated with storms, which sometimes lead to flooding, are covered in the flood chapter of this plan.

Table 1 Recorded Wind and Winter Storms in Clatsop County

Date	Location	Type	Comments
December 1-3, 2007	Clatsop County	Wind / Rain	Hurricane Force Winds, Rain, and Mudslides
December 14-15, 2006	Clatsop County	Wind / Rain	
November 5-8, 2006	Clatsop County	Wind / Rain	Severe Storms, Flooding, Landslides, and Mudslides
March 20, 2006	Clatsop County	Wind / Rain	
February 19, 2004	Clatsop County	Wind / Rain	
January 23, 1997		Wind / Rain	
December 23, 1996		Wind / Rain	
March 19, 1996		Wind / Rain	
February 9, 1996		Wind / Rain	
February, 1994	Near Warrenton	Tornado	Damage in local park
January 24, 1990		Wind / Rain	
January 1993	North Coast Range	Wind Storm	Inauguration Day Storm major disaster declaration in; resulted in a Washington State
November 1981	Oregon Coast and N. Willamette Valley	Windstorm	Back-to-back storms on the 13th and15th of November
January 25, 1974		Wind / Rain	
January 21, 1972		Wind / Rain	
February 13, 1971		Wind / Rain	
October 1966,	Seaside	Tornado	Windows broken, telephone lines down, outdoor signs destroyed
October	Near Astoria airport	Tornado	Began over ocean and moved inland. Several homes and commercial buildings damaged
December 24, 1964		Wind / Rain	
October 1962	Western Oregon and some locations east of Cascades	Windstorm	Oregon's most famous and most destructive windstorm, the Columbus Day Storm, produced a barometric pressure low of 960 mb (*)
November 1958	Northwest and Northern Oregon	Windstorm	Also produced damaging gusts across Idaho, Montana, Wyoming
March 1, 1957		Wind / Rain	
December 29, 1955		Wind / Rain	
December 1951	Statewide		Barometric pressure low of 968.5 mb near Astoria (*)
January 1921	Oregon coast / Lower Columbia	Windstorm	Winds 113 mph at mouth of Columbia. Gusts at Astoria, 130mph. Widespread damage
January 1880	Western Oregon	Windstorm	Very high winds. 65-80 mph near Portland Flying debris; fallen trees

(*) For the sake of comparison, surface barometric pressures associated with Atlantic hurricanes are often in the range of 910 to 960 mb. The all-time record low sea level barometric pressure recorded was associated with Typhoon Tip in the Northwest Pacific Ocean on October 12, 1979 at 870 mb.

Sources: FEMA < http://www.fema.gov/news/disasters_state.fema?id=41>, Taylor and Hatton, 1999, The Oregon Weather Book, pp. 130-137

Risk Assessment

How are Hazard Areas Identified?

Virtually every area of the County is susceptible to storm damage, especially the coastal and headland areas.

Probability of Future Occurrence

Snowstorms need two ingredients: cold air and moisture. Rarely do the two ingredients occur at the same time over western Oregon, except in the higher elevations of the Coast Range and especially in the Cascades.[ii]

High windstorms occur yearly. More destructive storms occur once or twice per decade. High wind events on the order of the 1962 Columbus Day storm are thought to have a 100-year recurrence interval. Clatsop County's Hazard Analysis Report (July 2003) ranked Clatsop County's probability for windstorms as 'high,' which indicates that at least one major emergency or disaster because of a windstorm is likely within a 10 to 35 year period.[iii] The Clatsop County Steering Committee agrees with this assessment.

Vulnerability Assessment

Many buildings, utilities, and transportation systems in Clatsop County are vulnerable to wind damage. This is especially true in open areas, such as along the Oregon Coast (towns such as Seaside, Gearhart, and Cannon Beach), natural grasslands, or farmland. It also is true in forested areas, along tree-lined roads and electrical transmission lines, and on residential parcels - where trees have been planted or left for aesthetic purposes.

Structures most vulnerable to high winds in Clatsop County include insufficiently-anchored manufactured homes and older buildings in need of roof repair. Manufactured and other non-permanent homes make up 9% of Clatsop County's housing and would require anchoring. In addition, a majority of Clatsop County's permanent housing structures were built before 1980 (Table 2) and would need to replace their original roofs if not already completed.

Table 2 Housing Year Built

Pre 1959	1960-1979	1980-2000
47.1%	26.1%	26.7%

Source: US Census, 2000

Division 530 of the Oregon Building Code identifies high wind areas in Clatsop County and sets anchoring standards for manufactured homes located in those areas.[iv] It is essential that coastal counties ensure that the standards are enforced. The Oregon Department of Administrative Service's inventory of state-owned and operated buildings includes an

assessment of roof conditions as well as the overall condition of the structure. Oregon Emergency Management has arranged this information by county.

Fallen trees are especially troublesome. They can block roads and rails for long periods, which can affect emergency operations. In addition, uprooted or shattered trees can down power and/or utility lines, effectively bringing local economic activity and other essential activities to a standstill. Much of the problem may be attributed to a shallow or weakened root system in saturated ground. Many roofs have been damaged or destroyed by uprooted ancient trees growing next to a house. In some situations, strategic pruning may be the answer. Clatsop County works with utility companies in identifying problem areas and establishing a tree maintenance / removal program.

Tree-lined coastal roads and highways present a special problem in Clatsop County, especially along Highways 30 and 101. This is because much of the traveling public enjoys the beauty of forested corridors and most certainly would be concerned with any sort of tree removal program. In short, any "safety" program involving tree removal must be convincing, minimal, and involve a variety of stakeholders.

Wind-driven waves are common along the Oregon coast and are responsible for road and highway wash-outs and the erosion of beaches and headlands. These problems are addressed under Flood Hazards (i.e., Ocean flooding and wave action). Bridges spanning bays or the lower Columbia River would be closed during high wind periods.

Clatsop County's Hazard Analysis Report (July 2003) ranked Clatsop County's vulnerability to windstorms as 'high.' This indicates that more than10% percent of the population or regional assets are likely to be affected by a major windstorm emergency or disaster.[v] The Clatsop County Steering Committee agrees with this assessment.

Risk Analysis

Damages and lost estimates related to wind and winters storms are not available at this time. Post-disaster damage estimates can be found following presidentially-declared disasters. Damages from the December 2007 storm, for example, were estimated at $12,353,136 in the rural County (excludes cities).[vi]

Community Hazard Issues

What is susceptible to damage during a hazard event?

The damaging effects of windstorms may extend for distances of 100 to 300 miles from the center of storm activity. Isolated wind phenomena in the mountainous regions have more localized effects. Near-surface winds and associated pressure effects exert loads on walls, doors, windows, and roofs, sometimes causing structural components to fail.

Positive wind pressure is a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Negative pressure also affects the sides and roof of a building: passing currents create lift and suction forces that act to pull building components and surfaces outward. The effects of winds are magnified in the upper levels of multi-story structures. As positive and negative forces impact and remove the building protective envelope (doors, windows, and walls), internal pressures rise and result in roof or leeward building component failures and considerable structural damage. Debris carried along by extreme winds can directly contribute to loss of life and indirectly to the failure of protective building envelope components. Upon impact, wind-driven debris can rupture a building, allowing more significant positive and internal pressures. When severe windstorms strike a community, downed trees, power lines, and damaged property are major hindrances to response and recovery.

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

Property is at risk due to flooding and landslides that may result if there is a heavy snowmelt. Additionally, ice, wind and snow can affect the stability of trees, power and telephone lines and TV and radio antennas. Downed trees and limbs can become major hazards for houses, cars, utilities and other property. Such damage in turn can become major obstacles to providing critical emergency response, police, fire and other disaster recovery services.

Severe winter weather also can cause the temporary closure of key roads and highways, air and train operations, businesses, schools, government offices and other important community services. Below freezing temperatures can also lead to breaks in un-insulated water lines serving schools, businesses, and industry and individual homes. All of these effects if lasting more than several days can create significant economic impacts for the communities affected. In the rural areas of Clatsop County, severe winter storms can isolate small communities, farms and ranches.

Both winter storms and windstorms are particularly damaging to mobile homes and other non-permanent housing structures, which account for 9% of the housing in Clatsop County. Special attention should be given to securing these types of structures.[vii] Winter and windstorms are also disrupting for road and air travel in Clatsop County. Flights face the potential for cancellation from storms. Airports have strict guidelines regarding when conditions are safe for flight.

Existing Hazard Mitigation Activities

Building Codes

Clatsop County Building Codes adhere to the Oregon Structural Specialty Code guidelines for new development.

Public Works

Clatsop County Public Works conducts yearly inspections along county owned roads to identify and remove danger trees that may block transportation routes.

Land Use Planning

Utilities in all new subdivision developments are required to be installed underground. This assists in the prevention of damaged power and communication lines during an event.

Hazard Mitigation Action Items

- Develop and implement hazard tree program.
- Promote tree planting projects on private and public properties.
- Have one to three ISA-certified arborists in each community that know how to properly prune storm damaged trees.
- Heightened awareness by First Responders and appropriate staff of the factors contributing to tree stability.
- Educate homeowners about methods to tie down metal roofs and metal sheds.
- Bury water lines in Big South Fork and Little South Fork watersheds (City of Warrenton Watershed within Clatsop County land).
- Identify major transportation routes that are at risk during a major winter storm event.

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[i] Taylor and Hatton, 1999, The Oregon Weather Book, p. 139; and FEMA-1405-DR-OR, Reducing Windstorm Damage to Property and Electrical Utilities.

[ii] ONHW. *Winter Storms Chapter, http://www.oregonshowcase.org/downloads/pdf/stateplan/OR-SNHMP_winterstorm_chapter.pdf*

[iii] Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

[iv] Oregon Secretary of State, Department of Consumer and Business Services, Building Codes Division. *Division 530: Park Trailer and Cabana Installation Standards, http://www.sos.state.or.us/archives/rules/OARS_900/OAR_918/918_530.html*

[v] Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

[vi] Clatsop County Post-Storm Report to FEMA.

[vii] US Census Bureau. *2000 Census Summary File 3, census.gov*

Volume III:
City Addendums

This volume includes the City Addendums to the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan

- City of Astoria
- City of Cannon Beach
- City of Gearhart
- City of Seaside
- City of Warrenton

Volume III: City Addendum
City of Astoria

Overview

The City of Astoria developed this addendum to the Clatsop County multi-jurisdictional Natural Hazards Mitigation Plan in an effort to increase the community's resilience to natural hazards. The addendum focuses on the natural hazards that could affect Astoria, Oregon, which include: Coastal Erosion, Drought, Earthquake, Flood, Landslide, Tsunami, Volcano, Wildfire, Windstorm, and Winter Storm. It is impossible to predict exactly when disasters may occur, or the extent to which they will affect the City. 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.

The addendum provides a set of actions that aim to reduce the risks posed by natural hazards through education and outreach programs, the development of partnerships, and the implementation of preventative activities such as land use or watershed management programs. The actions described in the addendum are intended to be implemented through existing plans and programs within the City.

The addendum is comprised of the following sections: 1) How was the Addendum Developed? 2) Community Overview; 3) Risk Assessment; 4) Action Items; 5) Supporting Documents.

How was the Addendum Developed?

In Fall 2006, the Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Community Service Center partnered with Oregon Emergency Management (OEM) and Clatsop and Lincoln Counties to develop a Pre-Disaster Mitigation Planning Grant proposal. Each county joined The Partnership by signing (through their County Commissions) a Memorandum of Understanding for this project. FEMA awarded the Oregon Coast Region a grant to support the development of multi-jurisdictional natural hazard mitigation plans for the two counties and the cities therein.

The Columbia River Estuary Studies Taskforce (CREST) was hired by Clatsop County to lead the development of the County's Multi-Jurisdictional plan. A graduate student with OPDR assisted CREST with data collection and plan writing to support the development of the County's Community Overview and Risk Assessment as well as similar components for the city addendums.

The City of Astoria's Community Development Director served on the Countywide Steering Committee which helped guide the development of the County's plan. A work session was held with City of Astoria staff on February 13th, 2008 to develop this city-specific addendum. OPDR facilitated this work session to gather information for the city's risk assessment. The following City departments were represented during this work session:

- Astoria Community Development Department;
- Astoria Public Works Department; and
- Astoria Fire Department.

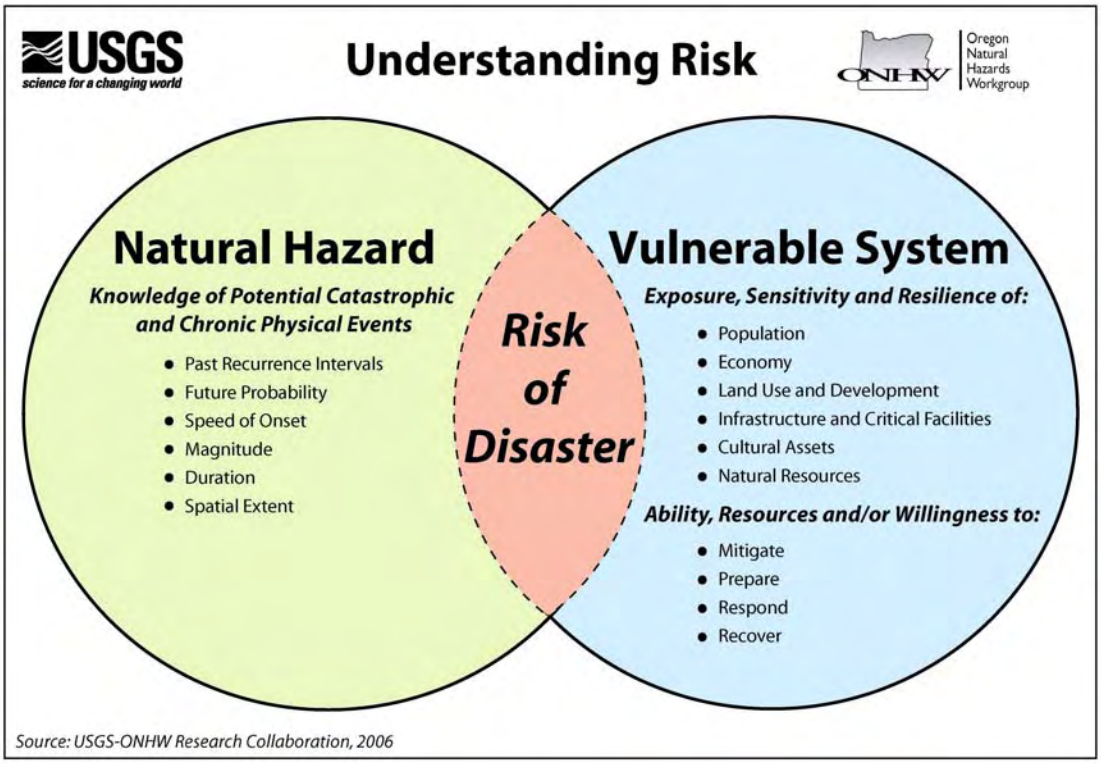
Clatsop Community College also participated in the Countywide Steering Committee and attended the Astoria work sessions. Potential mitigation projects for the Community College will be included in this addendum.

The City of Astoria adopted the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan via resolution on Insert Date, Year.

Community Overview

The following section describes the City of Astoria from a number of perspectives in order to help define and understand the City's sensitivity and resilience to natural hazards. 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 (e.g., governmental structure, agency missions and directives, and plans, policies, and programs). The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the City when the plan was developed. The information documented below, along with the hazard assessments located in the Hazard Summary, should be used as the local level rationale for the City's risk reduction actions. The identification of actions that reduce the City's sensitivity and increase its resilience assist in reducing overall risk, or the area of overlap in Figure 1 below.

Figure 1 Understanding Risk



Source: USGS - Partnership for Disaster Resilience Research Collaborative, 2006.

Geography & Climate

Located at the mouth of the Columbia River, Astoria is located in the northwestern corner of Clatsop County. The climate in the City of Astoria is moderate. The monthly average temperatures range from highs around 69 degrees and lows around 60 degrees in July and August, to highs around 48 degrees and lows around 36 degrees in December and January. The city receives approximately 66 inches of rain annually. Monthly precipitation averages range from 10 inches during the wetter months of November through January, to around 1 inch during the drier summer months of June through August.[i]

Population & Demographics

Astoria is the oldest American settlement west of the Rockies, dating from the fur trading post set up by John Jacob Astor's men in 1811. From 1813 to 1818, the British owned Astoria and it was known as Fort George. In 1818, a treaty with England established joint occupation of the Oregon Country, as it was called then. The boundary was set at the 49th Parallel. The British did not completely abandon Astoria until 1846. A hundred years ago,

Astoria was the second largest city in Oregon with a population of 8,975. The population now is just over 10,000.[ii]

In 2000, the city was home to 9,813 permanent residents, which makes up approximately 28% of Clatsop County's total population.[iii] The city population has remained steady for most of its history, hovering around 10,000. Table 1 shows the city's population since 1980.

Table 1 Population Growth, City of Astoria, 1980-2000

Census	Population	Percent Change
1980	9,998	---
1990	10,069	0.70%
2000	9,813	-2.50%

Source: US Census

Disaster impacts (in terms of loss and the ability to recover) vary among population groups following a disaster. Historically, 80% of the disaster burden falls on the public. Of this number, a disproportionate burden is placed upon special needs groups, particularly children, the elderly, the disabled, minorities, and low income persons. In Astoria, more than 8% of the City's population speaks a language other than English as their primary language. In 2000, 15.9% of all individuals and 11.6% of families in the Astoria were living below the federal poverty level.[vi] More information on special needs populations is shown in Tables 2 through 4.

Table 2 Population by Age, City of Astoria, 2000

Age	Percent
Under 5 years	6.4 %
5 to 9 years	6.1 %
10 to 14 years	7.2 %
15 to 19 years	7.1 %
20 to 24 years	6.3 %
25 to 34 years	12.3 %
35 to 44 years	14.1 %
45 to 54 years	15.7 %
55 to 59 years	5 %
60 to 64 years	3.7 %
65 to 74 years	7.4 %
75 to 84 years	6 %
85 years and over	2.5 %

Source: US Census, 2000

Table 3: Poverty Distribution by Age Group, City of Astoria, 2000

Age	Percent Below Poverty Level
Under 5 years	1.9%
5 years	0.5%
6 to 11 years	1.8%
12 to 17 years	1.2%
18 to 64 years	9.1%
65 to 74 years	0.6%
75 years and over	0.9%

Source: US Census, 2000

Table 4: Disabled Population, City of Astoria, 2000

Age	Percentage
5-20 years	6%
21-64 years	17.8%
65 years and over	48.6%

Source: US Census, 2000

Employment & Economics

Historically, the economy of Astoria has been largely based on fishing, fish processing, and lumber. Both the fish processing (canneries) and timber industries have declined in the last few decades. Though these areas continue to contribute to the city's economy, tourism and government services are the main economic activities. The Port of Astoria also serves as a docking site for cruise ships with 19 dockings scheduled for 2008. [iv]

Table 5 Employment by Industry, City of Astoria, 2000

INDUSTRY	Percent
Educational, health and social services	22.0
Retail trade	15.4
Arts, entertainment, recreation, accommodation and food services	14.1
Manufacturing	7.8
Public administration	6.5
Construction	6.3
Finance, insurance, real estate, and rental and leasing	4.8
Other services (except public administration)	4.8
Professional, scientific, management, administrative, and waste management services	4.4
Transportation and warehousing, and utilities	4.2
Wholesale trade	3.3
Agriculture, forestry, fishing and hunting, and mining	3.3
Information	3.1

Source: US Census, 2000

Median income can be used as an indicator of the strength of the region's economic stability. In 1999, the median household income in Astoria was $33,011.[v] This is almost $9,000 below the 1999 national median household income of $41,994, and around $3,000 below the $36,301 median household income for Clatsop County.[vi] Although it can be used to compare areas as a whole, this number does not reflect how income is divided among area residents.

Housing

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

In 2000, Astoria had 4,860 housing units. Of those, 45% (2,187) were owner occupied, 42.2% (2,055) were renter occupied, and 12.8% were vacant.[x] Nearly 90% of the city's housing stock was built prior to 1980, before

stronger seismic building codes were put into place. Other housing characteristics for Astoria are provided in Tables 6 and 7.

Table 6: Housing Type, City of Astoria, 2000 Housing

Housing Type	Percentage
Single-Family	60.1 %
Multi-Family	18.1 %
Mobile home	1.2 %
Boat, RV, van, (	0.4 %

Source: US Census, 2000

Table 7: Housing Structure Age, City of Astoria, 2000

Year Built	Percent of Structures
1980-2000	10.9%
1960-1980	14.7%
Before 1960	74.4%

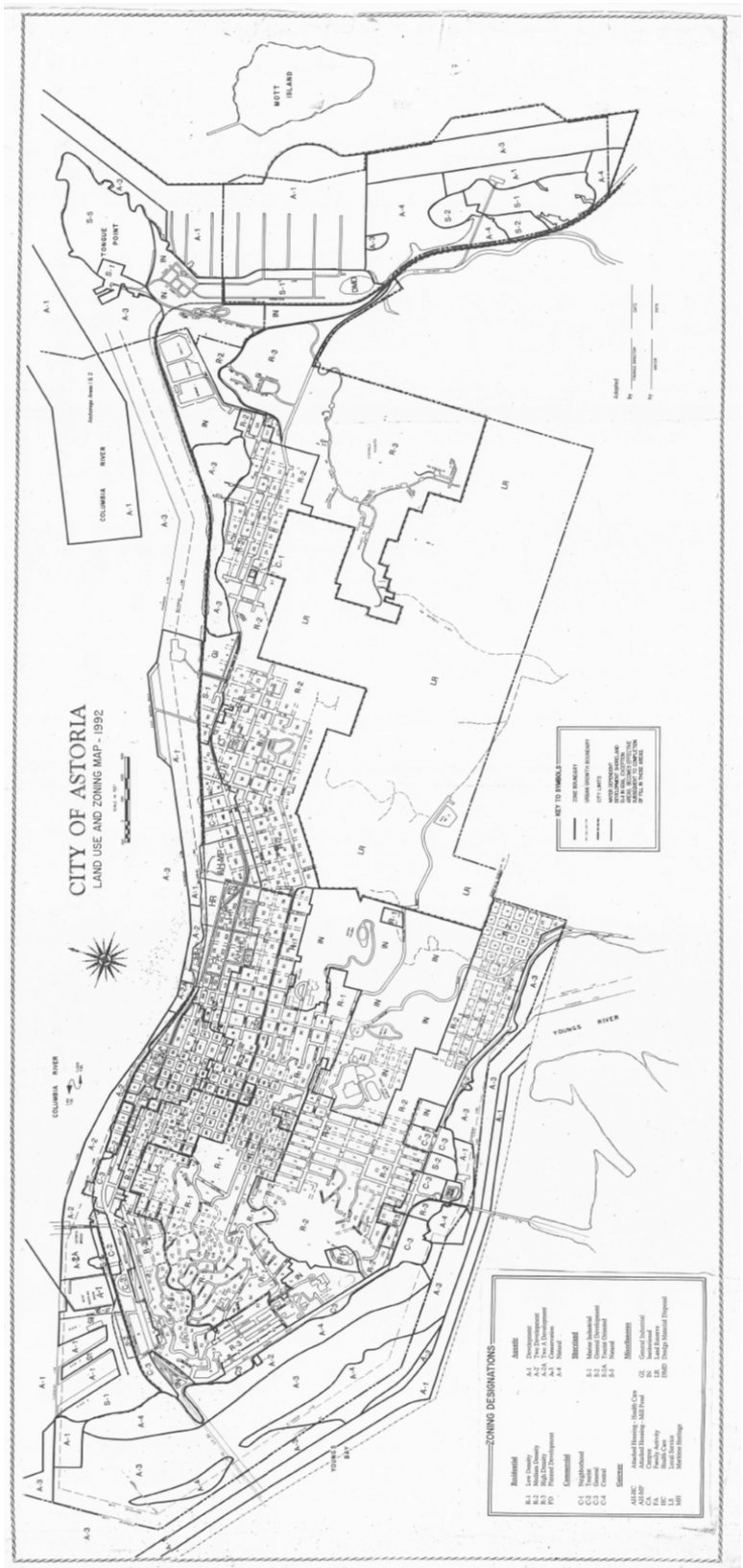
Source: US Census, 2000

Land Use & Development

Development in Astoria spreads mostly to the east and west along the Columbia River from the downtown area. The downtown area has itself seen much revitalization and new construction in recent years. Residential development is also located south of downtown; additional growth is limited by water bodies and designated 'land reserve.[vii]' The city's Comprehensive Plan identifies land use needs within the city and the Urban Growth Boundary.

The City of Astoria is in the process of conducting a buildable lands inventory.

Figure 2 City of Astoria Zoning Map (1992)



Source: City of Astoria (http://www.astoria.or.us)

Transportation

Two major transportation routes run through Astoria, Federal Highways 30 and 101. Highway 30 runs east to west and Highway 101 runs north and south over bridges leading into and out of Astoria over the Columbia River to the north and Young's Bay to the south. State Highway 202 runs along the southern edge of the city.

Transportation is an important consideration when planning for emergency service provisions. Growth within the city will put pressure on both major and minor roads, especially if the main mode of travel is by single occupancy vehicles. Figures 5 and 6 are the Oregon Department of Transportation maps for Astoria.

R. 9 W.

COLUMBIA RIVER

CHANNEL

TONGUE POINT

TONGUE POINT

US COAST GUARD STATION

CATHLAMET BAY

TONGUE NECK

TONGUE POINT JOB CORPS

BAYVIEW

PORTLAND (CITY OF ASTORIA) AND WESTERN ASTORIA

LOWER COLUMBIA RIVER HWY. NO. 2(W)

MOTT BASIN

Sewage Lagoons

Log Pond

MARITIME PARK

COLUMBIA RIVER MARITIME MUSEUM

COLUMBIA FIELD

ASTOR ELEM. SCHOOL

ALDERBROOK COMMUNITY HALL

POLICE & FIRE STA.

CITY SHOPS

DEPOT

BOAT RAMP

MOORING BASIN

Emerald Heights

COXCOMB HILL

JOHN JACOB ASTOR COLUMN PARK

CLATSOP COMMUNITY COLLEGE

COLUMBIA MEMORIAL HOSPITAL

FORT ASTORIA

CLATSOP CO. HERITAGE CEN.

STAR OF THE SEA SCHOOL

ASTORIA PARK PIONEER CEM.

EVERGREEN PARK

CITY PARK

SHIVELY COM. HALL

Reservoir No. 2

Reservoir No. 3

TRANSFER STATION

Creek

Craig Creek

Brown Creek

Jack Creek

Mill Creek

Fern Hill

CLATSOP STATE FOREST

(LOCATED LINE)

ASTORIA BYPASS (APPROX. LOCATION)

NEHALEM HWY. NO. 202

DAGGETT POINT

C.S.F.

YOUNGS RIVER

JOHN DAY RIVER HWY. NO. 2(W)

LOWER COLUMBIA HWY. NO. 102

STATE FORESTRY HEADQUARTERS

CLATSOP COUNTY FAIRGROUNDS

WALLUSKI

TO ASTORIA(WEST)

TO CLATSKANIE

TO JEWELL

T. 8 N.

LEGEND

FUNCTIONAL CLASSIFICATION (STATE / OTHER)

FOR FURTHER FUNCTIONAL CLASSIFICATION INFORMATION, CONTACT O.D.O.T. REGION OFFICE.

- INTERSTATE
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- URBAN COLLECTOR / RURAL MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD
- ORE. ROUTE – US. ROUTE – INTERSTATE ROUTE
- NATIONAL HIGHWAY SYSTEM ROUTE
- URBAN GROWTH BOUNDARY
- CITY LIMIT
- AMTRAK RAIL PASSENGER STATION
- BRIDGE
- GRADE SEPARATIONS : STATE – OTHER FUNCTIONALLY CLASSED – LOCAL ROAD

- PUBLIC BUILDING
- COURTHOUSE
- CITY HALL
- ARMORY
- POST OFFICE
- SCHOOL
- LIBRARY
- SAFETY REST AREA
- WEIGH STATION
- PARK & RIDE LOCATION
- INTERCITY – CITY TRANSIT
- COMMERCIAL – GENERAL AVIATION
- AMTRAK STOP – PORT FACILITY
- GRAVEL PIT – QUARRY – ODOT STOCKPILE SITE

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NORTH

"This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information."

SCALE

750 0 750 1500 FEET

225 0 225 450 METERS

ASTORIA
Population 9,970 *

T. 8 N. R. 9-10 W. W.M.

OREGON TRANSPORTATION MAP

Showing Functional Classification of Roads
City of

ASTORIA

PRELIMINARY COPY SUBJECT TO CORRECTION

PARK & RIDE | INTERBUS | AMTRAK — AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

CLATSOP COUNTY
2006
(ASTORIA EAST, SHEET 2 OF 2)

PORT | AIRPORT | COMM. AIR — AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

Copies available from the Oregon Department of Transportation, Map Distribution Unit, Mill Creek Office Park, 555 13th St. NE, Suite 2, Salem, Oregon 97301–4178, Telephone (503) 986–3154, http://www.odot.state.or.us/tdmappingpublic

* Based on current Oregon Population Report, College of Urban and Public Affairs, Portland State University, http://www.upa.pdx.edu/CPRC.

ASTORIA - CLATSOP COUNTY

R. 10 W. TO WASHINGTON R. 9 W.

COLUMBIA RIVER

Desdemona Sands

OREGON COAST HWY. NO. 9

ASTORIA BRIDGE M.P. 2.79

TONGUE POINT CHANNEL

LOWER COLUMBIA RIVER HWY. NO. 2(W)

WESTERN AND OF PORTLAND (CITY DAY RD.)

ASTORIA

Smith Point

YOUNGS BAY

NEHALEM HWY. NO. 9

OREGON COAST HWY. NO. 101

YOUNGS BAY BRIDGE M.P. 4.97

(ASTORIA CITY LIMITS) (WARRENTON CITY LIMITS)

NEHALEM HWY. NO. 102

OLD YOUNGS BAY BRIDGE M.P. 6.97

COXCOMB HILL

Reservoir No. 2 Reservoir No. 3

CLATSOP FOREST

DAGGETT POINT C.S.F.

NO. 105 HWY.

LEWIS AND CLARK RIVER

WARRENTON – ASTORIA

LEWIS & CLARK BRIDGE

PORT OF ASTORIA AIRPORT

U.S. COAST GUARD AIR STATION

TO GEARHART

TO JEWELL

TO ASTORIA(EAST)

R. 10 W. TO WARRENTON R. 9 W.

T. 8 N.

LEGEND

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- LIBRARY
- SAFETY REST AREA
- WEIGH STATION
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- COMMERCIAL – GENERAL AVIATION
- AMTRAK STOP – PORT FACILITY
- GRAVEL PIT – QUARRY – ODOT STOCKPILE SITE

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NORTH

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City of

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CLATSOP COUNTY
2006
(ASTORIA WEST, SHEET 1 OF 2)

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PORT AIRPORT COMM. AIR — AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

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* Based on current Oregon Population Report, College of Urban and Public Affairs, Portland State University, http://www.upa.pdx.edu/CPRC.

Critical Facilities & Infrastructure

Critical facilities are those that 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, public works shops, and water and waste water treatment facilities. Astoria has 2 fire stations, 1 hospital, 3 public elementary schools, 1 middle school, 1 high school, 1 community college and 1 private school.

Historic & Cultural Resources

Historic and cultural resources such as historic structures and landmarks can help to 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 City's Historic Inventory, dated January 2008, includes the following historic resources:

- 5 Museums;
- 40 places on the National Register of Historic Places;
- 2 National landmarks (Fort Astoria site & Lightship Columbia);
- 3 National Register Historic Districts (Uniontown-Alameda, Downtown, and Shively McClure).
- 6 Historic Sites (Taylor School; Shively Park; Tidal Rock (Local Landmark in DNRHD); First US Post Office West of the Rocky Mountains (Local Landmark in SMNRHD); Fort Astoria (also noted as National Landmark, DNRHD); 14th Street Ferry Landing (Local Landmark);
- 1 Historic Reconstruction (First US Customhouse West of the Rocky Mountains) and
- Local Historic Register including 90 individual designations and 748 historic properties.

Government Structure

The City Council is the policy making body for the City of Astoria. Members of the Council serve as Council representatives on many boards and commissions of the City, other local governments, agencies, and the State. The Mayor appoints all City Boards and Commissions. The Mayor and Councilors appoint the City Manager, City Attorney, and Municipal Judge. The City Manager appoints all other City employees.

The City of Astoria currently has the following departments[viii]:

City Manager's Office: The city manager is responsible for overall city administration and the supervision of seven department heads including: Finance, Community Development, Parks and Community Services, Library, Fire, Police and Public Works/Engineering. The City Manager is responsible to the City Council. The staff consists of the City Manager, an Executive Secretary, and a Human Resources Administrator.

Community Development Department: The Community Development Department is responsible for economic development, land use planning, zoning administration, building inspection, and historic preservation. The Department provides staff support to the Planning Commission (APC), the Historic Landmarks Commission (HLC), the Design Review Committee (DRC), and the Traffic Safety Advisory Committee (TSC). The Department administers both the City Comprehensive Plan and the Development Code. The Department also administers the City's Building Inspection Program.

Public Works Department: The Public Works Department is the largest department within the City of Astoria. Major areas of responsibility include: water treatment and distribution; waste water collection and treatment; street maintenance; engineering services; sanitation/recycling services; fleet maintenance for all City vehicles; forestry management; City facility maintenance; railroad maintenance; and mapping with Geographic Information Systems (GIS).

Finance Department: The Finance Department offers a wide variety of services to the general public and to other departments of the City. The major activities include: utility billing, cashiering, accounts receivable, payroll, purchasing, accounts payable, data processing, financial planning, budget preparation, cash management, parking control, and maintenance of official city records.

Fire Department: The Astoria Fire Department is responsible for fire suppression and emergency medical response, which is coordinated with the local ambulance service (Medix). The department also contracts with the Tongue Point Job Corps Center, Coast Guard property at Tongue Point along with USCG cutters Alert and Steadfast to offer fire suppression and emergency medical services.

Police Department: The Astoria Police Department provides law enforcement services for the City's residents and visitors 24 hours every day and places particular emphasis on responding to the community's calls for service, investigating crimes and traffic enforcement. In addition, the Police Department also includes 911 and dispatch services.

Parks and Community Services Department: The Parks and Community Services Department oversees parks and recreation activities for the City. The City has six historic sites, one caretaker home, three community halls, one maritime memorial park, six general use parks, one senior center, one indoor aquatic center, five public restroom buildings, three tennis courts,

eight playgrounds, ten ball fields, four basketball courts, one boat launch ramp/fishing dock, and seven miscellaneous locations, all of which are maintained by this department.

Astoria Public Library: The Astoria Public Library collects, preserves, and administers organized collections of books and related materials, promotes their efficient use, provides a public meeting place for discussion and reading, and extends the cultural life of the community. The Library Advisory Board, appointed by the Mayor, assists with the development of library policies. The City Council approves these policies and the library staff implements them.

Existing Plans, Policies and Community Organizations

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.[ix]

The City of Astoria's Natural Hazards Mitigation Plan Addendum includes a range of recommended action items that, when implemented, will reduce the City'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 City's resources.

The following table documents the plans and policies already in place in Astoria.

Table 8 Existing Plans, City of Astoria

Name	Date of Last Revision	Author/ Owner	Description	Relation to Natural Hazard Mitigation
City of Astoria Development Code/Zoning Ordinances	Feb-07	City of Astoria	The purpose of the Development Code is to promote orderly city growth, conserve and stabilize property value, encourage appropriate land use and establish standards for population density. It provides for adequate open space, fire and police protection, avoidance of traffic congestion; it also promotes and protects public health, safety, convenience and general welfare.	Article 2 The Flood Hazard Overlay Zone regulates the use of those areas subject to periodic flooding, to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions. Article 3 Erosion Control and Stormwater Managment - The purpose of this ordinance is to : 1) minimize impacts associated with excavation and grading, 2) minimize the erosion of land during clearing, excavation, grading, construction and post-construction activities, 3) prevent the transport of sediment and other soil borne pollutants into the Columbia River estuary and its tribuataries, wetlands and riparian areas, 4) prevent the transport of sediment onto adjacent property and into City rights of way and storm systems, 5) prevent unnecessary clearing, excavation, and stripping of land, and 6) to reduce the amount of soil exposure during construction. Article 4 Columbia River Estuary and Shoreland Regional Standards - The purpose of this article is to establish use and activity standards for developments in Columbia River estuary aquatic areas and shorelands. Article 5 establishes impact assessment and resource capability standards.
Astoria Transportation Systems Plan	Jul-99	City of Astoria	The TSP has been completed to help provide direction for transportation systems in the Astoria urban area over the next 20 years, as well as to meet federal, state and local transporation planning requirements. Transportation refinement plans were developed for the following areas of the City: Astoria Gateway TGM 7/99, East Gateway TSP 2/07, and Port/Uniontown TRP 2/07	Mitigation principles and strategies can be incorporated into Transportation Systems Plan to protect key transportation infrastructure from natural hazards.
City of Astoria Comprehensive Plan		City of Astoria	To anticipate and plan for future land use within the City of Astoria.	Section CP.390 -.400, "Geologic and Flood Hazards" outlines limitations and regulations abided by in regard to flooding, landslides, erosion, storm water, and development on steep slopes." The identification and prioritization of specific areas subject to each hazard can help in crafting action items.
Water Supply Master Plan		City of Astoria	The water supply master plan insures that future water supplies are adequate for the expected growth of the City of Astoria.	A water supply master plan can be used to implement mitigation activities realted to vulnerable water infrastructure.
Water Distribution Master Plan		City of Astoria	The water distribution master plan evaluates existing systems and assists in planning for future expansion and growth.	A water distribution master plan can be used to implement mitigation activities realted to vulnerable water infrastructure.
Wastewater Treatment Master Plan		City of Astoria	The purpose of this study is to provide a long range planning of the wastewater system improvement needs to meet the growing demand for sewer services.	A wastewater treatment master plan can be used to implement mitigation activities realted to vulnerable wastewater infrastructure.

The following are excerpts from the City's Comprehensive Plan that describe actions related to natural hazard vulnerability and risk.

- CP.400 Geologic and Flood Hazard Policies

    1. The city will take reasonable precautions to protect life and property from natural hazards or disasters, through the use of the City Flood Hazards Ordinance (Ord.78-06), the Uniform Building Code, and the policies for the management of geologic hazard areas.

2. Where it appears a landslide, or other earth movement hazard may be present, the approval of the City Engineer and/or Planning Commission may require a site investigation and report by a city approved licensed engineering geologist or soils engineer in such cases.

3. Land divisions in areas of steep slopes, unstable soils, weak foundation soils, or landslide potential will be permitted only after a favorable site investigation report has been completed. …

4. Detailed drainage plans showing the location of proposed storm water disposal will be a part of building permit or land division applications.

5. Clustering of development on steep or less steep portions of sites is encouraged in order to maintain steeper slopes in their natural condition.

6. General development policies for areas of steep slopes will be as follows:

7. Construction excavation will be held to a minimum necessary to build footings efficiently

8. Removal of vegetation will be kept to the minimum necessary for the placement of roads, utilities, and structures. Erosion control measures as required by the City Engineer will be employed during and after construction.

9. Access roads and driveways will be constructed with a minimum amount of grading.

10. No development will be allowed to block stream drainages in any area or divert storm water across adjacent property.

11. … Where necessary, the City Engineer may require certification by a professional engineer or architect to accompany building plans.

Community Organizations and Programs

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

these service providers already work directly with the public on a number of issues, one of which could be natural hazard preparedness and mitigation.

The County-wide Community Organizations and Programs table can be found in Section 2: Community Overview of the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan. The table highlights organizations that are active within the County and may be potential partners for implementing mitigation actions.

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by the community in an effort to reduce the community's overall risk to natural hazards. Documenting these efforts can assist participating jurisdictions better understand risk and can assist in documenting successes.

- MULTI-HAZARD – Astoria Builders Supply Co. designed their new building to be resistant to both flood and windstorms by elevating the building and utilizing hurricane building design concepts.
- MULTI-HAZARD - Current Oregon Codes / International Codes adopted for seismic and wind resistance requirements.
- MULTI-HAZARD - Public awareness and education efforts.
- MULTI-HAZARD - Community Emergency Response Team training for neighborhood disaster readiness and personal/home structural and non-structural mitigation efforts.
- MULTI-HAZARD – Columbia Memorial Hospital has placed a trailer on-site at the Middle School for storage of non-invasive medical supplies. In addition, the hospital purchased two generators. These generators would provide minimum emergency power if needed.
- EARTHQUAKE – Clatsop Community College's Jerome Avenue campus has completed renovations to the Student Services Center and subject to grant funding, will be renovating Towler Hall to bring the buildings to current seismic codes.
- EARTHQUAKE – Lewis and Clark Elementary School was built in 2002 and conformed to seismic building codes in place at that time. Projects at the high school included construction of a new gymnasium and student commons built to current seismic codes. Astor Elementary and Gray Elementary were renovated to bring the buildings into compliance with current building codes.
- FLOOD - Special Design Consideration of storm drains to minimize blockage. Public Works proactively checks storm basins and keeps

them clean of debris to help minimize urban flooding. In addition, they've installed stormwater drains with cow catcher shaped grills that help divert debris out of the way.

Figure 5. Stormwater drains – Astoria, Oregon

Source: City of Astoria Public Works

- FLOOD – The City of Astoria has adopted a Flood Hazard Overlay Zone that regulates the use of those areas subject to periodic flooding, to promote public health, safety and general welfare and to minimize public and private losses due to flood conditions.
- FLOOD - Many residential structures in low areas of town built to be flood resistant with unoccupied/unfinished first floors and main living area on 2nd and 3rd floor.
- FLOOD - Requirements for down-spouts/rain water to be directed to streets and storm drains to help control ground saturation.
- LANDSLIDE – The City has drafted a Geologic Hazard and Hillside Development Ordinance which will guide development related to earthquakes and landslides. The ordinance has yet to be adopted. The City also has requirements for comprehensive geo-technical reports prior to construction. The City has also purchased lands associated with historic landslides and is using them as parks and open space. A map showing past slides can be found within City records as well.
- WINDSTORM – New roofs were placed on Astor Elementary, Gray Elementary and the high school. The new roofs were rated for 100 mph winds and have a 20 year life.
- WILDFIRE – Significant upgrades were made to the electrical and lighting systems at the Middle School. Lewis and Clark Elementary and Gray Elementary were completely sprinkled while upgrades to the fire alarm systems were made at other schools.

- WILDFIRE – The City is participating in the development of a county-wide Community Wildfire Protection Plan to address the risks posed by wildfire.

Risk Assessment

The following hazards have been addressed in the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan. The City of Astoria reviewed the County's plan during a work session on February 12, 2008 and assessed how Astoria's risks vary from the risks facing the entire planning area.

Coastal Erosion

Astoria's location on Young's Bay makes it susceptible to coastal erosion. City of Astoria staff indicated that the **extent** of the coastal erosion hazard is limited to those lands directly adjacent to Young's Bay on the south side of town. These **locations** are highlighted in Figure 6 below.

Little data exists for **previous occurrences** of coastal erosion in Astoria. Significant erosion events took place along the Oregon coast during: El Nino events in 1982-1983 and 1997-1998 and winter storm events in 1998-1999. These events have been cited as the most significant examples of coastal retreat in the last three decades. [x] The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan did not rank the **vulnerability** or **probability** of coastal erosion.

According to a brochure developed by CREST, erosion can have the following **community impacts**:

- Loss of property;
- Threatens near shore buildings and other structures;
- Degrades aquatic and riparian habitats;
- Reduces water clarity, light penetration and plant productivity;
- Causes warming of the stream/river;
- Releases nutrients which could stimulate undesirable plant and algae growth;
- Affects fish feeding, spawning, and gill function; and
- Changes bottom substrate, reduces channel capacities, increases flooding.

Areas subject to Coastal Erosion –

courtesy of Google Earth

Drought

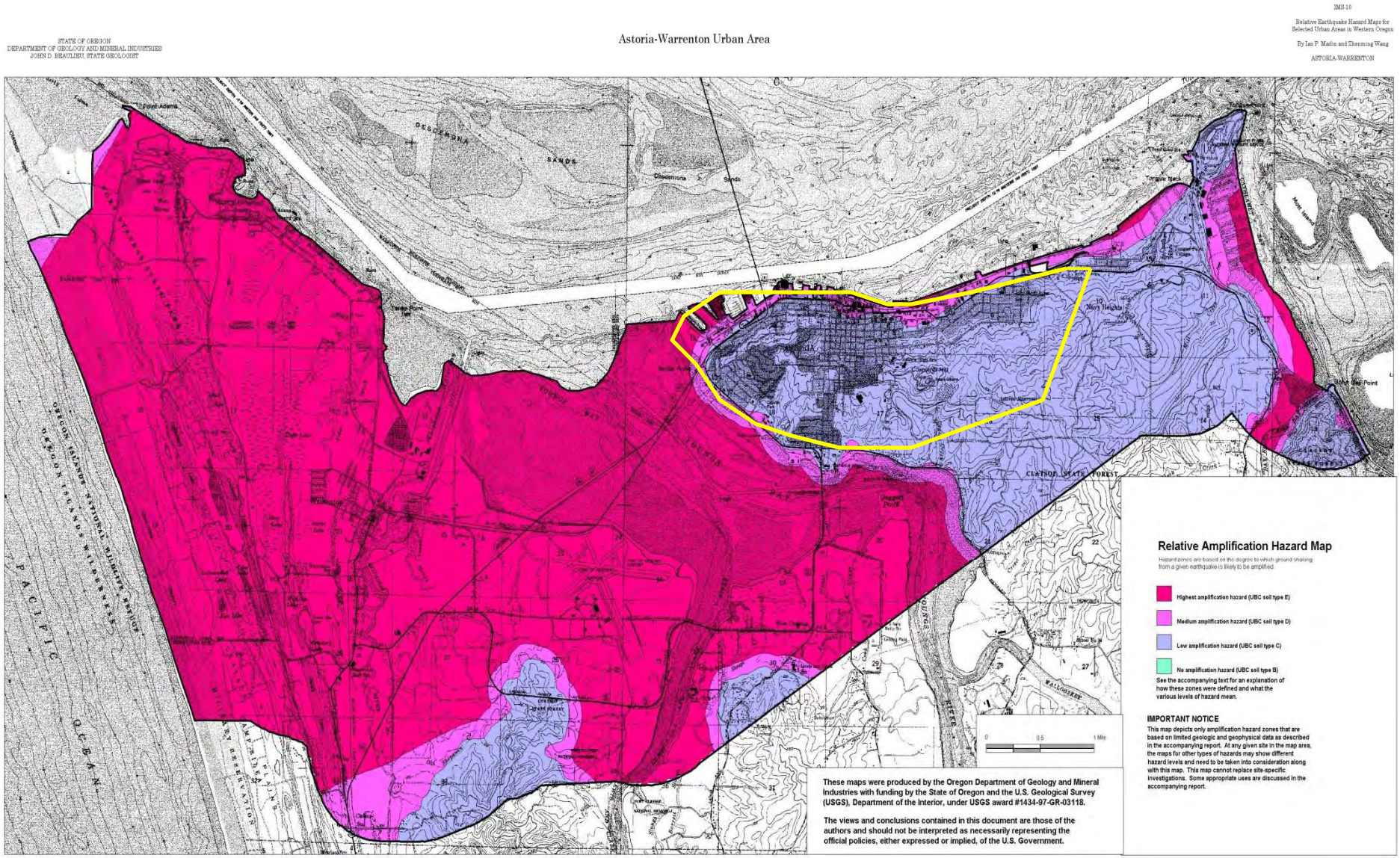
The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan adequately addresses the drought hazard for the City of Astoria. The **location, extent, previous occurrences, vulnerability**, and **probability** for drought in Astoria are the same as the County. City staff did indicate that the most significant **community issue** would be a lack of water, but that the City does have adequate storage capabilities. Staff also indicated that in the 1980's a drought prompted the city to implement voluntary water restrictions. In addition, drought conditions can also increase the probability of wildfires.

Earthquake

Astoria's location along the Oregon Coast makes it susceptible to earthquakes, especially a Cascadia Subduction Zone earthquake. The **extent** of the earthquake hazard includes the entire community of Astoria, although damage from an earthquake may be more severe in the downtown area where buildings are old and sit on fill that has liquefaction potential.

The following earthquake hazard maps were developed by the Department of Geology and Mineral Industries. The figures illustrate the **location** of the amplification, liquefaction, earthquake induced landslide, and relative earthquake hazards in both Astoria and Warrenton.

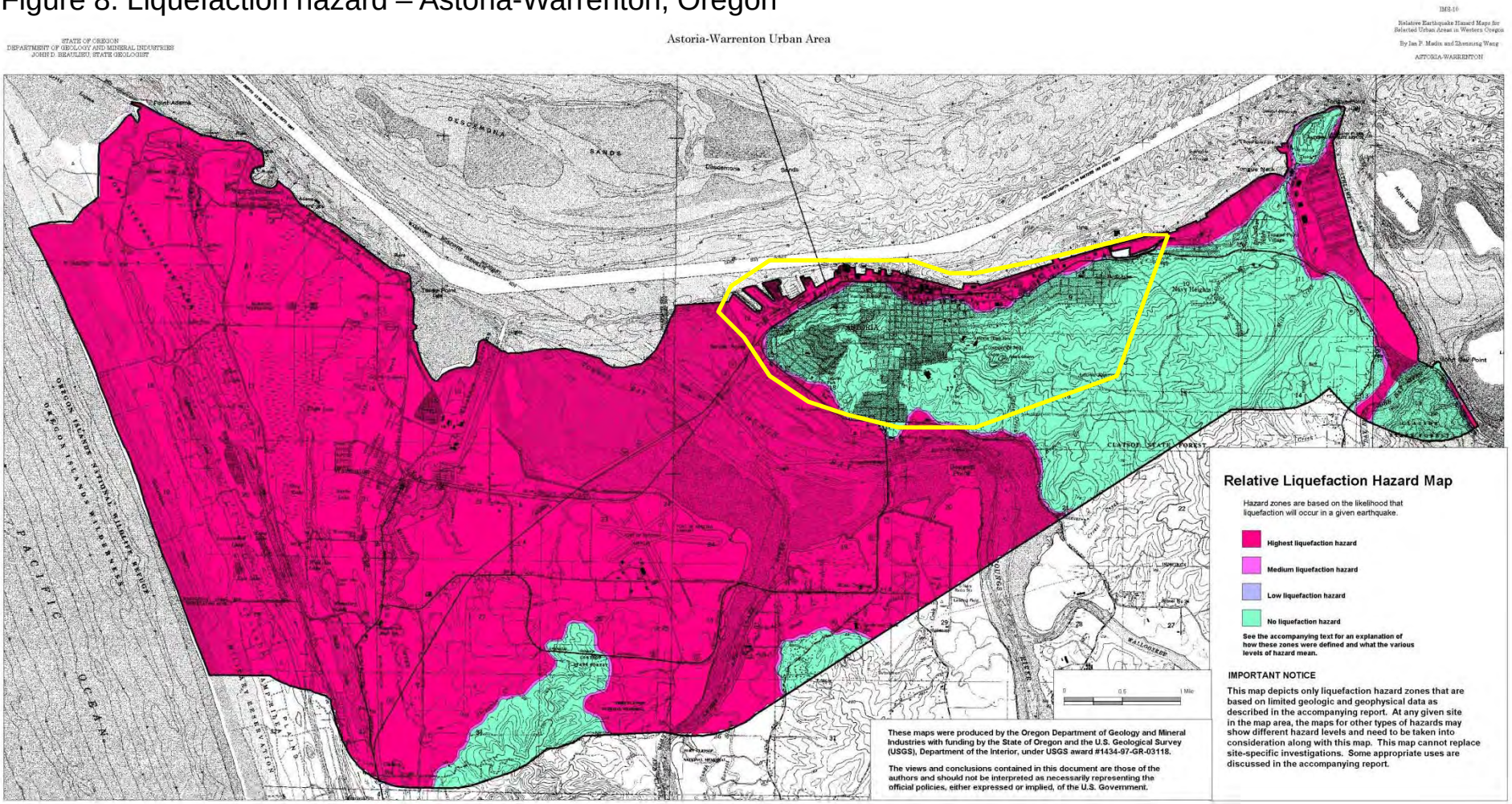
Figure 7. Amplification hazard – Astoria – Warrenton, Oregon



Source: IMS-10 Department of Geology and Mineral Industries, 1999.

The yellow line roughly represents the City of Astoria. The majority of the city is located in areas of low amplification hazards. Lands located immediately adjacent to the Columbia River and Young's Bay have a moderate or high risk of amplification.

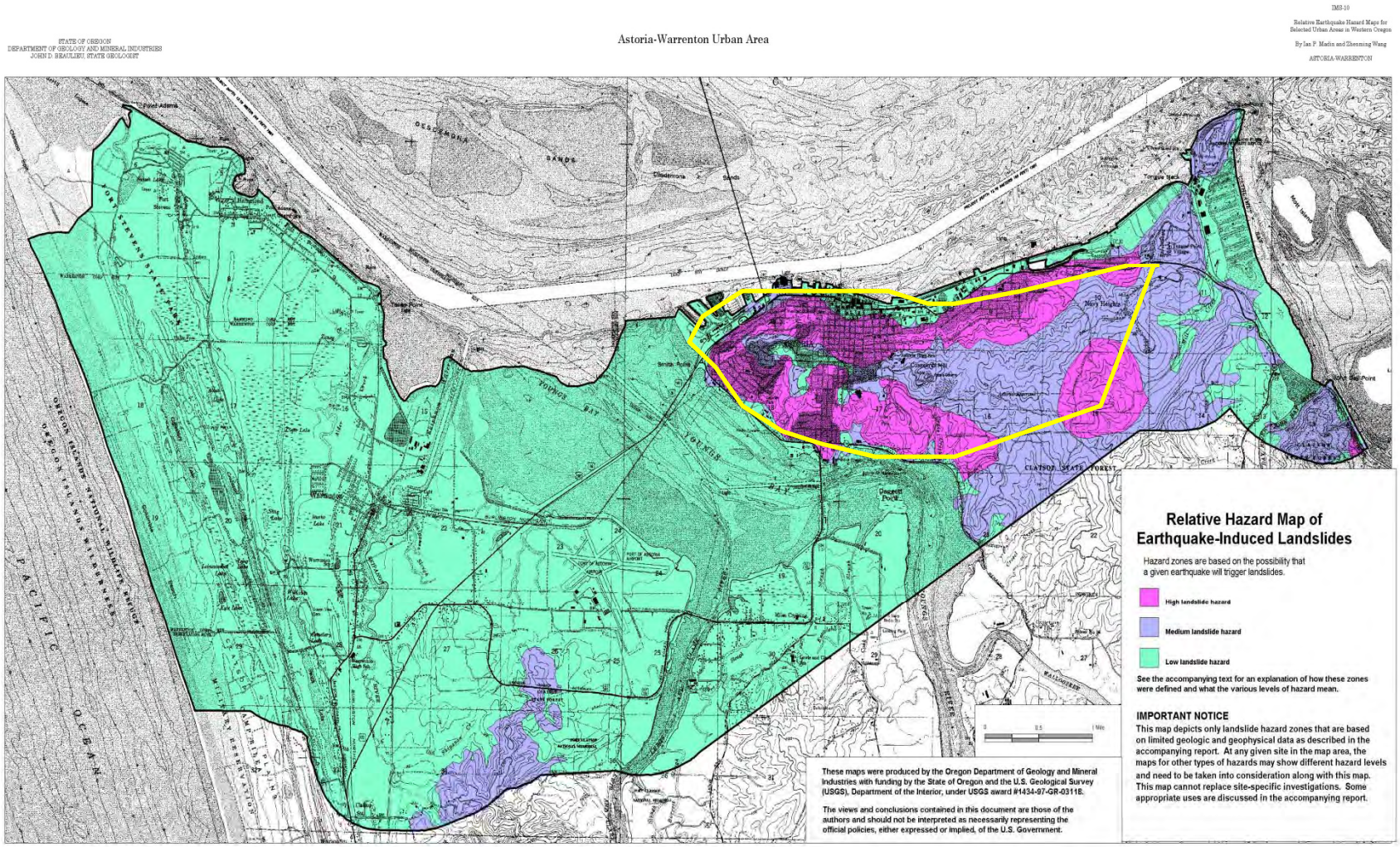
Figure 8. Liquefaction hazard – Astoria-Warrenton, Oregon



Source: IMS-10 Department of Geology and Mineral Industries, 1999.

The yellow line roughly represents the City of Astoria. The majority of the city is located in areas without liquefaction hazards. Lands loc
along the Columbia River have a high susceptibility to liquefaction. The majority of Astoria's businesses and its downtown corridor are l
in these high liquefaction zones.

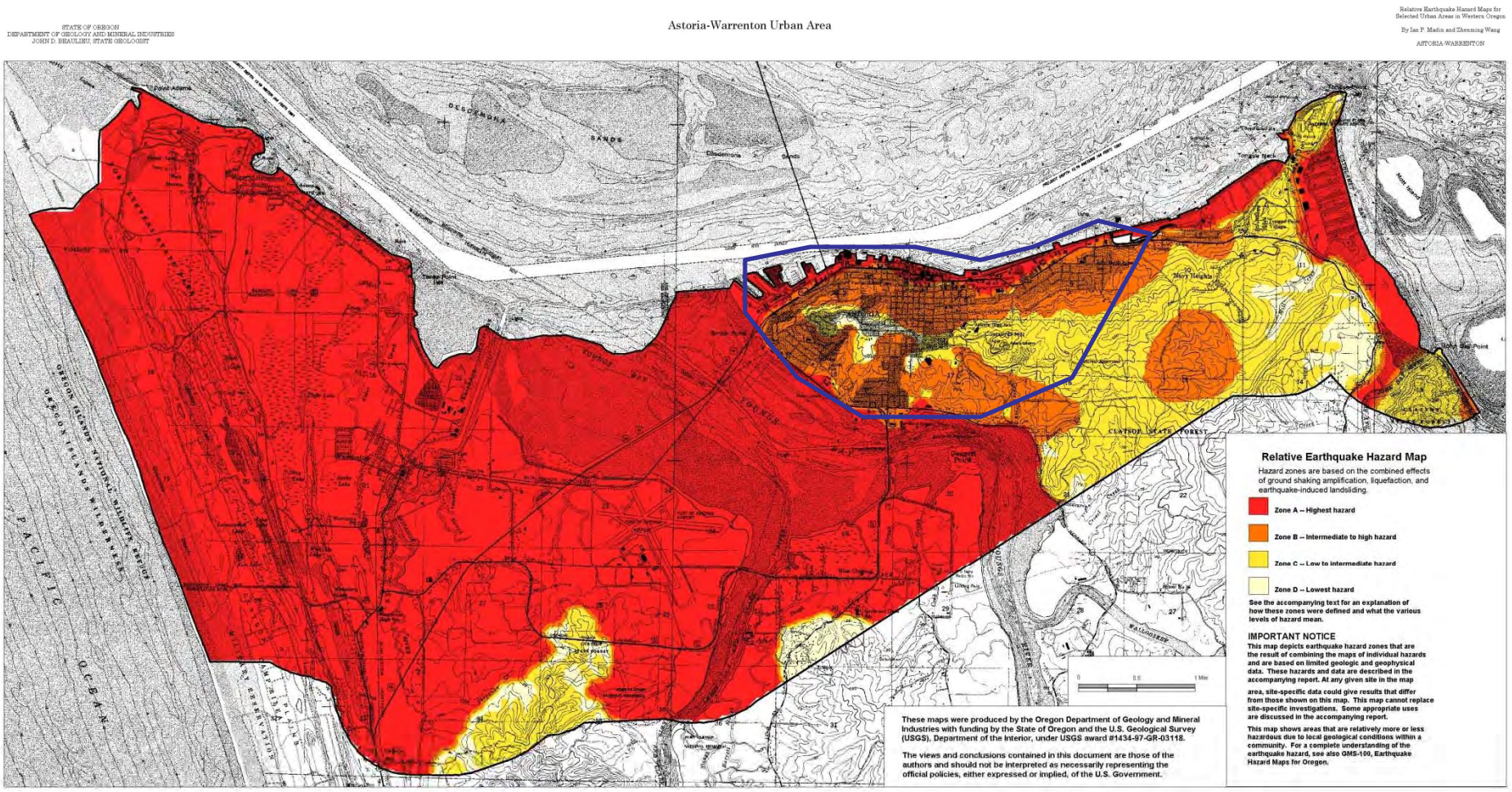
Figure 9. Earthquake induced landslide hazard – Astoria-Warrenton, Oregon



Source: IMS-10 Department of Geology and Mineral Industries, 1999.

The yellow line roughly represents the City of Astoria. The majority of the city is located in areas of high landslide hazards. Lands located along the Columbia River where most of Astoria's businesses and its downtown corridor are located are in medium and low landslide hazards.

Figure 10. Relative Earthquake hazard – Astoria-Warrenton, Oregon



Source: IMS-10 Department of Geology and Mineral Industries, 1999.

The blue line roughly represents the City of Astoria. The majority of the city is located in areas of high landslide hazards. Lands located along the Columbia River where most of Astoria's businesses and its downtown corridor are located are considered to have the highest relative earthquake hazards. The majority of Astoria's residential areas are located in areas that have moderate to high earthquake hazards.

The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan adequately identifies the **previous occurrences** of earthquakes for the City of Astoria. The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan ranked the **vulnerability** of earthquakes as high. The County plan also indicates that the **probability** of earthquakes is high. These scores would be representative of Astoria as well.

City staff identified the following potential **community impacts** or concerns about the earthquake hazard:

- City's reservoirs are water sources for both drinking water and fire suppression and are likely at risk due to age. City staff also identified the importance of Bear Creek Dam as a critical facility.
- Staff had concerns about the city's water distribution system pipe infrastructure which is comprised of mostly older materials - cast iron for water and vitrified clay and terra cotta for sanitary and storm sewer and the potential for loss of fire suppression water.
- The downtown area of Astoria was rebuilt following a catastrophic fire in 1922. The fire destroyed 32 blocks, 40 acres and 33 buildings. Reconstruction efforts involved chair-wall construction which created concrete tunnels for water and gas lines. The area around the chair walls was filled in with dredge sands during reconstruction.[xi] The majority of downtown is located on areas of high liquefaction risk. A large earthquake will have significant impacts on Astoria's economy.
- Only the newest buildings in the City have been built to earthquake standards. The majority of buildings, especially those located downtown, were built prior to the implementation of stricter building codes.
- Downtown's reconstruction using chair walls results in poor access to utilities located underground.
- Staff identified the vulnerability of the Tongue Point area specifically its location in areas of high liquefaction potential.
- The hospital is located on a site filled with dredge materials.
- Staff has concerns about the wastewater system and lift stations around town being damaged and leading to public health emergencies following an earthquake. In addition, the water distribution system would likely be heavily damaged, preventing the delivery of water for fire suppression and domestic use.
- The Astoria Column is an important historic and cultural resource and would like suffer damage from a large earthquake.

- The City owns three bridges in town that are likely at risk – however, the City will be replacing one of them (Franklin Bridge) in the next 3-4 years. The loss of bridges may cut off certain areas of the community.
- Chair-wall construction downtown creating common spaces over large area that can complicate flooding impact and problems due to the ease of travel for natural gas, smoke, fire, etc. between buildings and over a large area.
- Vulnerability and wide ranging hazards from gas and electric utility infrastructure.
- Effect on most road surfaces that will complicate access, evacuation, and emergency response.
- DOGAMI, in consultation with project partners developed a statewide seismic needs assessment that includes seismic safety surveys of K-12 public school buildings. According to this assessment the following school buildings in Astoria were rated with a high collapse potential and should receive further evaluation:
    - Astor Elementary School
    - Astoria Senior High School
    - Gray Elementary School
- Clatsop Community College's MERTS campus is built to earthquake standard 3, but is subject to liquefaction and has only one way in and out.
- Clatsop Community College's Jerome Avenue campus has completed renovations and seismic upgrades to the Student Services Center. The College is in need of addressing life safety issues at Towler Hall. Towler Hall has severe seismic deficiencies, has very high seismic risk, and is a high priority to the community and requires mitigation. The College will be constructing a new building, and replacing Patriot and Fertig Halls. The Library and Art Building were rated fair for seismic performance by a structural engineer and there are no anticipated renovations expected to these buildings.

Flood

Astoria is at risk of flooding from three main sources: the Columbia River, Young's Bay, and urban flooding from storm water coming off the slopes of the city's hillsides. Because of the prevalence of urban flooding, the **extent** of the flood hazard includes most of the city, with the exception of those residences located at the top of the hill in town. The City's Flood Insurance Rate Maps highlights the **location** of the flood hazard in Astoria.

The City's current effective date for the Flood Insurance Rate Map is August 1, 1978. Flood maps are currently under review by FEMA.

The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan adequately identifies the **previous occurrences** of floods for the City of Astoria. The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan ranked the **vulnerability** of floods as moderate. The County plan also indicates that the **probability** of floods is high. These scores would be representative of Astoria's risk as well.

The City of Astoria is a participant in the National Flood Insurance Program. The City has a total of 41 policies under the NFIP, only 20 of which are located in A zones. The total coverage for the city under the NFIP is $9,759,500. There have only been four claims since 1978, with nothing paid on those claims. The last Community Assistance Visit (CAV) was conducted on April 21, 2000.

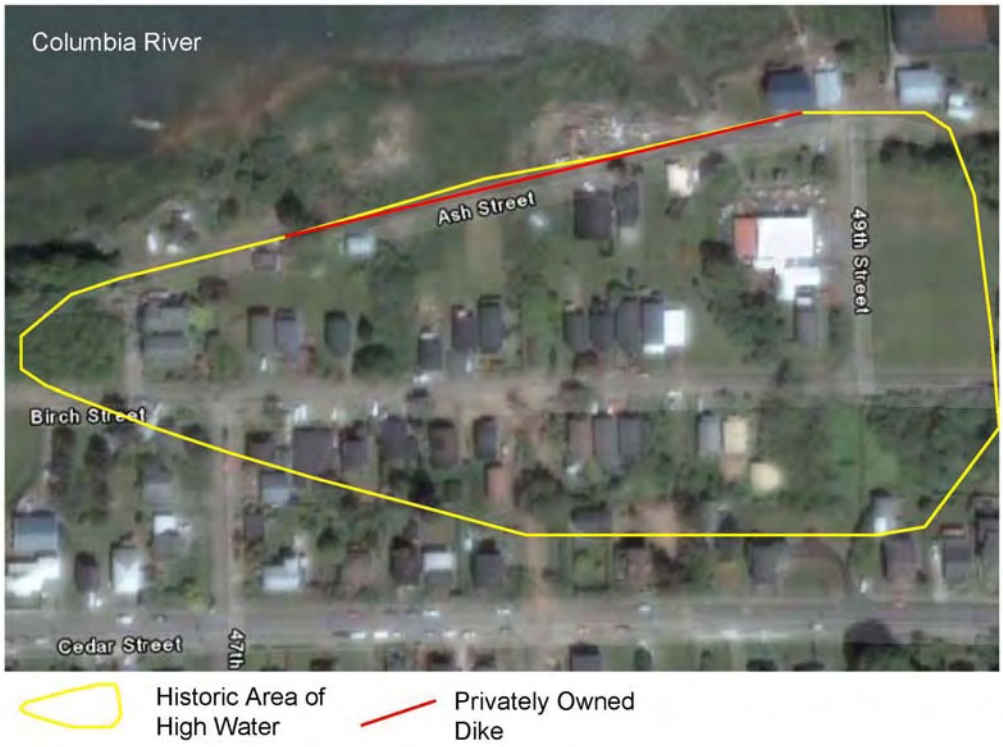
Using the existing FEMA Flood map and a visual review of aerial photographs of the City dated 2002, the Community Development Department estimates the following number of structures in the floodplain:

- Commercial/Industrial – 24 plus 2 mooring basins
- Residential – 50 plus several vessels at mooring basins
- Infrastructure – 16 facilities plus sewer outfalls.
    - Trolley trestles in Uniontown – 2
    - 7th Street trestle
    - 9th Street trestle
    - 6th Street trestle
    - Transient moorage at 17th
    - City sewer outfalls
    - 14th Street RiverPark
    - Trolley trestles in Alderbrook – 2
    - City sewer pump station 1
    - City sewer lagoon
    - Maritime Memorial Park
    - Mill Pond weir and trestle
    - 10th & 11th Street extensions
    - Alderbrook ball field

City staff identified the following potential **community impacts** or concerns about the flood hazard:

- City Staff indicated that the Alderbrook neighborhood, located on Highway 30 on the east end of town, often has flooding issues. Many homes have had water in their basements and some have bridges to their front doors. This neighborhood is only 11 feet above sea level. This neighborhood is particularly vulnerable when high tide on the Columbia coincides with high levels of runoff from the hillsides. The neighborhood has one privately owned dike that is approximately 3-4 feet high.
- City staff also mentioned the need for a shelter located inside city limits should roads or bridges be damaged or become impassable.

Figure 11. Location of Historic High Water – Astoria, Oregon



Source: Google Images and City of Astoria Areas of High Water and Past Slides Map.

- The Aquatic Center and Oregon State University Seafood Labs, located on the south side of Highway 30 are also vulnerable to flood waters.
- Businesses downtown (along Commercial, Marine, Duane, and Exchange Streets) are also vulnerable as they are located between one and four blocks from the Columbia River. This is the site of the majority of the businesses in Astoria.

- Houses located adjacent to streams are also vulnerable to frequent flooding. Public Works indicates that several times a year homes are pumping water out of their basements.
- The embankment along the River, which is located adjacent to the Columbia River, could be considered a flood protection device.
- There are flooding issues on Highway 202 on Young's Bay on the south west side of town as well.
- Clatsop Community College's MERTS campus is vulnerable to floods during dike breaches, high tides, or extensive rainfall. This location has only one evacuation route.
- Clatsop Community College leases a facility in the South County on Highway 101 that could be vulnerable to floods during high tides and storms.

Landslide

Astoria is at risk of landslides because of its location on the hillside above the Columbia River and Young's Bay. The **extent** of the landslide hazard includes most of the residential portions of the city. The City is in the process of completing a LiDAR study with the Department of Geology and Mineral Industries that will identify the **location** of potential landslide hazards in Astoria.

The City of Astoria *Areas of High Water and Past Slides* map originally developed in 1974 and updated as recently as 2008 identifies the **previous occurrences**, **location** and **extent** of earth movement in the City of Astoria. Those previous occurrences are summarized below. Note that landslide events are summarized by corresponding map sections A-K:

- Map Section A – a total of 7 slide areas
- Map Section B – a total of 9 small slide areas – the most recent in 1998
- Map Section C – 6 small to medium slides and two large slides.
- One of the large slides, known as the Bond Street slide occurred originally in 1954, and was triggered again in January 2007. This slide continued to move during the development of the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan. Mitigation of the landslide area and infrastructure is a top priority of the city. See Figure 12.

Figure 12. Bond Street Landslide Impact Area – Astoria, Oregon

Approximate location of the 1954 Bond Street slide, which reactivated in January 2007.

Source: Google Images and City of Astoria Areas of High Water and Past Slides Map.

- A second and larger slide is approximately bounded by 4th Street on the west, Exchange Avenue on the north, 10th Street on the east, and Irving Avenue on the south. This slide originally occurred in 1905 and continued to creep. In 1991 and 1992 additional portions slid.
- Map Section D – a total of four small slides
- Map Section E – a total of three slides. One large slide located bounded approximately by: Franklin Avenue to the north, 20th-24th Street to the east, north of Jerome Avenue to the south, and 20th Street to the west. The toe of this slide is located just south of the hospital. See Figure 13 below.

Figure 13. Historic Landslide Impact Area – Astoria, Oregon

Source: Google Images and City of Astoria Areas of High Water and Past Slides Map.

- Map Section F – a total of four slides.
- Map Section G – a total of six slides including the Uppertown earth movement dated May 2004 on the map. This slide is approximately bounded by: Lief Erikson Drive to the north, 34th Street to the east, Harrison Avenue to the south, and 31st Street to the west.
- Map Section H – a total of three small slides
- Map Section I – no slides indicated
- Map Section J – one slide located at the intersection of Highway 30 and 53rd Street.

The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan ranked the **vulnerability** of landslides as moderate. The City of Astoria's vulnerability to landslides, however, is high due to location of critical facilities and residential development within landslide prone areas. The County plan also indicates that the **probability** of landslides is high. This probability score would be representative of Astoria as well.

City staff identified the following potential **community impacts** or concerns about the landslide hazard:

- City staff was concerned about water and transportation infrastructure related to the landslide hazard. The re-activation of the Bond Street slide disrupted water infrastructure. The water distribution system is the only water supply for fire protection. Many streets are located along the sides of hills within the city. These streets function as major arteries and also house water and sewer lines. This creates potential risk that could result in the inability to provide effective emergency services.
- As is illustrated in Figure X above, Columbia Memorial Hospital is located at the foot of a historic slide.
- Public Works also indicated that areas near the intersection of 38th Street and Franklin Avenue are somewhat unstable.
- Staff indicated that when the city receives multiple days of heavy rain that the excess precipitation can lead to earth movement.
- Stabilization measures have been undertaken along Highway 30 around Tongue Point to help reduce the vulnerability of a slide cutting off Highway 30, which is the major east-west connection between Astoria and Portland.
- Clatsop Community College and City staff indicated that the eastern portions of the Community College may be at risk from landslides.
- Astoria Middle School may also be at risk to landslides.
- City staff suggested a potential mitigation action to improve the storm drainage system in the forested areas on the ridge in Astoria.
- The following issues have been identified in the City's proposed Geologic Hazard and Hillside Development Ordinance:

    1. Since 1950, it is estimated that sixty to seventy homes have been seriously damaged by earth movement. The resulting cost to the various owners is estimated to be between $500,000 and $1,000,000. Cost of street and utility repairs is estimated to be over $2,000,000.
    2. Geological information indicates that the bedding planes under Astoria generally dip toward the south, and that the landslide potential on the south slope (which is mostly undeveloped at present) could be considerable as development increases. Great care should be taken to insure this area does not experience the same problems encountered on the north slope of the city.

Tsunami

Astoria's location along the Oregon Coast makes it susceptible to tsunamis from both near shore (following a Cascadia Subduction Zone earthquake) and distant tsunamis. The **extent** of the tsunami hazard is limited to those areas adjacent to either the Columbia River or Young's Bay.

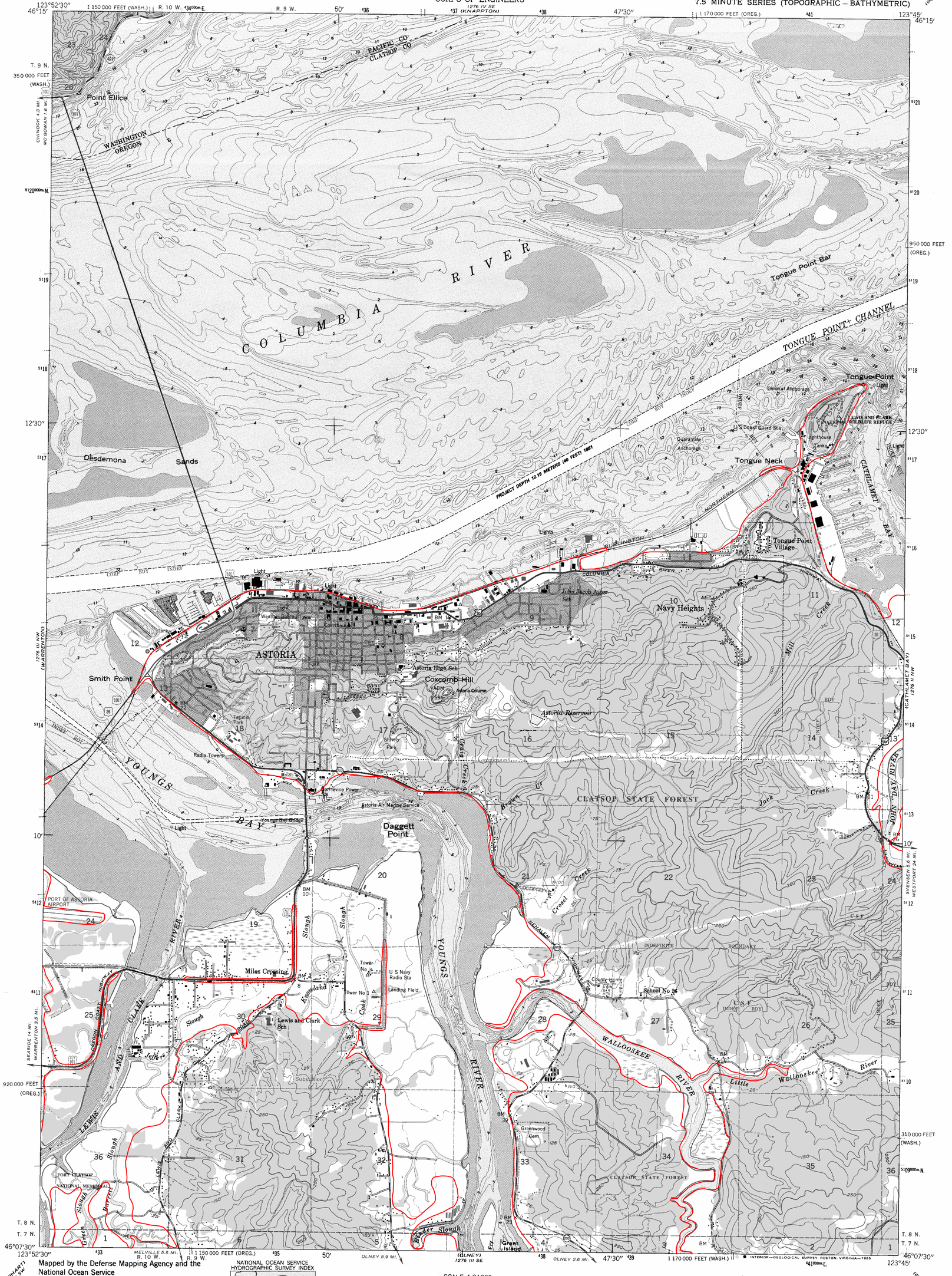
The following tsunami inundation map illustrates the **location** of the tsunami hazard. This map was developed by the Department of Geology and Mineral Industries in 1995.

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
DONALD A. HULL, STATE GEOLOGIST

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

ASTORIA QUADRANGLE
OREGON – WASHINGTON
7.5 MINUTE SERIES (TOPOGRAPHIC – BATHYMETRIC)



Open File Report
O-95-10
Tsunami Hazard Map of the Astoria Quadrangle, Clatsop County, Oregon

Tsunami inundation boundary
upper limit of area expected to be covered by flood water from a tsunami caused by a magnitude 8.8 undersea earthquake

See accompanying text for use of this map, mapping methodology, and acknowledgments.

Mapping by:

George R. Priest, Oregon Department of Geology and Mineral Industries, October-November, 1995.

CONVERSION SCALES

Feet	Meters
15000	4500
14000	4000
13000	3500
12000	3000
11000	2500
10000	2000
9000	1500
8000	1000
7000	900
6000	800
5000	700
4000	600
3000	500
2000	400
1000	300
	200
	100
0	0

Feet	Meters
1	.3048
2	.6096
3	.9144
4	1.2192
5	1.5240
6	1.8288
7	2.1336
8	2.4384
9	2.7432
10	3.0480

To convert feet to meters multiply by .3048

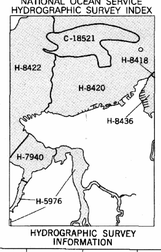
To convert meters to feet multiply by 3.2808

DEPTH GRADIENT

Meters		Feet
0	Exposed at low tide	0
	Maximum depth	

Mapped by the Defense Mapping Agency and the National Ocean Service
Published for civil use by the Geological Survey
Control by NOS/NOAA, USCE, Oregon State Highway Department and Pacific Power and Light Company
Topography from aerial photographs by multiplex methods
Aerial photographs taken 1943. Field checked 1949
Bathymetry compiled by the National Ocean Service from tide-coordinated hydrographic surveys. This information is not intended for navigational purposes
Mean low water (dotted) line and mean high water (heavy solid) line compiled by NOS from tide-coordinated aerial photography. Apparent shoreline (outer edge of vegetation) shown by light solid line
Polyconic projection. 1927 North American Datum
10,000-foot grid based on Oregon coordinate system, north zone and Washington coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks, zone 10, shown in blue
To place on the predicted North American Datum 1983, move the projection lines 24 meters north and 97 meters east as shown by dashed corner ticks
There may be private inholdings within the boundaries of the National or State reservations shown on this map
Red tint indicates areas in which only landmark buildings are shown
Revisions shown in purple compiled by the Geological Survey from aerial photographs taken 1981 and other sources
This information not field checked. Map edited 1984

NATIONAL OCEAN SERVICE HYDROGRAPHIC SURVEY INDEX



HYDROGRAPHIC SURVEY INFORMATION

SURVEY NUMBER	SURVEY DATE	SURVEY SCALE	SURVEY LINE SPACING (NAUT. MILES)
H-5976	1935	1:10,000	.01–.05
H-7940	1951	1:10,000	.02–.08
H-8418	1958	1:10,000	.02–.12
H-8436	1958	1:5,000	.01–.05
H-8420	1958	1:10,000	.01–.12
H-8422	1958	1:10,000	.01–.17
NOS CHART 18521	MARCH 27, 1982		1:40,000

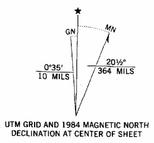
SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

CONTOUR INTERVAL 50 FEET
DASHED LINES REPRESENT 25 FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
BATHYMETRIC CONTOUR INTERVAL 2 METERS WITH SUPPLEMENTARY 1 METER CONTOURS – DATUM IS MEAN LOWER LOW WATER
THE RELATIONSHIP BETWEEN THE TWO DATUMS IS VARIABLE
THE MEAN RANGE OF TIDE IS APPROXIMATELY 2.4 METERS

BASE MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
BATHYMETRIC SURVEY DATA COMPLIES WITH INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO) SPECIAL PUBLICATION 44 ACCURACY STANDARDS AND/OR STANDARDS USED AT THE DATE OF THE SURVEY
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092,
AND NATIONAL OCEAN SERVICE, ROCKVILLE, MARYLAND 20852
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

ROAD CLASSIFICATION 1951
Heavy-duty — 4 LANE | 6 LANE — Light-duty
Medium-duty — 4 LANE | 6 LANE — Unimproved dirt
U. S. Route — State Route



UTM GRID AND 1984 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ASTORIA, OREG.–WASH.
46123-B7-TB-024

1949
PHOTOREVISED 1984
BATHYMETRY ADDED 1984
DMA 1276 III NE – SERIES V892

The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan ranked the **vulnerability** of tsunami as high. The County plan indicates that the **probability** of tsunami is moderate. These scores would be representative of Astoria's risk as well.

City staff identified the following potential **community impacts** or concerns about the tsunami hazard:

- City staff had concerns about community assets (including Police, Fire and Public Works facilities) located to the north of Marine Drive. Tsunami inundation maps indicate that this area is vulnerable to tsunami impact.
- The Fire Department indicated that further studies were needed to better assess the tsunami inundation zone given new technology and wave height modeling software now available.
- The City's tourist based economy and population density are significant issues related to the tsunami hazard.
- Clatsop Community College's South County Center is located in the tsunami inundation zone.

Volcano

The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan does an adequate job of describing the **location, extent, history, probability, vulnerability,** and **community impacts** of volcanoes in Astoria. The City of Astoria experienced ashfall and debris in the Columbia River as a result of the Mt. St. Helens eruption in 1980. Please refer to the County's plan for additional information on the volcano hazard.

Wildfire

The City of Astoria has urban forests. The urban forest is adjacent to State, County, and private forest that extends for miles east of the City limits. This creates the potential for wildland-urban interface and makes the City vulnerable to wildfire. Also at risk is the City's watershed which is made up of 3,700 acres (Wickiup Mountain) that serves as the City's water source. Clatsop County is currently in the process of developing a Community Wildfire Protection Plan (CWPP) that will further delineate the **location**, **extent**, **previous occurrences**, **probability**, **vulnerability**, and **community impacts** of wildfires in Astoria.

Based on the best available data, the **location** of the wildfire hazard in Astoria is the large urban forest located within the city and extending beyond the city limits to the east. The City of Astoria was listed as a Community at Risk during the State Wildfire Assessment. The **extent** of the wildfire hazard is likely limited to the interface areas along Irving Avenue to the north and following the crest of the hillside around to 9th Street on

the western side of town. A wildfire could travel from the urban forest into the neighborhoods on the hillsides.

Since June 2005, Astoria Fire has responded to 36 wildfires: 14 natural vegetation fires, 12 brush fires, 5 files in cultivated vegetation, 4 forest or wooded fires, and one grass fire.

The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan ranked the **vulnerability** of wildfire as moderate. The County plan indicates that the **probability** of wildfire is high. For the City of Astoria, the **vulnerability** of wildfire is high and the **probability** is moderate.

City staff identified the following potential **community impacts** or concerns about the wildfire hazard:

- City staff had concerns about a wildfire impacting the 3,700 acre watershed that is home to the city's water supply and located 12 miles east.
- The east end of the City is a large urban forest that creates the potential for interface fires.
- During August, September, and January, east winds can blow fires into the city.
- The urban interface has not yet been delineated, but will be completed s the County develops its CWPP.
- Clatsop Community College's MERTS campus is located in a heavily forested area and has a single evacuation route. Buildings at this campus have been sprinkled.
- Clatsop Community College's Jerome Avenue campus is located in a forested area and new and renovated buildings will be sprinkled.

Wind and Winter Storms

The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan addresses wind and winter storms together.

Windstorm

Astoria's location at the mouth of the Columbia River, and close to the Oregon Coast, makes it susceptible to windstorms. The County's plan accurately describes the **location**, **extent**, and **previous occurrences** of windstorms in Astoria. The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan ranked the **vulnerability** of windstorm as high. The County plan indicates that the **probability** of windstorm is high. These scores accurately reflect the vulnerability and probability of windstorms in the City of Astoria.

City staff identified the following potential **community impacts** or concerns about the windstorm hazard:

- City staff indicated that the south slope of the city is more vulnerable than other areas to high winds.
- The urban forest located to the east of the city is also vulnerable to wind damage.
- Pharmacies are an underrated asset following windstorms. Many of the residents of the December 2007 wind storm needed medications and may not have been able to get to the pharmacy.
- Staff raised concerns about emergency power for critical facilities such as shelters, schools, and the community college.
- The City frequently loses power several times each winter. Staff is also concerned about the resiliency of the City's power infrastructure to windstorms and suggested placing portions of the infrastructure underground as a potential mitigation action.
- Emergency notification and communication are always an issue when communication systems are down and the power is out. Lack of redundancy created a lack of communication during the December 2007 wind event.
- Downed trees can block transportation routes and impede the provision of emergency services and can also damage public and private property.
- New construction is being built according to model national building codes. A wind screen at the Hotel Elliot downtown survived the December 2007 windstorm as did new awnings recently installed at the Sears downtown.
- Clatsop Community College's MERTS campus may be vulnerable during a windstorm due to tree blow down across the single evacuation route.

  Clatsop Community College's Jerome Avenue campus may be impacted by downed trees. Proposed plans include minimal emergency back-up systems and replacing overhead utilities with underground utilities.

Winter Storm

Astoria's location on both the Oregon Coast makes it susceptible to winter storms. The County's plan accurately describes the **location**, **extent**, and **previous occurrences** of winter storms in Astoria. The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan did not rank the **vulnerability** or **probability** of winter storm. City of Astoria staff indicated that the **probability** and **vulnerability** for winter storms is high.

City staff identified the following potential **community impacts** or concerns about the winter storm hazard:

- Travel along the City's steep streets becomes difficult during ice storms.
- Elderly residents may be more directly impacted than other residents during winter storms because of their inability to travel safely to get medications.
- During extended freeze situations, water service lines connected to individual homes can freeze because they are not laid very deep in the ground.
- Staff indicated that there is a need for heated emergency shelters that are available during extended cold weather events.
- Staff is also concerned about the resiliency of the City's power infrastructure to windstorms and suggested placing portions of the infrastructure underground as a potential mitigation action.
- Clatsop Community College's MERTS campus is vulnerable due to its single evacuation route.
- Clatsop Community College's Jerome Avenue campus is replacing aggregate sidewalks with heavily brushed surfaces to reduce the likelihood of slipping.

Action Items

Multi-hazard Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

If the city's risk to a hazard (or hazards) is greater than the County's, then the city must create at least one action item to mitigate that hazard's effects.

The following action items are detailed recommendations for activities that local departments, citizens, and others could engage in to reduce risk. See full action item forms for more information. The starred(***) action items below are the City's top priorities for mitigation actions.

- Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.
- Address repetitive flood loss properties not covered by the National Flood Insurance Program
- Determine feasibility of becoming a participant in the NFIP's Community Ratings System
- Evaluate flood hazards in the Alderbrook Neighborhood
- Conduct a seismic and flood vulnerability assessment of all critical facilities and infrastructure in the City

- Continue efforts to replace aged bridges with newer structures.
- Re-map the tsunami inundation hazard for the City of Astoria
- Determine needs and issues related to tsunami warning systems.
- Implement an all-hazards education and outreach campaign
- Identify areas where undergrounding utilities may be appropriate
- ***Complete LiDAR study to further delineate landslide hazards in Astoria
- Improve drainage in forested areas in higher elevations above the city to help reduce the potential for landslides
- Evaluate the vulnerabilities of the water system (including the water pipes and dam) and mitigate to ensure disaster resiliency.
- Maintain and enhance efforts around Community Emergency Response Teams (CERT).
- Identify shelter locations and adequate equipment and supplies in town.
- Conduct fuel reduction in the City's watershed and urban forest
- Minimize risk in the City's wildland-urban interface.
- Reduce erosion on along Columbia River near the Aquatic Center and Seafood Center
- ***Strengthen the high risk seismic deficiencies at Clatsop Community College's Towler Hall.
- Assess seismic vulnerability to hazardous materials sites
- Relocate Public Work's Facilities
- Improve public communication infrastructure so that it is less vulnerable
- Acquire a Fire Boat
- Relocate Astoria Fire Department

See Action Item Appendix for detailed action item forms.

Plan Implementation & Maintenance

The city will utilize the same prioritization process as the County [See Section 4: Plan Implementation and Maintenance of the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan and Appendix D: Economic Analysis of Natural Hazard Mitigation Projects].

The City of Astoria Community Development Department will serve as the convener for the City of Astoria Natural Hazard Mitigation Plan Addendum. The Community Development Department will be responsible for convening the plan committee on a yearly basis to identify new risk assessment data, review status of mitigation actions, identify new actions, and seek funding to implement mitigation actions. The City of Astoria Natural Hazard Mitigation Plan Addendum will be updated every five years.

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[i] National Weather Service Forecast Office. 2007. < http://www.wrh.noaa.gov/pqr/climate/ast_clisummary.php>

[ii] City of Astoria. http://www.astoria.or.us/History/AstoriaHistory/tabid/4009/Default.aspx and Portland State University Population Projections.

iii United States Census Bureau. 2000. Fact Sheet: Astoria, Oregon. <www.census.gov>

iv Port of Astoria. 2007. <http://www.portofastoria.com/portfacilities/cruise/cruiseinformation/cruiseschedule.html>

v United States Census Bureau. 2000. Fact Sheet: Astoria, Oregon. <www.census.gov>.

vi United States Census Bureau. 2000. Fact Sheet: Clatsop County, Oregon. <www.census.gov>.

[vii] City of Astoria. 1992. Land Use and Zoning Map. <http://www.astoria.or.us/LinkClick.aspx?fileticket=2CTb0n2N43o%3d&tabid=4040&mid=9832>

[viii] City of Astoria. *Departments/Contacts* < http://www.astoria.or.us>

[x] Allan, J. et al. 2005. Dynamic Revetments for Coastal Erosion in Oregon. http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/DynamicRevetments.pdf

[xi] Astoria's history along the tracks - http://homepage.mac.com/cearl/trolley/ahistory.html

Appendix A:
City of Astoria Action Items

Natural Hazard Action Item Proposal Form[1]

Proposed Action Item:	**Alignment with County Goals:**
Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.	***Minimize damage to public and private buildings and infrastructure***

Rationale for Proposed Action Item:

- The National Flood Insurance Program provides communities federally backed flood insurance to homeowners, renters, and business owners, provided that communities develop and enforce adequate floodplain management ordinances. The benefits of adopting NFIP standards for communities are a reduced level of flood damage in the community and stronger buildings that can withstand floods. According to the NFIP, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance.
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Continued participation in the NFIP will help reduce the level of flood damage to new and existing buildings in communities while providing homeowners, renters and business owners additional flood insurance protection.
- The CAV is a scheduled visit to a community participating in the NFIP for the purpose of: 1) Conducting a comprehensive assessment of the community's floodplain management program; 2) assisting the community and its staff in understanding the NFIP and its requirements; and 3) assisting the community in implementing effective flood loss reduction measures when program deficiencies or violations are discovered.

Ideas for Implementation:

- Actively participate with DLCD and FEMA during Community Assistance Visits.
- Conduct an assessment of the floodplain ordinances to ensure they reflect current flood hazards and situations, and meet NFIP requirements.
- Coordinate with the County to ensure that floodplain ordinances and NFIP regulations are maintained and enforced.

Coordinating Organization:	**Community Development**

Internal Partners:	**External Partners:**
Public Works	**Department of Land Conservation and Development, Federal Emergency Management Agency**

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Address repetitive flood loss properties not covered by the National Flood Insurance Program	***Minimize damage to public and private buildings and infrastructure***

Rationale for Proposed Action Item:

- Often times, communities have repetitive flood loss properties that are not covered by the NFIP. Working with homeowners and business owners to identify mitigation actions, such as building elevation or property acquisition, can reduce the impact and damage from of floods on repetitive loss properties.
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Developing mitigation actions for repetitive flood loss properties can significantly diminish the impact and damage from flooding on these properties.

Ideas for Implementation:

- Develop a database of repetitive flood loss properties not covered by the NFIP to track flood damage and to use when identifying mitigation actions.
- County public works and the cities should coordinate to identify properties not covered by the NFIP and teach homeowners and businesses about mitigation actions they can implement.
- Work with homeowners to identify potential mitigation measures to be funded through either Pre-Disaster Mitigation or Flood Mitigation Assistance.
- Develop countywide stormwater management strategies to address repetitive loss properties.

Coordinating Organization:	Community Development

Internal Partners:	**External Partners:**
Public Works	Department of Land Conservation and Development

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Determine feasibility of becoming a participant in the NFIP's Community Ratings System	***Minimize damage to public and private buildings and infrastructure Reduce economic loss***

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 floodplain management activities that exceed the minimum NFIP requirements.
- Participation in the CRS can reduce homeowner's flood insurance premiums.

Ideas for Implementation:

- Review requirements of the CRS and determine whether participation is feasible.

Coordinating Organization:	Community Development

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

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Evaluate flood hazards in the Alderbrook Neighborhood	***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss***

Rationale for Proposed Action Item:

- City Staff indicated that the Alderbrook neighborhood, located on Highway 30 on the east end of town, often has flooding issues. Many homes have had water in their basements and some have bridges to their front doors. This neighborhood is only 11 feet above sea level. This neighborhood is particularly vulnerable when high tide on the Columbia coincides with high levels of runoff from the hillsides. The neighborhood has one privately owned dike that is approximately 3-4 feet high.
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Developing flood mitigation strategies for a part of town that is flood prone can help reduce the number of flood insurance claims and property damage.

Ideas for Implementation:

- Determine which residents are located in the flood hazard area
- Incorporate flood preparedness and mitigation information in existing Fire Department and CERT outreach efforts.
- Develop outreach materials on flood preparedness.
- Determine if any home owners are interested in flood mitigation activities (e.g., elevation or acquisition).
- Work with County and State on developing specific funding packages for flood mitigation activities on private property.

Coordinating Organization:	Public Works/Community Development

Internal Partners:	**External Partners:**
	Clatsop County

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Conduct a seismic and flood vulnerability assessment of all critical facilities and infrastructure in the City	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- Astoria's location on the Oregon Coast makes it susceptible to earthquakes and flooding. Portions of the city were built on fill, which makes any critical facilities and infrastructure located there particularly vulnerable.
- Staff has concerns about the wastewater system and lift stations around town being damaged and leading to public health emergencies following an earthquake. In addition, the water distribution system would likely be heavily damaged, preventing the delivery of water for fire suppression and domestic use.
- Only the newest buildings in the City have been built to earthquake standards. The majority of buildings, especially those located downtown, were built prior to the implementation of stricter building codes.
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Having a better understanding of the risks that critical facilities and infrastructure face can help the city identify the most cost-effective mitigation strategies.

Ideas for Implementation:

- Identify the critical facilities and infrastructure needing to be assessed.
- Take a multi-hazard approach and assess both seismic and flood hazard issues.
- Utilize the statewide seismic vulnerability study completed by DOGAMI to determine whether or not K-12 education, community college and critical facilities require additional assessments
- Assess flood risk for Columbia Memorial Hospital
- Prioritize mitigation efforts for those facilities and infrastructure with poor assessments
- Identify funding sources for implementing those mitigation projects.
- Identify potential secondary hazard issues related to the earthquake hazard.

Coordinating Organization:	Public Works/Engineering

Internal Partners:	**External Partners:**
Community Development	Clatsop County, Clatsop County Community College, DOGAMI, School Districts, Hospital

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Continue efforts to replace aged bridges with newer structures.	***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- Astoria's location on the Oregon Coast makes it susceptible to earthquakes. Damage to bridges would impact transportation within the City. The City has taken efforts to replace aged bridges.
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Developing mitigation actions for bridges can help ensure that vital transportation networks will be available for emergency services following a disaster.
- The City owns three bridges in town that are likely at risk – however, the City will be replacing one of them (Franklin Bridge) in the next 3-4 years. The loss of bridges may cut off certain areas of the community.
- Astoria is slated to replace the Franklin bridge in 2009 and the 19th and Irving bridge in 2013.

Ideas for Implementation:

- Continue bridge replacement efforts through Capital Improvements and other funding opportunities.
- Seek grant funding for local match.
- Explore opportunities for historic preservation funding for historic bridges
-

Coordinating Organization:	Public Works

Internal Partners:	**External Partners:**
Community Development	Clatsop County, Federal Highway Administration, Oregon Department of Transportation, State Historic Preservation Office.

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Re-map the tsunami inundation hazard for the City of Astoria	***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- Astoria's location on the Oregon Coast makes it susceptible to tsunamis from both near and distance sources. The existing tsunami inundation map was developed by DOGAMI in 1995.
- The Fire Department indicated that further studies were needed to better assess the tsunami inundation zone given new technology and wave height modeling software now available.
- The City's tourist based economy and population density are significant issues related to the tsunami hazard.
- City staff had concerns about community assets (including Police, Fire and Public Works facilities) located to the north of Marine Drive. Tsunami inundation maps indicate that this area is vulnerable to tsunami impact.
- Having a better understanding of where thee tsunami hazard is can help the city identify appropriate evacuation routes and education and outreach material.

Ideas for Implementation:

- Partner with DOGAMI to seek funding to update the 1995 map utilizing new modeling that has become available following the Indian Ocean tsunami in 2004.

Coordinating Organization:	Fire

Internal Partners:	**External Partners:**
Community Development, Public Works	Clatsop County, DOGAMI

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Determine needs and issues related to tsunami warning systems.	***Protect Life***

Rationale for Proposed Action Item:

- Astoria's location on the Oregon Coast makes it susceptible to tsunamis from both near and distance sources. The existing tsunami inundation map was developed by DOGAMI in 1995. Relatively little has been done to develop, maintain and update tsunami warning systems within the City.
- Warning systems can help save lives during an incident.

Ideas for Implementation:

- Evaluate needs and issues related to tsunami warnings.
- Develop education and outreach to residents about what the tsunami warning system means and how they should respond.
- Improve reverse 911 capability
- Assess communication technology needs related to the warning system.
- Coordinate with Clatsop County to seek funding opportunities to implement a tsunami warning system.
- Consider an all-hazard approach to warning
- Improve reverse 911 capability

Coordinating Organization:	Fire

Internal Partners:	**External Partners:**
Community Development, Police	Clatsop County, Oregon Emergency Management

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Implement an all-hazards education and outreach campaign	***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- Astoria is at risk to a number of hazards that have the potential to impact people and property. Conducting education and outreach can help reduce the impact of these events on residents.
- On average, the City of Astoria loses power at least once a winter. Power outages can impact residents especially the elderly, who rely on electricity for heat and to power medical equipment.
- The Disaster Mitigation Act of 2000 requires communities to identify a comprehensive range of mitigation actions. Education and outreach can be an effective mitigation strategy.

Ideas for Implementation:

- Continue to use CERT to inform the public about natural hazards
- Provide literature through Community Development when residents pull building permits
- Utilize existing community events to disseminate information – Community Safety Fairs, Home & Garden Shows, etc.

Coordinating Organization:	Fire

Internal Partners:	**External Partners:**
Community Development	Clatsop County, Oregon Emergency Management

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Identify areas where undergrounding utilities may be appropriate	***Decrease disruption to critical services*** ***Reduce economic loss***

Rationale for Proposed Action Item:

- On average, the City of Astoria loses power at least once a winter. Power outages can impact residents especially the elderly, who rely on electricity for heat and to power medical equipment.
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Developing mitigation actions for utilities can significantly diminish the impact and damage from natural hazards.

Ideas for Implementation:

- Identify areas with the most storm related failure points
- Determine feasibility of requiring undergrounding of utilities at those failure points
- Underground the line to the reservoir

Coordinating Organization:	Public Works

Internal Partners:		**External Partners:**
		Clatsop County, Pacific Power
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Complete LiDAR study to further delineate landslide hazards in Astoria	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- The City of Astoria has both a high probability and vulnerability to landslides.
- The Bond Street slide in 2006 damaged public infrastructure.
- Completing additional risk assessments on this hazard will allow the City to better understand the risk and direct development away from these areas.
- Since 1950, it is estimated that sixty to seventy homes have been seriously damaged by earth movement. The resulting cost to the various owners is estimated to be between $500,000 and $1,000,000. Cost of street and utility repairs is estimated to be over $2,000,000.
- City staff was concerned about water and transportation infrastructure related to the landslide hazard. The re-activation of the Bond Street slide disrupted water infrastructure. The water distribution system is the only water supply for fire protection. Many streets are located along the sides of hills within the city. These streets function as major arteries and also house water and sewer lines. This creates potential risk that could result in the inability to provide effective emergency services.
-

Ideas for Implementation:

- Complete DOGAMI LiDAR study
- Incorporate study information into the city's mitigation risk assessment
- Adopt revised development ordinance based on new study
- Conduct public education and outreach related to the study's findings.

Coordinating Organization:	Public Works

Internal Partners:	**External Partners:**
Community Development	Clatsop County, DOGAMI

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Improve drainage in forested areas in higher elevations above the city to help reduce the potential for landslides	***Minimize damage to public and private buildings and infrastructure Decrease disruption to critical services***

Rationale for Proposed Action Item:

- The City of Astoria has both a high probability and vulnerability to landslides.
- Forested areas located at the top of the hill in Astoria may contribute to the risk of landslides. Improving drainage in these upper elevations will help alleviate the potential for landslides.
- Since 1950, it is estimated that sixty to seventy homes have been seriously damaged by earth movement. The resulting cost to the various owners is estimated to be between $500,000 and $1,000,000. Cost of street and utility repairs is estimated to be over $2,000,000.
- City staff was concerned about water and transportation infrastructure related to the landslide hazard. The re-activation of the Bond Street slide disrupted water infrastructure. The water distribution system is the only water supply for fire protection. Many streets are located along the sides of hills within the city. These streets function as major arteries and also house water and sewer lines. This creates potential risk that could result in the inability to provide effective emergency services.
-

Ideas for Implementation:

- Determine where it makes the most sense to implement drainage improvements
- Seek funding to implement drainage improvements
- Document lessons learned and successes of project.
- Work with FEMA to identify appropriate strategies and funding opportunities.

Coordinating Organization:	Public Works

Internal Partners:	**External Partners:**
	Clatsop County, FEMA

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Evaluate vulnerabilities of the water system (including the water pipes and dam) and mitigate to ensure disaster resiliency	***Minimize damage to public and private buildings and infrastructure Decrease disruption to critical services***

Rationale for Proposed Action Item:

- The City of Astoria has both a high probability and vulnerability to landslides.
- Current pipe system is vulnerable to failure following ground movement. In the last 10 years pipe material has become more resistant.
- Staff had concerns about the city's water distribution system pipe infrastructure which is comprised of mostly older materials - cast iron for water and vitrified clay and terra cotta for sanitary and storm sewer and the potential for loss of fire suppression water.
-

Ideas for Implementation:

- Identify critical locations for retrofits, based on either rate of failure or age.
- Evaluate best materials for given locations.
- Determine cost of upgrade
- Seek funding for pipe upgrades
- Document lessons learned and successes

Coordinating Organization:	Public Works

Internal Partners:	**External Partners:**
	Clatsop County, FEMA

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Maintain and enhance efforts around Community Emergency Response Teams (CERT).	***Protect life*** ***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- The City of Astoria has an active CERT program.
- CERT can be an important resource before, during and after an incident.
- During the December 2007 storm, CERT was instrumental in getting out into the community to do damage reports. They also put a face to the City.

Ideas for Implementation:

- Increase CERT class offerings
- Increase recruitment of team members
- Seek funding to expand the program
- Target school and college staff to participate

Coordinating Organization:	Fire

Internal Partners:	**External Partners:**
	Clatsop County, Community College

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Identify shelter locations and adequate equipment and supplies in town.	***Protect life***

Rationale for Proposed Action Item:

- The City of Astoria does not have an emergency shelter located in town.
- The Middle School has been used, but it is also a back-up for the Hospital.
- Camp Rilea is the closest shelter, but requires Astoria residents to cross several bridges, which may not be useable.
- Staff raised concerns about emergency power for critical facilities such as shelters, schools, and the community college.
- Staff indicated that there is a need for heated emergency shelters that are available during extended cold weather events.
-

Ideas for Implementation:

- Partner with the American Red Cross to identify potential shelter locations.
- Talk with churches to gauge their interest in serving as a community shelter.
- Seek funding for backup power sources (also include costs for maintenance)
- Identify necessary shelter resources – back-up power, food, supplies, kitchen facilities, etc.
- Conduct education and outreach with the public to make them aware of shelter options in town.
- Develop a plan to distribute food

Coordinating Organization:	Fire

Internal Partners:	**External Partners:**
Community Development	Clatsop County, Red Cross, Clatsop Community Action Team, Oregon Emergency Management, Public Schools, Churches

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Conduct fuel reduction in the City's watershed and urban forest	***Minimize damage to public and private buildings and infrastructure Protect natural and cultural resources***

Rationale for Proposed Action Item:

- The City of Astoria is at risk from wildfires, specifically in the City's forested watershed.
- Completing fuel reduction will help reduce the potential for large scale fires to impact the City and will also reduce the negative impacts wildfire can have on a watershed.
- City staff had concerns about a wildfire impacting the 3,700 acre watershed that is home to the city's water supply and located 12 miles east.
- The east end of the City is a large urban forest that creates the potential for interface fires.
- During August, September, and January, east winds can blow fires into the city.
- The urban interface has not yet been delineated, but will be completed s the County develops its CWPP.
-

Ideas for Implementation:

- Coordinate with the development of the County's Community Wildfire Protection Plan to ensure this action is also included in that plan.
- Identify high risk locations that would benefit from fuel reduction.
- Work with County and Oregon Department of Forestry to identify potential funding sources
- Conduct education and outreach about the effort.
- The City's Urban Forester would be responsible for determining and drawing up contracts for fuel reduction efforts

Coordinating Organization:	Fire/Public Works

Internal Partners:	**External Partners:**
	Clatsop County, Oregon Department of Forestry, Fire Defense Board, Office of State Fire Marshall

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Minimize risk in the City's wildland-urban interface.	***Minimize damage to public and private buildings and infrastructure Protect natural and cultural resources***

Rationale for Proposed Action Item:

- The City of Astoria is at risk from wildfires, specifically in the City's forested watershed.
- City staff had concerns about a wildfire impacting the 3,700 acre watershed that is home to the city's water supply and located 12 miles east.
- The east end of the City is a large urban forest that creates the potential for interface fires.
- During August, September, and January, east winds can blow fires into the city.
- The urban interface has not yet been delineated, but will be completed s the County develops its CWPP.

Ideas for Implementation:

- Coordinate with the development of the County's Community Wildfire Protection Plan to ensure this action is also included in that plan.
- Identify wildland urban interface locations within and adjacent to the city limits.
- Conduct education and outreach about the effort.
- Work with homeowners to encourage fire resistant building practices.

Coordinating Organization:	Fire

Internal Partners:	**External Partners:**
Public Works, Community Development	Clatsop County, Oregon Department of Forestry, Fire Defense Board, Office of State Fire Marshall

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Reduce erosion on along Columbia River near the Aquatic Center and Seafood Center	***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss***

Rationale for Proposed Action Item:

- Astoria's location on the Oregon Coast makes it susceptible to flooding. Portions of the city were built on fill, which makes any critical facilities and infrastructure located there particularly vulnerable.
- The Aquatic Center and Oregon State University Seafood Labs, located on the south side of Highway 30 are also vulnerable to flood waters.
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Developing mitigation actions for flood hazards can significantly diminish the impact and damage from flooding on these properties.

Ideas for Implementation:

- Continue Public Work's annual maintenance of rip rap along seawall.

Coordinating Organization:	Public Works/Engineering

Internal Partners:	**External Partners:**

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Strengthen the high risk seismic deficiencies at Clatsop Community College's Towler Hall.	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- Towler Hall is critical to the campus history, operations and the community.
- Towler Hall has severe seismic deficiencies, has very high seismic risk, and is a high priority to the community and requires mitigation.
- Towler Hall is a 41,433 gross square foot building centrally located within the City of Astoria at an elevation of 271 feet.
- The building could serve as a coordinating point for services in the event of a disaster given its central location and elevation above sea level.

Ideas for Implementation:

- Plans include a complete renovation of this facility. Specific seismic strengthening would include new shear walls with foundations, floors and roof tied to exterior walls, drag struts at floors and roof to transfer seismic forces from the diaphragms to shear walls and addition of plywood sheathing to strengthen roof diaphragm and attic below.
- Exterior access to the building will be improved.

Coordinating Organization:	Clatsop Community College

Internal Partners:		**External Partners:**
		City of Astoria (Community Development, Emergency Services, Public Works), Clatsop County, Oregon Emergency Management, Federal Emergency Management Agency, DOGAMI
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
0-1.5 years, expected start date 2010		

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Assess seismic vulnerability to hazardous materials sites	***Minimize damage to public and private buildings and infrastructure Decrease disruption to critical services***

Rationale for Proposed Action Item:

- Astoria's location on the Oregon Coast makes it susceptible to earthquakes. Portions of the city were built on fill, which makes hazardous materials storage facilities vulnerable for secondary hazards following an earthquake.
- Within the city, 8 private properties have hazardous materials on-site.
- Public Works has three sites
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Addressing hazardous materials locations can help minimize secondary hazards following a disaster.

Ideas for Implementation:

- Complete seismic vulnerability assessments on hazardous materials storage sites to identify potential mitigation strategies.
-

Coordinating Organization:	Fire

Internal Partners:	**External Partners:**
Public Works	Office of State Fire Marshall

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Relocate Public Work's Facilities	***Minimize damage to public and private buildings and infrastructure Decrease disruption to critical services***

Rationale for Proposed Action Item:

- Astoria's location on the Oregon Coast makes it susceptible to earthquakes. The current Public Works facility is vulnerable to earthquakes and is located on fill and is therefore, also vulnerable to liquefaction. The Public Works facility is located on Highway 30 across from the Fire Station at 30th.
- City staff had concerns about community assets (including Police, Fire and Public Works facilities) located to the north of Marine Drive. Tsunami inundation maps indicate that this area is vulnerable to tsunami impact.
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Relocating critical facilities out of hazard areas will help ensure that essential city functions can continue following a disaster.

Ideas for Implementation:

- Identify alternative sites to relocate Public Works outside of hazard areas
- Seek funding to relocate facility

Coordinating Organization:	Public Works

Internal Partners:	**External Partners:**
	Oregon Emergency Management

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Improve public communication infrastructure so that it is less vulnerable	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- During the December 2007 windstorm, communications were problematic
- Communication is vulnerable during earthquakes, tsunamis and wind and winter storms.

Ideas for Implementation:

- Partner with the County on communication projects
- Combine 911 dispatch with the County
- Support efforts to harden the Wikiup repeater

Coordinating Organization:	Fire

Internal Partners:	**External Partners:**
Police	Clatsop County, Oregon Emergency Management, Other County Fire and Police

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Acquire a Fire Boat	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- During an earthquake or tsunami, Astoria Fire may not be able to access all fire vehicles. Having a fire boat would allow the City to provide fire protection from the river.
- A fire boat would also allow for adequate water pressure if water pipes are damaged.
- The Coast Guard has very limited capacity in this area and they can't fight fires on boats.

Ideas for Implementation:

- Explore funding sources – Assistance to Firefighters Grant through FEMA
-

Coordinating Organization:	Fire

Internal Partners:	**External Partners:**

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

Form Submitted by:	

Proposed Action Item:	**Alignment with County Goals:**
Relocate Astoria Fire Department	***Minimize damage to public and private buildings and infrastructure Decrease disruption to critical services***

Rationale for Proposed Action Item:

- Astoria's location on the Oregon Coast makes it susceptible to earthquakes. The Fire Department is currently a shared facility with Police. The building is vulnerable to both earthquake and tsunami and would be limited following an event due to bridge access. The facility is built on pilings.
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Relocating critical facilities out of hazard areas will help ensure that essential city functions can continue following a disaster.
- City staff had concerns about community assets (including Police, Fire and Public Works facilities) located to the north of Marine Drive. Tsunami inundation maps indicate that this area is vulnerable to tsunami impact.
-

Ideas for Implementation:

- Identify suitable locations closer to the city center and outside of the tsunami inundation zone.
- Seek funding to pay for the relocation
-

Coordinating Organization:	Fire

Internal Partners:	**External Partners:**
Community Development	

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

Form Submitted by:	

Volume IV:
Mitigation Resources

The purpose of this volume is to provide documentation of the following plan development resources:

- Appendix A – Action Item Forms
- Appendix B – Planning & Public Process
- Appendix C – Economic Analysis of Mitigation Actions
- Appendix D – Oregon Coast Regional Profile
- Appendix E – Household Survey
- Appendix F – Community Organizations

Appendix A:
Clatsop County Action Items

The purpose of this appendix is to document the actions identified in the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan. City-specific actions can be found in the city addendums in Volume III.

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.

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 Clatsop 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. Clatsop County currently addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, Clatsop County will work to incorporate the recommended mitigation action items into existing programs and procedures.

Many of the Clatsop 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, Clatsop 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.

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 jurisdictions 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.

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

Multi-Hazard #1

Proposed Action Item:	**Alignment with Plan Goals:**
Build new centralized Emergency Operations Center	***Decrease disruption to critical services*** ***Increase cooperation and collaboration among County partners***

Rationale for Proposed Action Item:

- **The current Emergency Operations Center located at the Sheriff's Building in Astoria is not large enough to accommodate the amount of people needed during a large disaster recovery effort. This was evidenced during the December 2007 storm.**
- **"It is important that critical facilities functions during and after disasters. Strengthening all essential facilities will improve recovery capacity and reduce risk and loss of life…" Examples of upgrading community services include developing "an Emergency Operations Center (EOC) that would house the County's emergency departments and serve as a shelter for critical County staff;" combining police, fire and 911 dispatch in a center that would also serve as a shelter for first responders during an emergency.**
- **This action was one of the Steering Committee's top three priorities for 2008-2009.**

Ideas for Implementation:

- **Camp Rilea in the Clatsop plains area has been identified as a potential candidate site.**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	Oregon Emergency Management

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #2

Proposed Action Item:	**Alignment with Plan Goals:**
Centralize Countywide 911 system	***Decrease disruption to critical services*** ***Increase cooperation and collaboration among County partners***

Rationale for Proposed Action Item:

- **"It is important that critical facilities functions during and after disasters. Strengthening all essential facilities will improve recovery capacity and reduce risk and loss of life…" Examples of upgrading community services include developing "an Emergency Operations Center (EOC) that would house the County's emergency departments and serve as a shelter for critical County staff;" combining police, fire and 911 dispatch in a center that would also serve as a shelter for first responders during an emergency.**
- **This was one of the Steering Committee's top three priorities for 2008-2009.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #3

Proposed Action Item:	**Alignment with Plan Goals:**
Develop a pre-plan of how to accommodate visitors to the coast following a major disaster.	***Protect life***

Rationale for Proposed Action Item:

- **Each year, hundreds of thousands visit communities in Clatsop County. If a major disaster were to strike during peak visitation times (summer), communities would be overwhelmed by the numbers of people to take care of.**

Ideas for Implementation:

- **Work with the County's Emergency Services Coordinator to develop pre-plan.**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #4

Proposed Action Item:	**Alignment with Plan Goals:**
Evaluate the vulnerability of waste water treatment facilities in the County.	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Many communities in Clatsop County have waste water treatment facilities that are at risk to earthquakes, tsunamis and/or floods.**
- **Retrofitting of vital infrastructure, such as schools and community buildings, provides important improvements that reduce hazard exposure and the cost and time associated with recovery.**
- **Protecting utilities from damage can minimize the economic and social disruption caused by natural disasters.**

Ideas for Implementation:

- **Complete vulnerability assessment**
- **Prioritize mitigation projects**
- **Seek funding for mitigation projects**
- **Complete mitigation projects**
- **Document successes**

Coordinating Organization:	**Clatsop County Public Works**

Internal Partners:		**External Partners:**
		City of Cannon Beach, City of Gearhart, City of Seaside, City of Warrenton, City of Astoria
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #5

Proposed Action Item:	**Alignment with Plan Goals:**
Evaluate the feasibility of undergrounding utilities where appropriate	***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **During the December 2007 windstorm, overhead utilities were vulnerable to disruption due to downed trees. This action is to identify those areas most susceptible to damage by falling trees and explore the feasibility of relocating critical utilities underground.**
- **Tree falls during winter storm events can be a risk to overhead power lines. During a winter storm, tree falls have the potential to down overhead power lines, causing electric power failures. Undergrounding utility extensions to reduce the effect of ice loading and tree falls can help mitigate a community's risk to winter storms, and limit disruptions in service in the event of a winter storm.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Public Works**

Internal Partners:	**External Partners:**
	City of Cannon Beach, City of Gearhart, City of Seaside, City of Warrenton, City of Astoria

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #6

Proposed Action Item:	**Alignment with Plan Goals:**
Identify and develop emergency shelter facilities throughout the County.	***Protect life*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **The December 2007 storm exposed the lack of a coordinated emergency shelter system for the County. No one knew where shelters were to be located and the ones that emerged were not adequately stocked.**

Ideas for Implementation:

- **Establish County shelter plans that identify where shelters are located. Ensure that shelters will be accessible, especially following seismic events.**
- **Equip shelters with appropriate equipment – cooking, lighting, emergency power.**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	American Red Cross

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #7

Proposed Action Item:	**Alignment with Plan Goals:**
Develop secondary back-up power, communication, and lighting for the Port of Astoria airport	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Currently, the airport lacks back-up power, communication and lighting. This was an issue during the December 2007 windstorm.**
- **The Port of Astoria airport is considered a critical facility and therefore, having back-up power, communication and lighting are important for maintaining services.**

Ideas for Implementation:

Coordinating Organization:	**Port of Astoria**

Internal Partners:	**External Partners:**
	Clatsop County, City of Warrenton, FAA

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #8

Proposed Action Item:	**Alignment with Plan Goals:**
Develop Post-Disaster Recovery Plans for communities in Clatsop County	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Clatsop County and the cities therein are vulnerable to the Cascadia Subduction Zone earthquake and resultant tsunami.**
- **Communities can start to address the redevelopment issues they will face following the event now by engaging in post-disaster recovery planning to identify goals and strategies for redevelopment.**
- **The City of Cannon Beach began this process in 2006 and has a post-disaster recovery work plan.**

Ideas for Implementation:

- **Utilize the Partnership for Disaster Resilience Post-Disaster Recovery Planning How To Guide to facilitate community forums.**
- **Develop recovery work plans and begin the planning process before the event.**
- **Develop guiding principles for rebuilding the community.**
- **Partner with public and private utilities to identify strategies for rebuilding infrastructure and utilities.**

Coordinating Organization:	**Clatsop County Planning**

Internal Partners:		**External Partners:**
		City of Cannon Beach, City of Gearhart, City of Seaside, City of Warrenton, City of Astoria
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #9

Proposed Action Item:	**Alignment with Plan Goals:**
Encourage residents to maintain and update 72 hour kits	***Protect life*** ***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- **Every citizen should have a 72 hr survival kit because when a large scale hazard event affect the north coast, we become very isolated from outside support. This means that citizens will need to have stocked enough survival gear and food to last through an extended recovery period.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	Chambers of Commerce, Title companies

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #10

Proposed Action Item:	**Alignment with Plan Goals:**
Harden the Wikiup repeater site	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **The Wikiup repeater site was down during the December 2007 windstorm creating lack of communication issues throughout the County.**
- **The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings, critical facilities, and infrastructure. [201.6(c)(3)(ii)]. Relocating critical facilities out of hazard zones will reduce the vulnerability of a community and avoid disruption of critical facilities.**
- **A strategy to avoid future disruption of critical facilities is to "relocate critical facilities and equipment out of known hazard zones or retrofit the facilities to minimize disruption of services."**

Ideas for Implementation:

- **Utilize Hazard Mitigation Grant Program (HMGP) 5% dollars to harden repeater site.**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	Oregon Emergency Management

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #11

Proposed Action Item:	**Alignment with Plan Goals:**
Develop an inventory of available generators and fuel distribution	***Decrease disruption to critical services*** ***Increase cooperation and collaboration among County partners***

Rationale for Proposed Action Item:

- **A better inventory is needed to increase the efficiency of generator and fuel distribution following a disaster.**
- **"It is important that critical facilities function during and after disasters. Local units of government want to insure continuous service by strengthening essential facilities such as fire stations, city halls, shelters, and police stations. In addition, emergency backup generators should be provided to each critical facility." Ensuring continuous service will assist residents in recovering from a natural disaster as well as make the process easier.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
Clatsop Co. Public Works	

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #12

Proposed Action Item:	**Alignment with Plan Goals:**
Partner with Clatsop County Community College on mitigation efforts	***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss*** ***Decrease disruption to critical services*** ***Increase cooperation and collaboration among County partners***

Rationale for Proposed Action Item:

- **The College can provide workforce training.**
- **Students and faculty are available for projects.**
- **Facilities can be utilized for training – CERT, Fire training, etc..**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	Clatsop Community College, City of Astoria

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #13

Proposed Action Item:	**Alignment with Plan Goals:**
Post-disaster pet/animal shelter	***Protect life***

Rationale for Proposed Action Item:

- **People will have more time to coordinate with disaster plans better and have better peace of mind if they knew where their pets and/or livestock are located**
- **Hurricane Katrina highlighted the importance of planning for pets before disasters.**

Ideas for Implementation:

- **Create 3 pet/animal shelters across the county**
- **At least one for livestock (County fairgrounds is one suggestion)**
- **Involve local vets, feed stores, pet stores and interested citizens**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	Pet stores, livestock stores, local veterinarians, etc.

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

Form Submitted by:	**Caren Black (CERT volunteer)**

Multi-Hazard #14

Proposed Action Item:	**Alignment with Plan Goals:**
Emergency Preparedness CDs	***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- **Two local KMUN radio programs have already been produced giving vital information on emergency preparedness and emergency behaviors (from interviews with Mike Jackson (Astoria Fire Marshall), Vanessa Clarkson (Red Cross),Don Hillgartner (RACES, ARES), Tom Manning (Tillamook County), Patrick Corcoran (OSU Extension Service), Deb Truesdell (Seaside Tsunami Prep Coordinator), and Ana Marie Jones (Firstvictims.org)**
- **There is a wealth of local emergency prep information in these interviews and it would be a great service to County residents to create and distribute CDs of the interviews to the general public.**

Ideas for Implementation:

- **CDs are not expensive and thus this project could produce a lot of free CDs and make them available at key locations throughout the County.**

Coordinating Organization:	**Clatsop County Emergency Management**

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

Form Submitted by:	**Caren Black (CERT volunteer)**

Multi-Hazard #15

Proposed Action Item:	**Alignment with Plan Goals:**
Food and Emergency Supply Stations	***Protect life***

Rationale for Proposed Action Item:

- **Food, water and other emergency supplies are critical items when a disaster strikes. Creating stations outside of the areas that are most likely to be damaged during disasters can provide safe and reliable locations for people to congregate and receive these items.**
- **This idea is already being developed in Seaside. They are storing emergency supplies in plastic barrels above the tsunami inundation line to ensure adequate supplies in the event that a tsunami strikes. The goal is to expand this idea to other areas in the County.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Caren Black (CERT volunteer)**

Multi-Hazard #16

Proposed Action Item:	**Alignment with Plan Goals:**
Relocate Lewis and Clark RFPD – Station #1	***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **The #1 Station is located in Jeffers Gardens which is below sea level and vulnerable to levee failure due to flooding and tsunamis.**
- **The all-volunteer RFPD staff will not be able to perform its duties in the event that the station floods.**

Ideas for Implementation:

- **Relocate the station above the tsunami inundation and 100 year flood lines (one possible location is near the Lewis and Clark Middle School.**

Coordinating Organization:	**Lewis and Clark RFPD**

Internal Partners:	**External Partners:**
	Clatsop County Emergency Management

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

Form Submitted by:	**Christopher Paddon, CERT volunteer**

Multi-Hazard #17

Proposed Action Item:	**Alignment with Plan Goals:**
CERT Program support	***Protect life*** ***Increase education and awareness of the risks and hazards in Clatsop County*** ***Increase cooperation and collaboration among County partners***

Rationale for Proposed Action Item:

- **The CERT programs in Clatsop County are not large enough to provide CERT assistance in the entire County. The goal is to provide CERT programs with enough assistance to be able to grow to accommodate more of the County.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Emergency Management, CERT**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #18

Proposed Action Item:	**Alignment with Plan Goals:**
Upgrade Wickiup Grange to become shelter for both short and long term disasters	***Protect life***

Rationale for Proposed Action Item:

- **The Wickiup Grange already serves as a well-known and central location for the surrounding community. It is near a senior citizens center, a market, Highway 30, and a half-mile from a rural Clatsop County Sheriff substation**

Ideas for Implementation:

- **The facility needs to build wheelchair access, add showers, upgrade kitchen and other infrastructure as well as retrofit building to withstand earthquakes.**
- **Upgraded facility can serve as a designated county shelter**

Coordinating Organization:	**Clatsop County Emergency Management, Wickiup Grange**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

Multi-Hazard #19

Proposed Action Item:	**Alignment with Plan Goals:**
Public Emergency Information Boards	***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- **The County can post public information boards at known locations to provide critical information to the public during emergencies.**
- **In the event that there is no power, these could be boards that residents know to go to in order to get the latest emergency information. During the last major winter storm event in Dec 2007, the public did not know where to go to receive critical information. This created confusion and thus much time was spent running around trying to get the latest information because there were no central locations identified to disseminate this information to the public.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**City of Warrenton Water Treatment Services**

Multi-Hazard #20

Proposed Action Item:	**Alignment with Plan Goals:**
Outreach and education to volunteer organizations that may be designated relief sites in a disaster regarding safe food, water, and sanitation practices.	***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- **In times of disasters many community organizations voluntarily step forward to help the community by providing basic emergency services such as food distribution, meal preparation, and shelter.**
- **Organizations/community groups not pre designated "official relief sites" are often not prepared with the technical knowledge, expertise, nor supplies to assure safe practices for mass feeding, emergency water disinfection or onsite sanitation issues.**
- **Identified as an issue in the North Coast 2008 Winter Storm After Action Report - Informal community feeding sites opened up and accepted privately donated perishable foods that did not meet the acceptable cold chain requirements. Serving foods not in compliance with cold chain requirements, in addition, to foods from unapproved sources creates a high risk for food borne illness.**
- **Assuring that volunteer mass feeding/ shelter operations conform to appropriate practices for safe food, water, sanitization is essential in the aftermath of a disaster to prevent food borne illnesses or the spread of communicable diseases.**

Ideas for Implementation:

1. **Provide targeted outreach and preparedness trainings in the areas of emergency food salvaging, food preparedness, water disinfection, and sanitation practices to volunteer groups/organizations that could provide group-setting services after a disaster.**

2. **Provide a resource guide and ready to use safe food handling kit to feeding sites and shelters.**

3. **Conduct a tabletop exercise with external partners to identify strategic locations for food receiving, storage and distribution, and an improved public communication strategy regarding food safety during disasters.**

Coordinating Organization:	**Clatsop County Health and Human Services, Environmental Health**

Internal Partners:	**External Partners:**
	Clatsop County food banks **Clatsop County Community Action** **North Coast Meals on Wheels** **Department of Agriculture** **Potential community meal sites**

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

Form Submitted by:	**Maureen Taylor, Environmental Health Clatsop County Health and Human Services 503-325-8500 x1927**

. Multi-Hazard #21

Proposed Action Item:	**Alignment with Plan Goals:**
Mitigating the risk of communicable disease in vulnerable, congregate settings.	***Protect life***

Rationale for Proposed Action Item:

- **The control of communicable diseases depend on a healthy environment-clean water, adequate sanitation, vector control, shelter, population immunization and health care workers trained in early diagnosis and treatment. Disasters compromise the infrastructures that support healthy environments.**
- **Congregate facilities in a disaster impact zone could have varying degrees of damage to their water, sewer, and power infrastructures.**
- **People affected by disasters are particularly vulnerable to communicable diseases due to stress, fatigue, malnutrition, and unsanitary living conditions.**
- **Communicable disease outbreak risk factors are associated with water and vector borne diseases, and contagious diseases spread by the close personal contact in crowded temporary accommodations, such as shelters.**
- **Community organizations identified as potential congregate settings should be prepared in: general infection control and prevention, monitoring for and management of persons with infectious diseases and response plans to manage potential gastrointestinal and respiratory diseases outbreaks.**

Ideas for Implementation:

1. **Provide consultation/trainings to community organizations, municipalities, and other groups who will provide post disaster relief services in a congregate setting, on recommended guidelines for prevention and control of communicable diseases.**

2. **Provide information packets with ready to use fact sheets, check lists, and infectious disease control & prevention protocols.**

Coordinating Organization:	**Clatsop County Health and Human Services**

Internal Partners:		**External Partners:**
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**Unknown at this time**
X		

Form Submitted by:	**Maureen Taylor, Environmental Health Clatsop County Health and Human Services 503-325-8500 x1927**

Multi-Hazard #22

Proposed Action Item:	**Alignment with Plan Goals:**
Develop a disaster debris management plan	***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **It is important for the county to develop a plan to better coordinate debris management following a disaster. In our county, it is particularly important because of the distance to landfills.**
- **Establishing beneficial uses for recovered materials will help to reduce the amount that goes to landfills.**
- **One option is using ground woody debris (which made up the majority of the Dec 2007 storm's debris) for energy by sending it to local mills to be used as hog fuel.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
Clatsop Co. Planning Dept.	**Western Oregon Waste Co.**

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

Form Submitted by:	**Laura Leebrick, W.O.W.**

Multi-Hazard #23

Proposed Action Item:	**Alignment with Plan Goals:**
Increase public education and outreach in natural hazards which affect the north coast	***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- **Following the December 2007 storm, it became clear that better education and outreach efforts are needed to inform the county's citizens about the hazards which affect us and how to prepare and mitigate for them.**
- **Education programs play a pivotal role in reducing risk from coastal hazards. Techniques used for hazard preparedness by an individual are primarily a function of their level of awareness. Realistic perceptions can minimize potential risk by influencing siting and design decisions. An educated community has a greater likelihood of making decisions that will reduce risk in coastal hazard situations.**
- **The Disaster Mitigation Act of 2000 requires that communities continue to involve the public beyond the original planning process [201.6(c)(4)(ii)]. Developing public education programs for hazard risk mitigation would be a way to keep the public informed of, and involved in, the County's actions to mitigate hazards.**

Ideas for Implementation:

- **Tie county efforts to state efforts**
- **Coordinate efforts with other local groups involved in education and outreach.**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	Lower Columbia Preservation Society, Long-term Disaster Recovery Committee, Astoria Visual Arts, Oregon Emergency Management

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

Form Submitted by:	**Clatsop County Steering Committee**

Tsunami #1

Proposed Action Item:	**Alignment with Plan Goals:**
Rebuild four Seaside School District schools outside of the tsunami inundation zone.	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Four out of five schools in the Seaside School District are located in the tsunami inundation zone and are located at elevations of 7 feet or less.**
- **DOGAMI estimates that the average wave height for the Cascadia Subduction Zone will be 40 – 50 feet.**

Ideas for Implementation:

- **Partner with DOGAMI to determine adequate elevations for the relocation**
- **Secure bonds to fund the relocation efforts**
- **Partner with the Cities to identify potential new properties outside of the inundation zone.**

Coordinating Organization:	**Seaside School District**

Internal Partners:	**External Partners:**
	City of Cannon Beach, City of Seaside, City of Gearhart, Weyerhauser Co.

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

Form Submitted by:	**Clatsop County Steering Committee**

Tsunami #2

Proposed Action Item:	**Alignment with Plan Goals:**
Build "tsunami towers" in coastal cities	***Protect life***

Rationale for Proposed Action Item:

- **Tsunami towers are tall, reinforced buildings (think giant lighthouse-like structure) which can provide for quick evacuations in tsunami zones that do not have nearby high ground to get to. These structures would be visible icons that can provide tsunami awareness simply due to their prominence in the area. They can also be built in an aesthetically pleasing fashion which could provide an added tourist attraction for the area.**
- **Tsunami towers have already been employed in Japan and can provide guidance for building them.**
- **The area where a tsunami tower can be most effective is perhaps Seaside due to the large number of tourists that congregate there, combined with the fact that there is no nearby high ground.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County, Coastal cities**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

Tsunami #3

Proposed Action Item:	**Alignment with Plan Goals:**
Complete tsunami risk assessment for Clatsop County	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss*** ***Decrease disruption to critical services*** ***Protect natural and cultural resources***

Rationale for Proposed Action Item:

- **The tsunami inundation maps completed in 1995 are no longer adequate. The Indian Ocean tsunami in 2004 has resulted in better modeling capabilities.**
- **Cannon Beach received new tsunami maps in 2008 from DOGAMI which showed a substantial increase in the inundation zones. DOGAMI needs to expand its new modeling to include the entire county.**

Ideas for Implementation:

- **Continue mapping efforts for other tsunami prone areas in Clatsop County**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	City of Cannon Beach, City of Gearhart, City of Seaside, City of Warrenton, City of Astoria, DOGAMI

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

Form Submitted by:	**Clatsop County Steering Committee**

Tsunami #4

Proposed Action Item:	**Alignment with Plan Goals:**
Improve public notification and warning system	***Protect life*** ***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- **The current public notification system along the coastline is patchy and not integrated. The County can collaborate with each of the coastal cities to ensure that sirens that are voice capable are able to be heard in all critical inundation zones.**
- **The coordination of a warning alert to the local level is as important is the alert itself**

Ideas for Implementation:

- **Purchase sirens that are voice capable.**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
Clatsop County	**Coastal Cities**

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

Form Submitted by:	**Clatsop County Steering Committee**

Tsunami #5

Proposed Action Item:	**Alignment with Plan Goals:**
Relocate Arch Cape Fire Stations out of the tsunami inundation and flood zones.	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **The Cannon Beach Fire Station was relocated out of the old tsunami inundation zone level. However, new tsunami modeling has indicated that the tsunami hazard area is much greater than originally identified and the relocated Cannon Beach Fire Station is still located in the inundation zone.**
- **The Arch Cape Fire Station is located in a flood hazard area.**

Ideas for Implementation:

- **Cannon Beach has purchased new property outside the inundation zone, but needs to seek funding for the construction costs.**

Coordinating Organization:	**Cannon Beach Fire**

Internal Partners:	**External Partners:**
	Clatsop County

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

Form Submitted by:	**Clatsop County Steering Committee**

Tsunami #6

Proposed Action Item:	**Alignment with Plan Goals:**
Elevate Brownsmead Rural Fire District Station	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Station is located in tsunami inundation zone, but needs to stay where it is located in order to be centrally located within the community.**
- **Most of Brownsmead is in the Tsunami inundation zone making it hard to relocate the station to higher ground, therefore elevating the station in its current location is the preferred option.**

Ideas for Implementation:

- **FEMA Pre-disaster mitigation grant program combined with local funding avenues**

Coordinating Organization:	**Knappa Fire**

Internal Partners:	**External Partners:**
Clatsop County	**Fire Defense Board, Watershed Council**

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

Form Submitted by:	**Clatsop County Steering Committee**

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Tsunami #7

Proposed Action Item:	**Alignment with Plan Goals:**
Establish long term supply and assembly areas outside of inundation zones.	***Decrease disruption to critical services*** ***Increase cooperation and collaboration among County partners***

Rationale for Proposed Action Item:

- **To prepare for a tsunami, emergency supply locations will need to be identified and established in areas near tsunami-prone population centers, but outside the inundation zones.**
- **The City of Seaside has already begun this process.**

Ideas for Implementation:

- **Coordinate with Seaside to expand the program to include the rest of the inundation zones within the County.**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	All cities and population centers in inundation zones

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

Form Submitted by:	**Clatsop County Steering Committee**

Tsunami #8

Proposed Action Item:	**Alignment with Plan Goals:**
Upgrade and improve evacuation routes as well as assembly areas outside of tsunami inundation zones	***Protect life*** ***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- **Currently the evacuation routes and assembly areas that exist are not well defined or are inadequate for the total population of locals and visitors. The County should coordinate with each of the coastal cities to develop a more comprehensive county-wide evacuation map which can be disseminated to the public.**
- **Additionally, these evacuation routes should be better marked and maintained.**
- **These would be easily accessible sites on high ground with pre-staged food, water, tents, medical supplies, helicopter pad, generators and other necessities**
- **A network of government-funded evacuation trails. These would be designed and maintained to remain passable after a major quake, leading from low-lying areas to high ground above tsunami inundation zones.**

Ideas for Implementation:

- **Identify where current evacuation routes and assembly areas are located**
- **Identify where additional pedestrian evacuation routes could be developed.**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:		**External Partners:**
Clatsop Co Planning Dept		**Population centers at risk of tsunami inundation.**
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	

Form Submitted by:	**Clatsop County Steering Committee**

Tsunami #9

Proposed Action Item:	**Alignment with Plan Goals:**
Seismic vulnerability assessment/vertical evacuation routes	***Protect life***

Rationale for Proposed Action Item:

- **Survey all tall buildings in the County to determine which buildings will be standing after an earthquake in order to design vertical evacuation routes during tsunami events.**
- **The Disaster Mitigation Act of 2000 requires communities to assess their vulnerability to natural hazards, particularly by identifying the types and number of buildings, infrastructure, and critical facilities that could be affected.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

Tsunami #10

Proposed Action Item:	**Alignment with Plan Goals:**
Conduct preliminary research on the development of a County Land Use Ordinance relating to Tsunami Hazards	***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **A Tsunami Hazards Overlay district may be a useful tool for planners to address the issues involved in land ownership in a tsunami inundation zone. Things such as landowner education for new homeowners may help to increase tsunami awareness on the coast.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Planning Department**

Internal Partners:	**External Partners:**
Clatsop Co. Emergency Management	

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

Form Submitted by:	**Clatsop County Steering Committee**

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Tsunami #11

Proposed Action Item:	**Alignment with Plan Goals:**
Establish high ground commercial districts (above tsunami lines)	***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss***

Rationale for Proposed Action Item:

- **High ground commercial zones can be established to encourage new or relocating businesses to establish themselves above tsunami zones. This will ensure that in the event of a disaster, there will be some businesses that are still operational and can help to serve the public following a disaster.**
- **They could also possibly serve as shelters.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County, Cities**

Internal Partners:	**External Partners:**
Clatsop County Emergency Management	

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

Form Submitted by:	**Jessica Long, Residential Property Appraiser**

Wind/Winter Storm #1

Proposed Action Item:	**Alignment with Plan Goals:**
Develop and implement hazard tree program	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Protect natural and cultural resources***

Rationale for Proposed Action Item:

- **Lack of hazard tree inventories or management plans**
- **Wind and winter storms have the potential to down trees, causing injuries and damage to property and infrastructure. In counties with a high level of risk to wind and winter storms, developing and implementing programs to reduce the potential for wind and winter storms to cause damage by downing trees can assist a community in mitigating its overall risk to wind and winter storms.**
- **The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that are being considered by the community to reduce the effect that natural hazards will have on the community [201.6(c)(3)(ii)]. Developing and implementing programs to reduce the potential for wind and winter storms to cause damage by downing trees can assist a community in mitigating its overall risk to wind and winter storms.**

Ideas for Implementation:

- **Each city in Clatsop county is working from hazard tree management plans that are tailored to the needs of, and resources available to that city**
- **Partner with Oregon Department of Forestry to develop and implement program.**
- **Utilize low-cost access to tree inventory software specific to coastal communities acceptable to FEMA for resource damage reimbursements hoping to be made available by Oregon Department of Forestry**
- **Utilize existing Master Gardener participants in hazard tree programs**

Coordinating Organization:	**Clatsop County Public Works Dept.**

Internal Partners:	**External Partners:**
Clatsop County Public Works Dept. **Clatsop County Planning Dept.**	**Oregon Dept. of Forestry, Cities, OSE Extension**

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

Form Submitted by:	**Clatsop County Steering Committee**

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Wind/Winter Storm #2

Proposed Action Item:	**Alignment with Plan Goals:**
Promote tree planting projects on private and public properties	***Minimize damage to public and private buildings and infrastructure*** ***Protect natural and cultural resources***

Rationale for Proposed Action Item:

- **Significant and additional community tree damage due to inadequate tree care after storm event, which may contribute to decrease in environmental services derived from community trees (wind buffering, wildlife habitat, erosion control, stormwater mitigation, etc.**
- **Landscaping and vegetation make a difference in mitigating the impacts of natural hazards. Trees break the force of the wind and stabilize the soil. Wetlands absorb much of the overflow from stream channels. Fire-resistant vegetation can retard the spread of wildfires toward vulnerable buildings. Planners can use landscaping requirements to preserve or enhance he protection such natural features afford. These requirements may be part of site plan reviews or a separate set of zoning regulations and environmental performance standards.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Public Works Dept.**

Internal Partners:	**External Partners:**
Clatsop County Public Works Dept. **Clatsop County Planning Dept.**	**Oregon Dept. of Forestry, cities, utility companies, nurseries, homeowners**

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

Form Submitted by:	**Clatsop County Steering Committee**

Wind/Winter Storm #3

Proposed Action Item:	**Alignment with Plan Goals:**
Have one to three ISA-certified arborists in each community that know how to properly prune storm damaged trees	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Current lack of ISA certified arborists in rural NW Oregon to meet local community needs**
- **Debris clearance is often traffic clearance as well, to the extent that roadways are blocked by felled trees or flood muck and thus impede other recovery functions.**
- **Ensuring the smooth function of this service also speeds the clearance of debris-ridden sites so that properties may be repaired and rebuilt, and enhances the prospects for economic recovery by eliminating potential eyesores.**
- **Debris management needs to be determined prior to a hazard to ensure a coordinated response.**
- **Often times, debris management is one of the largest local expenditures following a disaster. Having a plan ahead of time may assist the community in curbing excess spending post disaster.**

Ideas for Implementation:

- **Facilitate ISA arborist training and recruitment during Spring 2008**
- **Encourage interested participants to take ISA exam**
- **Work with ISA to hold certification exam on North Coast in 2009**

Coordinating Organization:	**Clatsop County Public Works Dept., Cities**

Internal Partners:	**External Partners:**
Clatsop County Public Works Dept. **Clatsop County Planning Dept.**	**Cities, local businesses, OSU Extension, ODF**

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

Form Submitted by:	**Clatsop County Steering Committee**

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Wind/Winter Storm #4

Proposed Action Item:	**Alignment with Plan Goals:**
Heightened awareness by First Responders and appropriate city staff of the factors contributing to tree stability	***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- **Potential for increased tree hazard in and around people and homes over time**
- **The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that are being considered by the community to reduce the effect that natural hazards will have on the community [201.6(c)(3)(ii)]. Developing and implementing programs to reduce the potential for wind and winter storms to cause damage by downing trees can assist a community in mitigating its overall risk to wind and winter storms.**
- **Wind and winter storms have the potential to down trees, causing injuries and damage to property and infrastructure. In counties with a high level of risk to wind and winter storms, developing and implementing programs to reduce the potential for wind and winter storms to cause damage by downing trees can assist a community in mitigating its overall risk to wind and winter storms.**

Ideas for Implementation:

- **Broadly disseminate *How to Recognize Hazard Trees* brochure (with PNW-ISA, OEM); conduct training if there is enough interest**
- **Seek FEMA mitigation funds for local cost share grants**

Coordinating Organization:	**Clatsop County Planning Dept.,** **Clatsop County Public Works Dept.**

Internal Partners:	**External Partners:**
Clatsop County Public Works Dept. **Clatsop County Planning Dept.**	**ODF, OSU Extension, citizens, local businesses, OEM/HMGP**

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

Form Submitted by:	**Clatsop County Steering Committee**

Wind/Winter Storm #5

Proposed Action Item:	**Alignment with Plan Goals:**
Educate homeowners about methods to tie down metal roofs and metal sheds.	***Minimize damage to public and private buildings and infrastructure*** ***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- **During the December 2007 windstorm, metal roof and metal sheds caused secondary damage when they became windborne. This is because many of those roofs and sheds are not secured very well to a solid foundation. This action is to develop an education program to get information out to the public on securing these types of structures.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Planning/Building**

Internal Partners:	**External Partners:**
Clatsop Co Emergency Mgmt	**Manufacturers, distributors of these types of structures**

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

Form Submitted by:	**Clatsop County Steering Committee**

Wind/Winter Storm #6

Proposed Action Item:	**Alignment with Plan Goals:**
Identify major transportation routes that are at risk during a major storm event	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Use this data when considering capital improvement projects and maintenance activities within County maintained transportation system.**
- **Develop and publicize alternative transportation routes in the event that a major winter storm event restricts access to essential County and State transportation routes.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Transportation and Development Dept.**

Internal Partners:	**External Partners:**
Other County departments	

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

Form Submitted by:	**Clatsop County Steering Committee**

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Earthquake #1

Proposed Action Item:	**Alignment with Plan Goals:**
Retrofit County bridges that are identified by a seismic vulnerability assessment	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Conduct a seismic vulnerability assessment and then use it to retrofit bridges identified as in need of retrofitting.**
- **Planning post-disaster transportation strategies ahead of time will assist communities in disaster recovery efforts. "The condition of bridges and streets is a very important component of post-disaster data assessment." In addition, "damaged transportation systems may delay the arrival of goods, services, and resources vital to response and recovery efforts."**
- **This was one of the Steering Committee's top three priorities for 2008-2009.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

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Earthquake #2

Proposed Action Item:	**Alignment with Plan Goals:**
Complete seismic vulnerability assessment of County owned bridges	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **There are isolated "nodes" of development in the County that may become more isolated by damaged bridges.**
- **Planning post-disaster transportation strategies ahead of time will assist communities in disaster recovery efforts. "The condition of bridges and streets is a very important component of post-disaster data assessment." In addition, "damaged transportation systems may delay the arrival of goods, services, and resources vital to response and recovery efforts."**

Ideas for Implementation:

- **Look at ODOT's County owned bridge list and determine priority for retrofits**
- **Utilize the results of this assessment to aid in identifying potential shelter locations.**

Coordinating Organization:	**Clatsop County Planning**

Internal Partners:	**External Partners:**
	ODOT

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

Form Submitted by:	**Clatsop County Steering Committee**

Earthquake #3

Proposed Action Item:	**Alignment with Plan Goals:**
Seismic upgrades for the Ecola Creek Bridge in Cannon Beach (Hwy 101)	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **This bridge was washed out during the 1964 tsunami event.**
- **The bridge is the only ingress/egress on the north side of the city.**

Ideas for Implementation:

- **Partner with ODOT to develop implementation strategy**

Coordinating Organization:	**City of Cannon Beach**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

Earthquake #4

Proposed Action Item:	**Alignment with Plan Goals:**
Complete a seismic vulnerability assessment for Port of Astoria facilities.	***Protect life*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Much of the Port land has been created by fill, and as a result, the port facilities are particularly vulnerable to earthquakes. The Port needs a comprehensive seismic vulnerability assessment performed on all of the facilities at the port in order to identify those areas in need of seismic upgrades.**
- **A seismic event may negatively impact a local economy, especially if a community's businesses are located in unreinforced masonry buildings. Completing an inventory of commercial buildings that may be vulnerable to earthquake damage will assist a community in prioritizing buildings for seismic retrofit.**
- **The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]. Implementing seismic hazard area ordinances will reduce a community's vulnerability to seismic hazard by helping communities identify what steps should be taken to minimize damage from earthquakes.**

Ideas for Implementation:

Coordinating Organization:	**Port of Astoria**

Internal Partners:	**External Partners:**
	DSL, City of Astoria

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

Form Submitted by:	**Clatsop County Steering Committee**

Earthquake #5

Proposed Action Item:	**Alignment with Plan Goals:**
Develop incentive programs to encourage homeowners to do seismic retrofits.	***Protect life*** ***Minimize damage to public and private buildings and infrastructure***

Rationale for Proposed Action Item:

- **Incentive programs include a variety of benefits to building owners or developers that help to offset the cost of mitigation. Examples of possible incentive programs include: density bonuses, tax credits, property tax incentives or deferrals, real estate disclosures, property acquisition or purchase of development rights, increased funding of public infrastructure programs, and phasing retrofitting programs over a longer period of time.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	City of Cannon Beach, City of Gearhart, City of Seaside, City of Warrenton, City of Astoria

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

Form Submitted by:	**Clatsop County Steering Committee**

Earthquake #6

Proposed Action Item:	**Alignment with Plan Goals:**
Seismic retrofitting of old Hamlet Fire Station	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **The Hamlet fire station needs to be upgraded and retrofitted to be able to withstand an earthquake**
- **"For governments, less damage to government structures will mean continued services and normal processes or at least minimal interruptions. If government structures come through an earthquake with little or no damage, agencies will not have to relocate services, and public officials can respond to the immediate and long-term demands placed on them by the event. In short, seismic rehabilitation as a pre-event mitigation strategy actually will improve post-event response by lessening life loss, injury, damage, and disruption."**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County, Hamlet RPFD**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Bill Boone, Hamlet RFPD**

Flood #1

Proposed Action Item:	**Alignment with Plan Goals:**
Partner with ODOT to elevate Highway 101 roadbed to an elevation sufficient to avoid annual winter flooding on multiple sections between the City of Seaside and the Junction of Highways 101 and 26.	***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Routine winter flooding of this section of Highway 101 has several negative effects:**
  - **Disrupts coastal economy from Tillamook to Astoria and beyond**
  - **Prevents or delays timely ambulance response between Seaside and points south and west.**
  - **Prevents or delays police and fire mutual support to and from Seaside during emergencies.**
  - **Prevents or delays routine patrols by Oregon State Police and Clatsop County Sheriffs Office.**
  - **Damages vehicles attempting to drive through the flooded sections of roadway**
  - **Causes vehicles to be swept off the roadway while attempting to drive through sections of flooded roadway, posing a threat to life.**
  - **Consumes many hours of labor for ODOT and other public agencies attempting to control or warn motorists of the hazard**
  - **Consumes motorist funds for towing and repairs to vehicles disabled by floodwaters.**
  - **Flooding on the highway can impact public safety as well as the economic vitality of communities in Clatsop County.**

Ideas for Implementation:

- **Gain political consensus for project from ODOT and affected counties, cities, state & federal agencies, and citizens**
- **Conduct engineering studies for raising roadway elevations or utilize existing studies in ODOT files.**
- **Prepare or utilize existing job specifications**
- **Estimate job costs**
- **Obtain funding**
- **Solicit bids for the specified work**
- **Award a contract for the work**
- **Complete the project**

Coordinating Organization:	**State of Oregon, Dept. of Transportation**

Internal Partners:	**External Partners:**
Division of State Lands, Dept. of Fish and Wildlife	**FEMA, Clatsop County, Clatsop Co. Cities, Oregon Emergency Management**

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

Form Submitted by:	**Clatsop County Steering Committee**

Flood #2

Proposed Action Item:	**Alignment with Plan Goals:**
Elevate runway at Port of Astoria airport and improve diking around the airport	***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **The runway is vulnerable to flooding and tsunamis.**
- **The US Coast Guard relies on the runway.**

Ideas for Implementation:

Coordinating Organization:	**Port of Astoria**

Internal Partners:	**External Partners:**
	Clatsop County, City of Warrenton, FAA

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

Form Submitted by:	**Clatsop County Steering Committee**

Flood #3

Proposed Action Item:	**Alignment with Plan Goals:**
Complete a risk assessment related to levees in the County and adjacent development	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Clatsop County has a policy that allows development behind diked lands. Because of this, a risk assessment needs to be performed county-wide to evaluate the potential for dike failures.**
- **The 2000 Disaster Mitigation Act states that technical and financial assistance for Pre-Disaster Mitigation may be used to improve assessments of a community's vulnerability to natural hazards. Collecting data for non-declared natural hazards events will assist communities in determining overall vulnerability and risk to natural hazards.**

Ideas for Implementation:

- **Explore opportunities for transfer of development rights.**

Coordinating Organization:	**Clatsop County Planning**

Internal Partners:	**External Partners:**
	Department of Land Conservation & Development

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

Form Submitted by:	**Clatsop County Steering Committee**

Flood #4

Proposed Action Item:	**Alignment with Plan Goals:**
Westport Railroad Bridge (71.3) replacement	***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **The railroad bridge is made up of many rows of trestles which cause debris to pile up against during flooding events. This debris jam causes Plimpton Creek to overflow at the bridge and flood surrounding homes.**
- **The goal of the project would be to replace the trestle bridge with an open span bridge, thus allowing flood debris to flow underneath without causing flooding in Westport.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County**

Internal Partners:	**External Partners:**
	Railroad Company, State Agencies

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

Form Submitted by:	**Clatsop County Steering Committee**

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Flood #5

Proposed Action Item:	**Alignment with Plan Goals:**
Provide support and assistance to diking districts in respect to accreditation of the County's levees.	***Minimize damage to public and private buildings and infrastructure*** ***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **With the new flood map revisions FEMA is in the process of decertifying almost all of the dikes (levees) in the county. This results in a higher BFE of many places and the inclusion in a flood zone for others (when they previously were excluded because of levee protection).**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Planning Department**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

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Flood # 6

Proposed Action Item:	**Alignment with Plan Goals:**
Continue compliance with the National Flood Insurance Program (NFIP).	*Protect life* *Minimize damage to public and private buildings and infrastructure* *Reduce economic loss* *Decrease disruption to critical services* *Increase education and awareness of the risks and hazards in Clatsop County*

Rationale for Proposed Action Item:

- **The National Flood Insurance Program (NFIP) provides communities with federally backed flood insurance, provided that communities develop and enforce adequate floodplain management measures. According to the NFIP, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance.**
- **The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Continued participation in the NFIP will diminish flood damage to new and existing buildings in communities while providing homeowners, renters, and business owners additional flood insurance protection.**

Ideas for Implementation:

- **Actively participate with DLCD and FEMA during Community Assistance Visits. The Community Assisted Visit (CAV) is a scheduled visit to a community participating in the NFIP for the purpose of: 1) conducting a comprehensive assessment of the community's floodplain management program; 2) assisting the community and its staff in understanding the NFIP and its requirements; and 3) assisting the community in implementing effective flood loss reduction measures when program deficiencies or violations are discovered.**
- **Conduct an assessment of Clatsop County floodplain ordinances to ensure they reflect current flood hazards.**

Lead Agency:	**Community Development**

Internal Partners:	**External Partners:**
County Commission, Public Works	**FEMA**

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

Form Submitted by:	**Clatsop County Steering Committee**

Action Item Status: Pending

Landslide #1

Proposed Action Item:	**Alignment with Plan Goals:**
Build new access road on east side of Astoria from Hwy 30	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **If Leif Erickson Drive is blocked, such as through a landslide which occurs regularly, then there is no other access to Highway 30 heading east from Astoria**
- **Planning post-disaster transportation strategies ahead of time will assist communities in disaster recovery efforts. "The condition of bridges and streets is a very important component of post-disaster data assessment." In addition, "damaged transportation systems may delay the arrival of goods, services, and resources vital to response and recovery efforts."**

Ideas for Implementation:

- **Route the new road through Land Reserve Area**

Coordinating Organization:	**Clatsop County, City of Astoria, ODOT**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Rosemary Johnson, City of Astoria Planner**

Landslide #2

Proposed Action Item:	**Alignment with Plan Goals:**
Continue upgrading and enhancing County GIS	***Decrease disruption to critical services*** ***Increase cooperation and collaboration among County partners***

Rationale for Proposed Action Item:

- **This should be done in order to more efficiently identify areas prone to landslide and mass movement.**
- **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. Focusing on areas that will be developed and will affect people and critical infrastructure will improve land use planning and provide for more efficient and cost effective development.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Planning Department**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

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Landslide #3

Proposed Action Item:	**Alignment with Plan Goals:**
Develop alternative transportation routes around slide-prone areas in County	***Decrease disruption to critical services***

Rationale for Proposed Action Item:

- **Identify historically slide-prone areas and then develop alternative routes in advance of a slide event.**
- **This will help to reduce the time it takes to re-open a road following a slide.**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County Planning Department**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

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Drought #1

Proposed Action Item:	**Alignment with Plan Goals:**
Investigate the viability of County-wide public awareness activities regarding water conservation	***Increase education and awareness of the risks and hazards in Clatsop County***

Rationale for Proposed Action Item:

- **Even though drought does not affect this county very often, it would be a positive to address water conservation in the event those steps are needed.**
- **"The Disaster Mitigation Act of 2000 requires that communities continue to involve the public beyond the original planning process [201.6(c)(4)(ii)]. Developing public education programs for hazard risk mitigation would be a way to keep the public informed of, and involved in, the County's actions to mitigate hazards."**

Ideas for Implementation:

Coordinating Organization:	**Clatsop County**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Clatsop County Steering Committee**

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Wildfire #1

Proposed Action Item:	**Alignment with Plan Goals:**
Develop and implement the Community Wildfire Protection Plan	***Protect life*** ***Minimize damage to public and private buildings and infrastructure*** ***Reduce economic loss*** ***Decrease disruption to critical services*** ***Increase cooperation and collaboration among County partners***

Rationale for Proposed Action Item:

- **The plan is needed to better address the very real dangers of wildfires in this forest rich county.**
- **Natural disasters, including earthquakes, tsunamis, tornadoes, hurricanes, flooding, and wildfires, pose great danger to human life and to property throughout the United States; (2) greater emphasis needs to be placed on- (A) identifying and assessing the risks to States and local governments (including Indian tribes) from natural disasters.**

Ideas for Implementation:

- **The process began in 2008 and will eventually be incorporated into the Wildfire Annex of the Pre-disaster mitigation plan.**

Coordinating Organization:	**Clatsop County Emergency Management**

Internal Partners:	**External Partners:**
	Fire Defense Board, etc.

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

Form Submitted by:	**Clatsop County Steering Committee**

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Appendix B:
Planning and Public Process

The purpose of this appendix is to provide documentation of the planning and public process utilized to develop the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan.

The following documents are included:

- Steering Committee MOU
- City/Special District Planning Process Handout
- Steering Committee #1 Agenda – November 15, 2007
- Steering Committee #1 Minutes – November 15, 2007
- Steering Committee # 2 Agenda – February 14, 2008
- Steering Committee # 2 Minutes – February 14, 2008
- Steering Committee #3 Agenda – April 16, 2008
- Steering Committee #3 Minutes – April 16, 2008
- Steering Committee #4 Agenda – August 7, 2008
- Steering Committee #4 Minutes – August 7, 2008
- Public Involvement Strategy
- Newspaper Articles: Daily Astorian
    - January 11, 2008
    - January 16, 2008
    - January 17, 2008
    - January 18, 2008
    - August 18, 2008
- Stakeholder Interview Summary
- Public Outreach fliers, talking points, media announcements

MEMORANDUM OF UNDERSTANDING

between
CLATSOP COUNTY
and the
PRE-DISASTER MITIGATION STEERING COMMITTEE

I. Purpose

As a part of the Pre-Disaster Mitigation Planning Program, a Memorandum of Understanding (MOU) must be executed between Clatsop County and the Pre-Disaster Mitigation Planning Steering Committee. The plan created as a result of this MOU will be presented to the Clatsop County Planning Commission and Board of Commissioners for ratification into the Comprehensive Plan.

When adopted, plans provide guidance to county boards, commissions and departments. Adopted plans serve as a guide and do not include a specific financial commitment by the county, cities or special districts involved. All adopted plans should address land use, community facilities and transportation networks. Priority projects are considered for recommendation as a part of the Annual Improvement Project Report. This report will be forwarded to all parties involved.

The intent of this MOU is to ensure that the mitigation plan is developed in an open manner involving community stakeholders, that it is consistent with local policies and is an accurate reflection of the community's values. Its purpose is to form a working relationship between the citizens of Clatsop County and the Pre-Disaster Mitigation Steering Committee.

This MOU sets out the responsibilities of all parties. The MOU identifies the work to be performed by the planning team and parties involved. Planning tasks, schedules and finished products are identified in the Work Program.

II. Responsibilities

A general list of responsibilities follows:

Steering Committee Responsibilities

1. Ensure that the complete planning team includes representatives from neighborhood stakeholders groups, including all residents, community groups, property owners, institutions, businesses, schools, etc. The Steering Committee should approve the final composition of the complete planning team.

2. Develop the Work Program with the County Planning Team.

3. Organize regular meetings of the Steering Committee in coordination with the County Planning Team.

4. Assist the County Planning Team with organizing public meetings to develop the plan.

5. Identify the community resources available to support the planning effort, including people to serve as meeting facilitators and sub-committee chairs.

6. Assist with recruiting participants for planning and stakeholder meetings, including the development of an information distribution strategy

7. Submit the proposed plan to the county, cities and special districts for interdepartmental review.

8. Work with County Planning Team to incorporate interdepartmental comments into the proposed plan.

9. Submit the proposed plan to the county and cities' Planning Commissions, or its special district equivalent.

10. After adoption, develop a Coordination Committee to monitor and work toward plan implementation.

11. After adoption, publicize the plan countywide to ensure community members are aware of the plan and its contents.

County Planning Team Responsibilities

1. The Columbia River Estuary Study Taskforce (CREST) and a graduate student from the University of Oregon will facilitate the planning process and assist the County and cities in all aspects of the planning process and plan adoption.

2. Assign a planning team member to provide technical assistance and necessary data to the planning effort.

3. Coordinate and facilitate community meetings with the assistance of the Steering Committee.

4. Provide any necessary materials, handouts, etc., necessary for public planning meetings.

5. Work with the steering committee to collect and analyze data and develop goals and implementation strategies.

6. Provide assistance with the creation of the plan, including review, editing, and formatting.

7. Coordinate with county departments, cities, special districts, public agencies and other stakeholders during plan development.

8. Coordinate the County interdepartmental review.

9. Coordinate with the Transportation and Development Services Department to prepare for plan consideration by the County Planning Commission and Board of Commissioners.

Clatsop County Manager – Scott Derickson

Signature: _____

Date: _____

Steering Committee Chair – Gene Strong

Signature: _____

Date: _____

Clatsop County Pre-Disaster Mitigation Planning

Basic Outline of Planning Process and City/Special District Involvement

1. **County Planning Process**
    a. The process will take about a year to complete. It is broken down into four phases:
        i. *Phase 1* (Oct-Dec) – Developing the Steering Committee (SC) and gathering involvement from the major cities and special districts.
            1. *NOTE*: County will officially recognize the SC as having the authority to develop a mitigation plan.
            2. Develop a public involvement strategy for the entire process.
        ii. *Phase 2* (Jan-Mar) – develop a Risk Assessment (RA) for all natural hazards that may affect the county.
            1. Cities will add to this RA any risks special to them or of greater importance.
        iii. *Phase 3* (Apr-Jun) – Develop mitigation actions that will help reduce the risks identified in the RA. Review these action items for priority, feasibility and cost-effectiveness.
            1. Action items should include procedural changes as well as on the ground projects (capital improvement projects/infrastructure).
        iv. *Phase 4* (Jul-Sept) – Implement the mitigation plan by adopting it into the local comprehensive plan, for both cities and county.
    b. The next step following the plan implementation will be to use the mitigation action items that were developed and apply for funding of those items with the following federal programs:
        i. FEMA's Hazard Mitigation Grant Program.
        ii. FEMA's Pre-Disaster Mitigation Grant Program.
            1. *NOTE*: these two grant programs are only available to communities that have implemented a Pre-Disaster Mitigation Plan.
        iii. Further federal funding is also available for flood and wildfire specific mitigation:
            1. Flood Mitigation Assistance Program for communities with a Flood Mitigation Plan.
            2. National Fire Plan Grant Program for communities with a Community Wildfire Protection Plan.
                a. NOTE: These two plans can be created alongside the pre-disaster plan with only a few additional requirements.
2. **City/Special District Involvement in County Planning**
    a. By getting involved in the county planning process, the city/special district will have less work to become compliant (with the federal Disaster Mitigation Act of 2000) than going through the process alone.
    b. There are *4 requirements* the city/special district will need to complete in order to create an Addendum to the county plan:
        i. Document the planning process. (Phases 1-4)
        ii. Review the county's risk assessment. Indicate where the city/special district has similarities and where those risks are different. (Phase 2)
        iii. Develop local mitigation action items. (Phase 3)
            1. *NOTE*: These are items that potentially qualify for federal grant money. Mitigation actions items are for identification purposes and do not require that action be taken.
        iv. Formally adopt the Addendum into the comprehensive plan with specific reference to the county's mitigation plan. (Phase 4)
    c. Each city/special district will need to create a small working group (includes SC rep) to develop its addendum. The city/special district is free to decide who will be involved in its working group and how the tasks are broken down.

Clatsop County Pre-Disaster Mitigation Planning

Steering Committee Meeting # 1 – Nov 15th, 2007, 1-3pm

LOCATION

Clatsop County Sheriff's Office, 355 7th St., Astoria, OR 97103
*-- **Ground Floor Conference Room** --*

MEETING AGENDA

Phase 1: Getting Started

Meeting led by Jay Flint, Plan Facilitator

(Powerpoint presentation format)

- **Welcome the Steering Committee and introductions**
- **Discuss: What is mitigation planning?**
- **Review the plan template and its components**
- **Discuss the roles of the Steering Committee**
- **Discuss the draft Mission Statement and Plan Goals**
- **Discuss the draft Public Involvement Strategy**
- **Discuss the draft Memorandum of Understanding**
- **Next Steps**

Clatsop County Pre- Disaster Mitigation Planning Meeting
Steering Committee
November 15, 2007 1PM

Attendees:
Gene Strong, Clatsop County Emergency Management Coordinator
Dave Dougherty, Seaside School District
Richard Mays, City of Cannon Beach
Duane Mullins, Medix Ambulance
Pat Corcoran, Clatsop County Extension
Ted Ames, Warrenton Fire Department
Patrick Wingard, Clatsop County Planning
Bruce Francis, Clatsop County Planning Commission
Jay Flint, CREST
Christine Lolich, Columbia Memorial Hospital
Brett Estes, City of Astoria
Susan Trabucco, Coast River Business Journal
Kevin Cupples, City of Seaside
Margo Lalich, Clatsop County Public Health

City of Warrenton Planning Director – Absent

Jay Flint from CREST explained the purpose of this meeting and talked about creating a mission statement for the plan, he also went over the four phases of the Pre-Mitigation Planning process.

- The first phase will be to develop a Planning Team, which will develop a public involvement strategy for the entire process.

- The second phase will be to develop a Risk Assessment for all natural hazards that may affect the county. Individual cities will add any special risks they have to this list. There is currently a Profile/Risk assessment for the Coast that has been created by the State; the committee will need to update and fine-tune the document.

- The third phase will be to develop mitigation actions that will help reduce the risk identified in the Risk Assessment. They actions will need to be reviewed for priority.

- The forth and final phase will be to implement the mitigation plan by adopting it into the local comprehensive plan for both cities and counties. Once this is completed the county will become FEMA compliant and grant eligible.

Margo Lalich asked: Before we proceed is there a comprehensive list of what is already existing as far as plans for the county? Jay answered that Yes, we will look at all existing

plans, the second phase will be for compiling the information and determining what plans already exist. CREST along with graduate students will gather information during stakeholder meetings.

There was some discussion on how to involve the public in the process. Some ideas discussed were:

- To use the County website for the public to make comments on the process
- Put out a Media Announcement prior to the second phase, it was suggested the information be kept simple, easy to understand and not to raise the public's expectations. Jay commented that the public should know that this is focusing on Natural disasters, things that FEMA would cover.
- Create a survey to be mailed out or accessed on a web site or put in newspaper.
- Community meetings, informing public any new issues brought up would be looked at.

Patrick stated that it would be important to be clear with the public that this is mitigation planning and its purpose is for planning before a disaster happens.

Jay stated that any drafts of information going to the public would be brought to the steering committee before being sent out.

It was agreed that the County Planning Team would consist of this Steering Committee with Gene Strong being the Team Chair. A Memorandum of Understanding will be created from samples of other counties. If you have any comments on the MOU please get them to Jay.
Patrick will check to see if the MOU needs to go through the Planning Commission and who will need to sign it.
Jay will add to the MOU that the steering committee will be responsible for prioritizing the action items.

There will be 3 more meetings during the next year to complete this process. The next 3 meetings will be more working groups rather than presentations. Jay will get examples from outer counties to work from. During the next meeting the committee will need to finalize the Mission Statement Goals, involvement, strategy and MOU. The committee will also need to begin to develop the risk assessment profile.

Jay talked more about how each city will have specific addendums relating to their city. This is how the cities can incorporate their mitigation plans into the county Pre Disaster Mitigation plan thus making them eligible for FEMA Grants.

Other issues addressed:

- What does FEMA fund?
  - Hazard Mitigation Grant – After disaster occurs you can apply for funding
  - Pre Disaster Grant – Nationwide competitive basis
  - Flood Mitigation Grant
  - National Fire Plan Grant

- Clatsop County is one of 2 counties in Oregon yet to develop this plan.

- Patrick said he would focus on flood mitigation.

- If this plan is going to "do something" we need to set goals accordingly: all schools and all cities with clear, simple goals and plans.

- County plans will need to be updated to be sure there are no conflicts with plans already in place.

- Should this group be a sub-committee of the EPREP Group? Jay felt that maybe there should be a formal link to the EPREP group; EPREP will be kept appraised of the process and progress. EPREP will be a source for this group to gather information.

- Discussion on if an outside consultant should be hired to evaluate plans and verify that 2 separate processes are not going on at the same time.

The meeting was adjourned at 3PM
Phase 2 meeting will be held in February

Clatsop County Pre-Disaster Mitigation Planning

Steering Committee Meeting # 2 - Feb 14th, 2008, 1-3pm

LOCATION

Bob Chisholm Community Center, 1225 Avenue A, Seaside, OR, 97138
*-- **Meeting Room 2** --*

MEETING AGENDA

Phase 2: Risk Assessment

- **Overview** (10 min), Jay Flint, CREST
  - Review what has been accomplished and where we are at in the process

- **Presentation – Oregon Partnership for Disaster Resilience – UO** (25 min)
  - Krista Dillon, Associate Director, OPDR
    - Discuss City Addendums
    - Present example of a completed County Plan with City Addendums
  - Sara Schooley, Graduate Assistant, UO
    - Present draft Community Profile
    - Present draft Hazard Annexes

- **Presentation – Clatsop County Planning Dept.** (15 min)
  - Jennifer Bunch, Planner/GIS
    - Present GIS maps of County assets and hazards
    - Distribute city maps to be filled out for City Addendums

- **Steering Committee Work Session** (60 min), Jay Flint, CREST
  - Use Hazard Identification and Community Assets worksheets to add information to the County's GIS maps and the Hazard Annexes
  - Finalize the Stakeholders Interview list
  - Finalize the dates/locations of the Public Forums

- **Next Steps** (10 min), Jay Flint, CREST
  - Discuss homework for the city-representative members and for non-city rep. members
  - Explain the next stages in the planning process

Memo

To: Clatsop County Mitigation Plan Steering Committee

From: Oregon Natural Hazard Workgroup at the University of Oregon

Date: February 18, 2008

Re: Phase 2 – Risk Assessment: Feb 14th, 2008 - Steering Committee Meeting # 2

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1. **Role Call**

   Jay Flint, CREST
   Jennifer Bunch, Clatsop County
   Brett Estes, Astoria
   Cleve Rooper, Clatsop Fire Dist./ Cannon Beach
   Doug Dougherty, Seaside School District
   Lindi Overton, Clatsop Community College
   Lora Eddy, Port of Astoria
   Kevin Cupples, Seaside
   Patrick Corcoran, OSU Sea Grant
   Bruce Francis, Clatsop County Planning Commission
   Patrick Wingard, Clatsop County
   Pamela Alegria, Warrenton
   Richard Mays, Cannon Beach
   Krista Dillon, OPDR
   Sara Schooley, OPDR

2. **Presentation – Oregon Partnership for Disaster Resilience – UO**
   a. Krista Dillon, Associate Director, OPDR
      i. Reviewed the make-up and purpose of City Addendums. Presented example of a completed County Plan with City Addendums (Harney County)
   b. Sara Schooley, Graduate Assistant, UO
      i. Presented draft Community Profile and Hazard Annexes.

3. **Presentation – Clatsop County Planning Dept.**
   a. Jennifer Bunch, Planner/GIS
      i. Presented GIS maps of County assets and hazards. So far, she has mapped some schools and medical facilities. She will overlay population data onto the maps to match population density with geographical areas.
      ii. City maps were distributed to committee members for their respective city. Committee members should mark the locations of places of interest on the map for their city addendums and for Jennifer. She will then add those places of interest to the County map.

4. **Steering Committee Work Session**, Jay Flint, CREST

a. Began to discuss stakeholders. Decided to have each committee member conduct stakeholder identification as homework. Email stakeholder list to Jay by 2/29/08.
b. Discussed the dates/locations of the Public Forums. Decided to have at least two public forums – one during Seaside Tsunami Awareness events (Kevin to report back to Jay on a date) and one hosted by Clatsop Community College. Information about the plan will also be presented at a disaster awareness event in Cannon Beach by Richard Mays. Jennifer and Patrick will take the lead on getting information about the plan to Jewel.

5. **Next Steps** (10 min), Jay Flint, CREST
    a. Homework for committee members:
        i. Review Community Overview and Hazard Annexes at http://www.oregonshowcase.org/index.cfm?mode=projects&page=oregoncoast. Email comments to Sara at sschoole@uoregon.edu. The web site works best using Firefox. Please send comments to Sara by 2/29/08.
        ii. Draw places of importance on the map. Places include schools, medical facilities, government structures, etc. Contact Jennifer Bunch at with any questions (JBUNCH@co.clatsop.or.us or 503.325.8611).
        iii. Complete stakeholder identification. Email stakeholder suggestions to the entire email list so we do not have duplicates. Please send the email by 2/29/08. Jay will compile the list.
        iv. Put together a list of current mitigation projects completed or currently being done in your respective cities. Email this information to Jay by 2/29/08.

Clatsop County Pre-Disaster Mitigation Planning

Steering Committee Meeting # 3 – April 16th, 2008, 1-3pm

LOCATION

Warrenton City Hall, 225 South Main Avenue, 97146
-- ***City Commissioners Room*** –
For info on the location, contact Pamela Alegria (503) 861-0920

MEETING AGENDA

Phase 3: Mitigation Project Development

1. Welcome & Introductions
   (***5 minutes***) - Jay Flint, CREST

2. Mission Statement
   (***15 minutes***) - Jay Flint
   - *EX: To Create a disaster resilient Clatsop County*

3. Mitigation Plan Goals
   (***20 minutes***) - Jay Flint,
   Examples:
   - Protect life
   - Minimize damage to public and private buildings and infrastructure
   - Increase cooperation and collaboration among County partners
   - Reduce economic losses
   - Protection natural and cultural resources

4. Mitigation Action Items
   (***45 minutes***) - Krista Dillon, OPDR

5. Next Steps
   (***5 minutes***) - Jay Flint

6. City Representatives – Review City Addendums
   (***30 minutes***) - Jay Flint, Krista Dillon
   - Review what the cities have completed and provide assistance

Clatsop County Pre- Disaster Mitigation Planning
Steering Committee Meeting
April 16, 2008 1-3 PM
Warrenton City Hall, City Commissioners Room

Attendees:
Dave Dougherty, Seaside School District
Patrick Wingard, Clatsop County Planning
Jennifer Bunch, Clatsop County Planning
Bruce Francis, Clatsop County Planning Commission
Jay Flint, CREST
Gene Strong, Clatsop County Emergency Coordinator
Brett Estes, City of Astoria
Maurine Sheffield, Clatsop County Public Health
Kevin Cupples, City of Seaside
Pamela Alegria, City of Warrenton
Lora Eddy, Port of Astoria
Cleve Rooper, Cannon Beach, Fire District
Lindi Overton, Clatsop Community College
Krista Dillon, OPDR
Christine Lolich, Columbia Memorial Hospital
John McKesson, Clatsop County Soil and Water Conservation District
Scott Rueter, local citizen and member of CERT

Meeting Began 1pm:
Jay Flint welcomes the planning team back and organized the meeting in more of a work session style with everyone sitting around a circle of tables and no formal presentations. The reasons for doing this was because this meeting was mainly focused on developing mitigation actions for the plan and thus requires a lot of group discussion.

Jay began will presenting the mission statement and the mitigation plan goals to the group and asked for input. There were no objections to the mission statement ("to create a disaster resilient Clatsop County"). There were also no objections to the plan goals presented and they are as follows: protect life; Minimize damage to public and private buildings and infrastructure; reduce economic losses, decrease disruption to critical services; protect natural and cultural resources; increase education and awareness of the risks and hazards in Clatsop County; and increase cooperation and collaboration among County partners.

Next, the group jumped right into creating an initial list of mitigation action ideas. The team went around the table and asked everyone to present ideas on potential mitigation actions. The following list of actions were created from this session:
TSUNAMI

- Elevate Brownsmead Rural Fire District Station

- Rebuild four Seaside School District schools outside of the tsunami inundation zone.
- Relocate Cannon Beach and Arch Cape Fire Stations out of the tsunami inundation and flood zones.
- Relocated Cannon Beach City Hall and Police outside of the tsunami inundation zone.
- Establish long term supply and assembly areas outside of inundation zones.
- Improve public notification and warning system
- Maintain public education and outreach
- Upgrade and improve evacuation routes as well as assembly areas outside of tsunami inundation zones
- Complete tsunami risk assessment for Clatsop County

WINTER/WIND STORM

- Develop and implement hazard tree program
- Promote tree planting projects on private and public properties
- Have one to three ISA-certified arborists in each community that know how to properly prune storm damaged trees
- Heightened awareness by First Responders and appropriate city staff of the factors contributing to tree stability
- Educate homeowners about methods to tie down metal roofs and metal sheds.

EARTHQUAKE

- Seismic upgrades for the Ecola Creek Bridge in Cannon Beach
- Partner with Oregon Department of Transportation to upgrade the bridge over Ecola Creek on Highway 101.
- Complete a seismic vulnerability assessment for Port of Astoria facilities.
- Develop incentive programs to encourage homeowners to do seismic retrofits.
- Complete assessment of County owned bridges
- Develop pre-plan to get medical services in Warrenton following large earthquake event

FLOOD

- Partner with Oregon Department of Transportation to address flooding issues on Highway 101 just south of Seaside
- Elevate runway at Port of Astoria airport and improve diking around the airport
- Complete a risk assessment related to levees in the County and adjacent development

MULTI-HAZARD

- Develop a pre-plan of how to accommodate visitors to the coast following a major disaster.
- Evaluate the vulnerability of wastewater treatment facilities in the County.
- Evaluate the feasibility of undergrounding utilities where appropriate
- Identify and develop emergency shelter facilities throughout the County.

- Develop secondary back-up power, communication, and lighting for the Port of Astoria airport
- Develop Post-Disaster Recovery Plans for communities in Clatsop County
- Encourage residents to maintain and update 72 hour kits
- Harden the Wickiup repeater site
- Build new centralized Emergency Operations Center
- Develop an inventory of available generators and fuel distribution
- Centralize Countywide 911 system
- Partner with Clatsop County Community College on mitigation efforts

After the work session on mitigation actions, the meeting was adjourned, except for the county planning and city reps working on their individual sections of the plan. Next Krista and Jay spoke to each of the representatives to review what the cities/ county have completed and provide assistance as needed.

Meeting was fully adjourned at 3:30pm.
Next meeting will be in June/July.

Clatsop County Pre-Disaster Mitigation Planning

Steering Committee Meeting # 4 – August 7th, 2008, 1-3pm

LOCATION

Clatsop County Public Services Bldg
800 Exchange Ave, Astoria
Conf. Rm. 430

MEETING AGENDA

Phase 4: Plan Implementation and Maintenance

1. Welcome & Introductions
   (***5 minutes***) - Jay Flint, CREST

2. Establish convener, coordinating body, continued public involvement, and plan maintenance meeting schedule
   (***30 minutes***) - Jay Flint

3. County Mitigation Actions
   (***45 minutes***) - Jay Flint
   - The latest County mitigation actions will be presented and prioritized

4. Timeline of future events
   (***10 minutes***) - Krista Dillon, OPDR

5. Next Steps
   (***10 minutes***) - Jay Flint

6. City Representatives – Review City Addendums
   (***20 minutes***) - Jay Flint, Krista Dillon
   - Review what the cities have completed and provide assistance

Clatsop County Pre- Disaster Mitigation Planning
Steering Committee Meeting
August 7, 2008 1-3 PM
Clatsop County Public Services Building, Rm. 403

Attendees:
Dave Dougherty, Seaside School District
Jennifer Bunch, Clatsop County Planning
Jay Flint, CREST
Brett Estes, City of Astoria
Maurine Taylor, Clatsop County Public Health
Kevin Cupples, City of Seaside
Pamela Alegria, City of Warrenton
Cleve Rooper, City of Cannon Beach, Fire District
Lindi Overton, Clatsop Community College
Krista Dillon, OPDR
Christine Lolich, Columbia Memorial Hospital
Megan Findley, OPDR
Sabrina Pearson, City of Gearhart
Patrick Corcoran, OSU Sea Grant Extension

Meeting Began 1:15 pm:

Agenda Items:

Jay Flint welcomes the planning team back.

Convener
Jay explained to the group that they needed to establish a "convener" to see the plan through the next 5 years during the plan maintenance and implementation phase. CREST's contract to manage the process ends when the plan in adopted and thus a new plan convener is needed and will be included in the plan itself under Section 4. He suggested that in many other county plans, the planning department becomes the convener, but that it could be any person or department that the group decides. After a brief discussion, the committee agreed that the county's planning department should oversee the plan during the next 5 years with the coordination of the County Emergency Services department. Note: this recommendation is not permanent and it is contingent upon the agreement of the County Administrator.

Coordinating Body
Jay explained that the committee also needed to decide on a coordinating body. The coordinating body's duties are to convene every year to work on implementation of the plan and oversee the updating process. The group decided to keep, at the least, the same people as are on the steering committee, but with possibly a few additions. Suggestions

were to add more school districts, and more members of the business community. One suggestion was to ask a member of the economic development group, CEDR.

Public Involvement

Next the group discussed the options for pubic involvement in the future. The following suggestions were offered: County-wide Hazard Preparedness Fair, National Night Out, Astoria Service Fair, County Fair, and Cannon Beach Tsunami Fair. It was mentioned that all of these events are not needed and that the group can decide in the future which ones to focus on.

Plan Maintenance

The schedule for plan maintenance was next discussed. The main issue was how many times the group would like to meet during the next 5 years to go over the plan's implementation and eventual update. Jay offered the suggestion that the group could meet either once or twice a year to accomplish the needed goals. After a discussion of the merits of one or two meetings, the group chose to meet twice a year. The first meeting will be around May, before the end of the fiscal year, in order to allow the jurisdictions amply time in which to decide which mitigation actions should be pursued during the fall's grant cycle. The next meeting will happen around November. This meeting can focus on the other aspects of plan maintenance and implementation.

County Mitigation Actions

The final item to go over was to prioritize the County's mitigation actions and come up with a list of top candidates to recommend to the County Commission. Jay presented the 54 proposed county mitigation actions. Krista Dillon, of OPDR, said that projects which will be lead by the individual cities, even if they have a county component, should be housed in the city addendums. Because of this, about 3 or 4 actions were removed from the list to be included in their respective city addendums. The rest of the actions were then individually discussed and voted upon. The committee members were allowed to vote on three actions in the all-hazards action items and two actions in each of the other hazard-specific actions. The voting was focused on the actions which FEMA can fund through one of FEMA's grant program. The results of the rounds of voting created three top vote-getters. The following action items were determined to be the most important to pursue at this time as determined by the steering committee:

1. Establish and new and improved Emergency Operations Center
2. Consolidate 911 services in the County
3. Retrofit county bridges which are identified by an as yet to be performed seismic vulnerability assessment

Timeline

And finally, Krista Dillon, OPDR, spoke about the timeline for the plan's pre-approval by FEMA, subsequent adoption, and the end of the grant cycle for the FEMA pre-disaster mitigation grant program, which will be around December 13. She said that in order for the plan to get pre-approval and have time to be adopted before the Dec 17th deadline, the plan will need to be ready to send to FEMA by August 27th. This was the deadline

established for all jurisdictions to get their plans into the Plan Facilitator to be sent to FEMA. It is important to note that if there are cities which do not have their plans ready by this date, it is fine, because we will just send those addendums in later. The deadline is only important for jurisdictions who wish to apply for a FEMA grant this fall.

Meeting was fully adjourned at 3:15pm.
This was the final meeting for the plan development phases. The next meeting will occur sometime next spring after the plan has been adopted by the County and cities.

Clatsop County Pre-Disaster Mitigation Planning

Public Involvement Strategy

1. **Phase 1 (Oct-Dec)**
    a. Website (County)
        i. Develop a website dedicated to the pre-disaster mitigation planning process. This will be developed by the County and a link to the website will be found on both the County and CREST websites.
        ii. The website can be updated throughout the process. A good example is the special webpage created for the Bradwood Landing LNG project. Here is the link: http://www.co.clatsop.or.us/default.asp?pageid=406&deptid=12
    b. Media annoucement(s) (County)
        i. Discuss the PDM planning process and explain how the public will be involved throughout the process. Explain how it will be FEMA-compliant and open funding avenues for mitigation projects.
2. **Phases 2 & 3 (Jan-Jun)**
    a. Stakeholder interviews (OPDR)
        i. (15-25) individual interviews of people in positions which have critical knowledge of the risks/assets associated with our county's natural hazards as well as mitigation actions that may help reduce that risk over time.
    b. Public meetings/forums (County)
        i. Approximately 3 meetings – possibilities: Astoria/Warrenton, Seaside/Gearhart, Cannon Beach/Arch Cape, Westport, Jewell.
        ii. These will be used to gauge the level and areas of concern to the general public as well as provide them information on the process.
    c. Surveys (OPDR/County)
        i. Develop questions that ask residents about their understanding of risks and their level of preparedness for home and business. A survey could be general or targeted to specific groups/people.
        ii. Oregon Partnership for Disaster Resilience will conduct a regional household preparedness survey. The County could supplement this survey with an online or paper survey of its own.
            1. Paper survey – standard mail
            2. Online survey – on PDM website
    d. Business Training toolkit (OPDR)
        i. OPDR will implement an Open for Business Toolkit Training (online) that will provide local businesses to develop their own preparedness and mitigation plans.
3. **Phase 4 (Jul-Sept)**
    a. Media announcement(s) (County)
        i. Discuss the plan implementation and what has been discovered through the planning process.
    b. Media friendly events (County)
        i. Awareness walks – lead a group to a location that is at risk and discuss the mitigation action that has been developed to reduce the risk.

Letter: Good managers needed

HTTP://www.dailyastorian.com/main.asp?SectionID=23&subsectionID=393&articleID=48445&Q=62659.09
Web Posted 1/18/2008 10:11:00 AM
Article :

Reading in the newspaper that "Clatsop County has no disaster mitigation plan registered with the federal government" was troubling (The Daily Astorian, Jan. 11), and raises the question: "When did it become known that the sheriff could not complete a disaster plan, and what prevented senior county management from taking on this essential duty themselves?"

What is truly bothersome was the county wasting valuable staff time and money in orchestrating a petty feud with the district attorney over a relatively minor issue. If the same energy that went into trying to clip the district attorney's wings had been used on disaster plan, Clatsop County would have been on the upward swing when disaster money was needed. Even without a disaster plan, the sheriff did a good job with the resources that he had available during the last windstorm.

Going back in recent history: The failure to maintain a number of old dikes that have failed or could fail is a good example of a systematic failure of forward-thinking management. Allowing the governing boards to dissolve on their own should have been a clue that there could be a problem in the future.

Diking districts are classified as special districts under Oregon law which states "If a majority of the membership of the governing body is vacant or if a majority cannot agree, the vacancies shall be filled promptly by the county court of the county in which the administrative office of the district is located." This statement places the responsibility squarely on the shoulders of the county to ensure that these boards do not dry up and go away.

An airline pilot does not normally pump the fuel into his aircraft - that is the responsibility of the ground crew - but it is in the best interests of the pilot (and passengers) to ensure the plane is fueled before takeoff. This is why pilots walk around their aircraft and perform itemized system checks before take-off.

A captain of an oceangoing freighter does not maintain the propeller shaft seal - that is the job of the chief engineer - but the captain does make periodic rounds to ensure the seal is not leaking. Airline pilots and ship captains have known for generations it is in their best interest to check on the details and not let others determine their fate. Why can't these same ethics be in public agencies?

What has to be ingrained in the governmental thought process is a forward-thinking system of priorities, checks and balances with the capacity to quickly recognize when follow-up action is needed. If one entity lacks the capacity, then the next level needs to have the political courage to step in and do it.

By the way, none of this requires a visioning session, focus groups or a consultant - just good managers with the willingness to poke around a few dark closets.

Jim Santee
Astoria

Our safety is the ultimate priority

HTTP://www.dailyastorian.com/main.asp?SectionID=23&subsectionID=392&articleID=48420&Q=59386.13
Web Posted 1/17/2008 12:42:00 PM
Article :

If you thought bureaucratic delay and irresponsibility only resided in Washington, D.C. or Salem, guess again.

Companion stories on Friday's front page revealed five years of inaction that has cost the city of Astoria money in disaster relief from the January 2007 landslide and could keep Clatsop Community College from collecting $1.5 million for the seismic upgrade of the centerpiece of its campus renewal.

At the very least, it is surprising that Clatsop County is one of only two Oregon counties without a disaster mitigation plan registered with the Federal Emergency Management Administration. But the articles by Joe Gamm and Kara Hansen depict something that is more disturbing than simple surprise.

It appears that a group of local public officials are being so - shall we say diplomatic? - that they seem to be papering over gross irresponsibility.

The controversy continued in Wednesday's edition. Commissioner Sam Patrick said he thinks the leadership of county government was "asleep at the switch."

It would be difficult to name an Oregon county that is more vulnerable to a disaster than Clatsop. So why do we still not have a disaster mitigation plan?

County Manager Scott Derickson says it's the sheriff's problem, but he is willing to assist. That in itself is worrisome. The buck stops with the county's chief executive. After all, what is a higher priority in the county than the safety of its citizens? He should be agitating for action, offering his own solutions, and demanding assistance from the department heads who report to him.

It is true that Clatsop County Sheriff Tom Bergin is responsible for the disaster plan's completion. Bergin says Emergency Management Coordinator Gene Strong - a lone, part-time employee - hasn't had time to complete the disaster mitigation plan because he's been working on a plan for the emergency operations center. So, once Bergin realized that he couldn't complete both plans at once, he should have demanded help to get both jobs done. Commissioner Patrick suggests the County Planning Department. How about making it a priority for all county department heads?

In contrast, Tillamook County has a full-time emergency coordinator, a designated deputy, plus a zealous volunteer; its leaders have no trouble proving to federal authorities that they take disaster planning seriously.

When Astoria sought to dig out from the Bond Street landslide, city leaders learned the lack of a county disaster mitigation plan prevented them obtaining significant federal cash. Pinpointing the cause and putting permanent fixes in place cost more than $500,000; the city had already spent more than $300,000 on temporary repairs, of which only $156,900 would be reimbursed by FEMA.

That slide was a year ago, and we are sure the city of Astoria informed the county's top leadership of the problem. But, instead of treating the safety of its citizens as a top priority, and getting its plan finished, county commissioners went off on a tangent. With one exception, they wasted the whole of last summer trying to find ways to bring the district attorney to heel. This cost time and money during months of embarrassment, and left lingering bitterness.

Perhaps the worst part of this story is the lament from the state, whose experts have been offering help for five years. Thirty-four of 36 Oregon counties have taken up their kind offer. Until now, Clatsop and Lincoln have not. Only this week are state experts in town to help fashion a plan for both counties. This belated action comes after the second-biggest storm in Oregon history devastated hundreds of acres of trees, wrecked countless storefronts and homes, disrupted 50,000 lives, and caused the deaths of four North Coast residents, two in Clatsop County.

City of Astoria and college officials may downplay their concerns for now. But as long as a hazard mitigation plan remains nonexistent, the community will continue paying for disasters, while federal programs offset these costs in almost every other county in the state.

Leaders 'asleep at the switch' on disaster plan

HTTP://www.dailyastorian.com/main.asp?SectionID=2&subsectionID=398&articleID=48378&Q=59603.63
Web Posted 1/16/2008 11:30:00 AM
Article :

Clatsop County Commissioner Sam Patrick has strong words for county leadership over its failure to put a disaster plan in place.

"County management's been asleep at the switch," Patrick said Tuesday.

He blasted county leadership for placing the burden of building a Disaster Mitigation Plan on Sheriff Tom Bergin and Emergency Operations Coordinator Gene Strong.

"The mitigation plan should be done in management's office or County Planning," Patrick said.

His comments came as North Coast officials and state leaders continued their investigation into the emergency response to the Dec. 2-3 windstorm. Also at issue is how the city of Astoria and Clatsop Community College have been unable to tap into federal money for landslide repairs and college campus seismic needs because of the lack of a county plan.

Patrick said the planning department has staff who are familiar with the mitigation issues, but the sheriff doesn't.

"The county administration stands ready to assist in whatever is needed to help facilitate completion of the Disaster Mitigation Plan," said Clatsop County Manager Scott Derickson.

Patrick said Derickson needs to step up and own this problem.

Derickson reiterated that the emergency management program resides under the purview of the sheriff's office.

"I would assist the sheriff any way that is appropriate," Derickson said this morning. "A little over a year ago, the Board of Commissioners affirmed the EOC (Emergency Operations Center) would reside with the sheriff."

He said the Disaster Mitigation Plan falls into the scope of county emergency operations.

Of 36 counties in Oregon, Clatsop and Lincoln counties are the only two which don't have a plan.

Phase 1 of creation of Clatsop's plan began in September, when the emergency operations coordinator, Strong, hired the Columbia River Estuary Study Taskforce to begin the process to create the plan.

Jay Flint, a coastal/estuarine planner from CREST, began gathering a steering committee. To have county leadership on board, one of Flint's first selections for the committee was Patrick Wingard, Clatsop County's community development supervisor.

The second phase of creating the county's Disaster Mitigation Plan began Tuesday when the University of Oregon, Oregon Emergency Management and the Federal Emergency Management Agency began training leaders from Clatsop and Lincoln counties and their cities to create the plan.

Krista Dillon, associate director of the Oregon Partnership for Disaster Resilience, said the purpose for the training was to help the plan preparers to conduct risk assessments for their mitigation plans.

The risk assessment provides the factual basis for activities proposed to mitigate losses from disasters. It is intended to give the committee enough information for the counties to identify and prioritize mitigation activities.

For example, the committee would look at tsunamis, storms, floods, landslides, earthquakes and wildfires to see how often they happen, how fast they occur, what their duration is and the breadth of their damage.

But another factor developers of the plan would take into account is the vulnerability of the community.

The developers would look at the exposure, sensitivity and resilience to the hazards of the population, the economy, infrastructure and natural resources. During this stage, they would assess the ability, resources and willingness of the communities to prepare for and mitigate natural hazards, then respond and recover.

Clatsop County has no disaster mitigation plan registered with the federal government

HTTP://www.dailyastorian.com/main.asp?SectionID=2&subsectionID=398&articleID=48313&Q=51400.98
Web Posted 1/11/2008 10:55:00 AM
Article :

Clatsop County is one of only two counties in Oregon that doesn't have a disaster plan registered with the federal government.

This is despite offers of help from the state dating back five years.

As the community recovers from the worst storm in 25 years, questions are being asked about how a county for which forest fires, damaging winds, flooding, tsunamis and earthquakes are very possible fears, can be without a mitigation plan.

The county manager says it's the sheriff's problem. The sheriff says he's been working on it for years. But Emergency Operations Coordinator Gene Strong - who's only budgeted for half time - has been working on another needed plan - how to cope with disasters when they occur.

Meanwhile, city of Astoria officials want to register a plan of their own with the federal government, but officials were told they couldn't because any plan has to be part of a countywide plan.

City leaders are diplomatic - but still express strong concerns that the county has failed to show leadership on the disaster (or hazard) mitigation plan.

The Federal Emergency Management Agency will give a community money for a program for prevention of disasters.

The catch is that to qualify for these grants, the communities and agencies that apply for them have to have disaster mitigation plans registered with the agency.

In 2002, FEMA established regulations requiring state and local government to establish mitigation plans. Mitigation plans are unlike Emergency Operations Plans - which are countywide plans for procedures dealing with post-disaster emergency operations - in that they address vulnerability to natural hazards by identifying resources, information and ways to reduce risks before a disaster occurs.

Of 36 counties in Oregon, only Clatsop and Lincoln have not completed their mitigation plans and registered them with FEMA. Astoria City Manager Paul Benoit said the city became aware of the need for those plans following a landslide in January last year.

But he said officials from the state said any disaster mitigation plans for the city have to be attached to a countywide master plan.

"The communities need to rely on the county's leadership. Why the county wasn't already looking at this, I don't know," Benoit said.

Dennis Sigrist, an Oregon Military Department hazard mitigation officer, said Oregon's emergency management officials began working with counties back in 2002, but they couldn't force communities to create local plans, just encourage them by noting the benefits of federal assistance and reduced risks.

"Mitigation planning is voluntary," Sigrist said. "The state can provide tools and resources; those resources can be technical assistance, they can be dollars. In the end, the community has to choose whether it wants to develop a plan."

Yumei Wang, a geotechnical engineer and hazards team leader at the Oregon Department of Geology and Mineral Industries, agreed.

"We have 36 counties in the state, and all of them are pretty far along," she said. "I think Lincoln County and Clatsop are being kind of slow, and the state has been offering assistance to both. But with natural hazard plans, the state can't come in and make them for the county. The county has to do this work."

Clatsop County Manager Scott Derickson said the mitigation plans fall in the bailiwick of the sheriff's office.

Sheriff Tom Bergin said Clatsop County Emergency Operations Coordinator Gene Strong - working far more than part time - spent the first two years of his part-time service to the county creating an Emergency Operations Plan. He hasn't had time to create a disaster mitigation plan.

"I wish the person before me had done it. It puts a lot of pressure on me," Strong said.

Bergin said Strong's predecessor, Jan Glarum, had done little besides traveling out of town to teach for a few years.

"What happened was, the EOP was nonexistent until a year ago," Bergin said. "We took a couple of years to get that EOP up and running."

And the EOP is still under development.

Clatsop County engaged the Columbia River Estuary Study Taskforce to begin the process of creating a countywide disaster mitigation plan in September.

CREST Coastal/Estuarine Planner Jay Flint has the task of coordinating the establishment of the county's plans.

"Gene Strong hired CREST. They didn't have the resources at the county to handle this year-long process," Flint said. He said the former director of CREST, Catie Fernandez, obtained a grant to create the plan, then turned the project over to him.

Working in a steering committee made up of leaders from Clatsop County, the county's five incorporated cities, local emergency agencies, local businesses, school districts and the Port of Astoria, Flint began the first stage of the four-stage process to create and implement the disaster mitigation plan.

During this stage, the committee developed a public-involvement strategy for the process. It intends to hold "public input" meetings.

Committee members looked at communities' populations, economies, development, resources, critical facilities and infrastructure, and summarized potential natural hazards to the communities.

They settled on a mission to create a disaster-resistant Clatsop County.

The second stage of the process is to perform a risk assessment. Each city is providing a city addendum to the plan, and special districts are compiling information for the countywide risk assessment.

"A couple of months from now, I'll be able to speak to all the risks," Flint said.

The third phase is to develop actions to help reduce the risks identified by the assessment. They will be prioritized based on feasibility and cost effectiveness.

Finally, the plan will be implemented, by adopting it into the local comprehensive plans for cities and the county. FEMA has to approve the plan, and it has to be adopted by the county and cities to meet FEMA requirements.

Flint said the steering committee is leaning toward making the plan a Natural Hazards Mitigation Plan.

"It will not encompass human-caused disasters. Counties don't generally plan for human-caused disasters," he said.

Those sorts of disaster plans are usually done by the businesses involved, and require proprietary knowledge, raising a lot more issues than the committee would want to deal with.

Flint said Oregon has a history of being subject to a range of natural disasters, bringing devastating consequences to communities.

Clatsop County's NHMP focuses on the primary natural hazards affecting the community - such as storms, floods, tsunamis, wildfires and landslides.

"With careful planning and collaboration among public agencies, private sector organizations and citizens within the region, it is possible to minimize the losses that can result from natural disasters," he wrote in a press release.

Not over yet Even when all the plans are in place, the work won't be finished.

Wang, of DOGAMI, described the hazard mitigation plan as a sort of "living document."

"Even after you develop a plan and FEMA approves it, they still want you to update the plan and improve it," Wang said. "You need to get your foot in the door by having it approved by FEMA, but then they want you to develop something called an enhanced plan."

An enhanced version opens up "an even higher percentage of FEMA funds," she said.

Flint said the county is already working on a Wildfire Protection Plan, which makes it eligible for money through a National Fire Plan Grant Program.

The county will also have a Flood Mitigation Plan incorporated into the NHMP, making it eligible for grants through the Flood Mitigation Assistance Program. The plan will also make funds available through FEMA's Hazard Mitigation Grant Program and Pre-Disaster Mitigation Grant Program.

Letter: Note from commissioners

HTTP://www.dailyastorian.com/main.asp?SectionID=23&subsectionID=393&articleID=48452&Q=62596.04
Web Posted 1/18/2008 10:18:00 AM
Article :

It's a sad day when a community leader places blame rather than accepting responsibility ("Leaders asleep at the switch," The Daily Astorian, Jan. 16).

On Feb. 22, 2006, Clatsop County Commissioner Sam Patrick made a motion to approve Sheriff Tom Bergin's request for an agreement to begin the Disaster Mitigation Plan. There was no discussion about taking that oversight away from Bergin at the time and the Sheriff's request was approved unanimously. The grant issued for this work specifically identifies the Sheriff's Office as the principal administrator of the Disaster Mitigation Plan effort.

Commissioners then engaged in a series of discussions held between Dec. 18, 2006 and June 13, 2007 to discuss who should be responsible for the Office of Emergency Management - including the development of the Disaster Mitigation Plan. These meetings concluded in June when the county manager recommended that the Emergency Management Program remain under the supervision of Sheriff Bergin. A motion was made and seconded by Sam Patrick. Again, the motion passed unanimously.

The current effort to develop the Disaster Mitigation Plan includes multiple county departments, including the County Manager's Office, Community Development, Public Works, etc. all in cooperation with, and under the direction of, Sheriff Bergin. We have confidence in the Sheriff's administration of this project and appreciate Bergin's leadership. To date, Sam Patrick has made no effort to address his concern with the board of commissioners and we see no need for the county manager to intervene with Bergin at this time. Nor has Bergin requested this action.

Our county manager has acted exactly as the board of commissioners directed and maintains our full support. Any assertion that Scott Derickson should have unilaterally inserted himself into the duties of our independently-elected Sheriff, and against board direction, is completely wrong. Derickson has shown considerable professionalism, leadership, cooperation and strong character through some very difficult controversies.

PATRICIA ROBERTS, JEFF HAZEN, RICHARD LEE, ANN SAMUELSON Clatsop County commissioners

The DAILY ASTORIAN
Tuesday, August 19, 2008

Council awards contract for pool boiler

P & L Johnson to install fuel-efficient boilers to replace failed one

By SANDRA SWAIN
The Daily Astorian

Tuesday, August 19, 2008

A consulting mechanical engineer who told city staff it was time to replace the boiler at the Aquatic Center knew what he was talking about.

While staff was in the process of following Mark Heizer's advice, the old boiler started leaking so badly it had to be shut down. On Aug. 8, with no way to heat the water, the pools were closed.

Now help is on the way. At Monday's meeting, the Astoria City Council voted unanimously to award a contract to P & L Johnson Mechanical of Astoria to install two new boilers and modify the Aquatic Center's ventilation system. P & L's bid of $96,641 was the only one received.

The efficient new boilers, which cost $47,620, are expected to significantly reduce the amount of natural gas used at the Aquatic Center. Along with other energy-efficient steps recommended by the consultant, including replacing the facility's hot water system

with tankless water heaters, the city likely will save an estimated $12,000 to $13,000 a year in natural gas expenses, according to City Manager Paul Benoit.

The new boilers are expected to last 30 years. But the old boiler was just halfway to its life expectancy of 20 years when it gave up the ghost, and Mayor Willis Van Dusen told Benoit he wants to know what happened so it can be prevented from happening again. The City Council voted to ask Heizer, who is with the firm Interface Engineering, for a detailed report on the causes and what is being done to prevent a recurrence with the new boilers.

The city will receive $14,388 from the Energy Trust of Oregon and might be eligible to receive $37,000 from the Oregon Department of Energy according to Benoit. The rest of the funding for the $150,000 Aquatic Center improvement project will come from the city's Astor East Urban Renewal District.

In other action, the Council had a first look Monday at a Pre-Disaster Mitigation Plan that will be an addendum to a Natural Hazards Mitigation Plan now being developed by Clatsop County with assistance from the Columbia River Estuary Study Task Force.

Jay Flint, of CREST, the project manager overseeing the countywide plan, has worked with the city for the past 10 months on the addendum. It will eventually be incorporated into the county's plan, along with addendums from the other cities in Clatsop County. Benoit said the lack of such a plan during the First and Commercial Street landslide last year compromised the city's reimbursement opportunities.

Once adopted by the city, the addendum could open doors for funding of projects that reduce risks posed by natural hazards. Benoit said one such project is helping Clatsop Community College remedy Towler Hall's seismic deficiencies. The college has participated in developing the Astoria addendum and the seismic upgrade has been included as an item for possible future action.

Flint said the county plan and city addendums must be sent to the Federal Emergency Management Agency for approval by Aug. 27. FEMA has 45 days to approve them. Astoria needs to get its addendum back in time to adopt it before the Dec. 17 deadline for submitting grant applications this year. Flint said once the addendum is adopted, the Council can decide each year what grants to apply for, independent of the county. Astoria's plan will be housed in the city's Community Development Department.

Paving was also on the agenda. In anticipation of large paving projects next year, city street paving projects have been limited to patching and repairs this summer. Meanwhile, city leaders are waiting for a full year of revenues to accumulate from the new fuel tax

that started last November. As of June, the city had received more than $108,000.

Now the question is which streets to pave in 2009. To come up with the answer, Public Works Department staff will use a pavement management system that provides software and training. "This is a necessary precursor to doing work on our streets," Benoit said. "This is the professional way to go."

But Councilor Blair Henningsgaard was skeptical, saying the last time paving was prioritized, who the road served became more important than other factors. Van Dusen noted that a number of streets on the map from a 2003 prioritization did not get paved, disappointing some people who had voted for a street levy based on the map. He said the city owes it to citizens to pave the streets on the old list. After more discussion, the Council approved a $14,400 contract with Capital Asset & Pavement Services for a system designed to assist staff in making cost effective, systematic decisions.

In other business, the Council:

• approved an $8,790 contract with Quality Tree Removal to cut down hazardous trees on city property that were damaged during the December storms;

• approved hiring a Bob Jossis, a professional engineer, at $120 an hour, to serve as construction manager for the two major Combined Sewer Overflow projects now underway;

• awarded a $999,143 construction contract to low bidder Wilkins Construction LLC for reservoir covers and flow improvements at Reservoirs 2 and 3;

• accepted a $31,500 grant award from the state Health Preparedness Organization for purchasing equipment and securing a tactical radio frequency for medical operations.

Memo

To: Clatsop County Steering Committee

From: Sara Schooley, Research Assistant

Date: May 19, 2008

Re: Summary, Clatsop County Stakeholder Interviews

Most organizations in Clatsop County are concerned with windstorms, flooding, earthquakes and tsunamis (in decreased order). Some are also concerned about landslides and fires. In particular, the coastlines are the most vulnerable because of their exposure to harsh weather conditions such as wind. Warrenton was mentioned multiple times as an area susceptible to extreme flooding (Perkins & Dolphin Rd), and Astoria was mentioned as the city most susceptible to landslides. HWY 101 is affected by floods frequently, which can paralyze communities along the coastlines because it is the only way in and out of cities such as Cannon Beach, Seaside, and Gearhart.

Organizations spoke about how they are more likely to mitigate for floods and windstorms because they have been through those events. Mitigating for earthquakes and tsunamis is less likely because of the costs involved and the lack of understanding as to what could happen during a natural hazard. Many organizations also spoke about how their funds are tight and can only be used for specified uses – often not mitigation activities. Other organizations believed that their property was not of sufficient quality to mitigate it from earthquakes and/or tsunamis; it is not cost-effective.

Other barriers to mitigation include the fact that Clatsop County is a coastal area and is therefore inherently prone to hazards. Respondents repeatedly said that the county needs to accept the risk of living in such an environment and avoid trying to engineer their way out of the hazard. Instead, the county should use natural systems to mitigate (e.g., dunes, wetlands, forest diversity). Also, the county and FEMA are sending mixed signals to residents by bailing them out after a disaster; this action does not encourage people to mitigate.

Organizations spoke about collaborations in mitigation planning within the county which exist, although they do not have a well-defined structure. Many groups used collaboration as back-up mechanism to be aware of the resources available for disaster response, but not necessarily mitigation. Other groups spoke about coordination with other similar groups in the region (e.g., hospitals) to know where similar services could be offered or moved if necessary. Some groups have been involved with mitigation planning, but none were satisfied with the effort so far; one respondent vocalized concerns about "brain drain" of the mitigation planning community and that in a few years, there would be little historical knowledge remaining.

The following actions were suggested for county/city mitigation plans:

- **Enforce code requirements for all structures:** This repeatedly came up as a sector where the community was lacking. Some interviewees were concerned about residents that were "grandfathered in" and were not required to update their structure. Many of the residents do not have resources to update their structures independently, so would have to find outside resources.

- **Evaluate land to remain open:** Organization suggested that the county buy and/or restrict building on land that is especially vulnerable to natural hazards such as wetlands, floodplains, steep slopes and dunes.
- **Assess water systems:** Gearhart is especially vulnerable to floods/earthquakes/tsunamis because the city is entirely on septic. They are also looking at converting their drinking water system to wells instead of tapping into Warrenton's network. If water tables were to rise, or extensive flooding was to occur, there is potential for major health hazards due to water contamination.
- **Have adequate transportation:** Many respondents were worried about how the transportation system would hold up in a hazard because of limited routes and locations of the roads (e.g., HWY 101 would be flooding in a tsunami). Given the lack of public transportation in the County, this is a factor for the mobility impaired. This was also a concern for the Port of Astoria, where many of the goods for the county arrive. The county needs to plan for alternate transportation networks to accommodate the residents.
- **Don't just think tsunami:** Inland organizations were worried that the county was overly focused on tsunami mitigation and that the county could better utilize their resources on water hazard mitigation that would benefit the entire county.
- **Clarify mitigation chain-of-command:** Some organization knew the chain of command for disaster response but were unsure of what resources were available for mitigation planning. They suggested an educational campaign to inform groups and individuals what information is available and where to search for mitigation opportunities.

The following organizations were interviewed:

- Northwest Oregon Housing Authority
- US Coast Guard
- NorthWest Senior & Disability Services
- Skipanon Watershed Council
- Clatsop County Health and Human Services
- Soil and Water Conservation District
- Port of Astoria
- North Coast Land Conservancy
- Northwest Natural
- Camp Rilea

EMERGENCY PREPAREDNESS FAIR -- APRIL 30, 2008 -- Seaside Civic and Convention Center

APRIL 30 E-PREP FAIR	2:30-3:30	4-5pm	5:30-6:30pm	7:00-8:00PM
Seaside Room 1 & 2	**PANEL DISCUSSION:** Lynn Smith – Seaside Police & 911, Don Larson – Seaside Mayor, Jay Flint- CREST-Co. Pre-Disaster Mitigation Planner , Bill & Dorothy Davidson-Astoria CERT	**Tsunamis – "3 Things you <u>need</u> to know"** Patrick Corcoran, Coastal Hazard Specialist, OSU Extension	**Quakes & Waves – What's New?** OSU O.H. Hinsdale Wave Lab/Seaside Simulation- Dan Cox, Director and Seaside geology and the "big one"- Tom Horning , Seaside Geologist	Closed
Seaside Room 3	**CERT Demonstrations:** (Community Emergency Response Team) Cribbing demonstration (rescuing crushed victims) and more.	Closed	**CERT Demonstrations:** (Community Emergency Response Team) Cribbing demonstration (rescuing crushed victims) and more.	Closed
Riverview Room 1 & 2	**All Hazard Preparedness – (Jeff Holwege)** This is a "must attend" crash course in emergency preparedness, threats, communication options and more. -CERT & Ham Radio Volunteers	**New Discovers in Tsunami Science** James Roddy – Dept. of Geology and Mineral Industries (DOGAMI) New Cannon Beach Map, Slip quakes and swarms.	**All Hazard Preparedness- (Roy Hackett)** This is a "must attend" crash course in emergency preparedness, threats, communication options and more. -CERT & Ham Radio Volunteers	Closed
Riverview Room 3	**Tell Your Story** Video and photography crews will be on hand to document your experiences during the winter storms, past emergencies, past earthquakes and tsunamis, emergency preparedness efforts, etc. Make your mark on the history!!			Closed
Sea Mist Room	**Kid's Activities and Child Care** Sponsored by SEPRD (Sunset Empire Parks and Recreation District) – kids activities and child care will be provided for children 6 years of age and older. Several emergency preparedness activities will be available. FAMILY PREPAREDNESS is essential…be sure to include your kids!			
Pacific Room (Seating for 400)	**Videos and More** This area is reserved for ongoing videos and audio-visual presentations. This casual area will have plenty of chairs and tables. Stop by and take a rest while you watch informative presentations.		**PANEL DISCUSSION:** Rep. Debbie Boone; Rich Mays – C.B. city manager, Doug Dougherty – School Superintendent, Guy Williams-TAG Volunteer and Jay Flint-PD Mitigation	**City of Seaside Presentation** New Siren System, James Roddy (DOGAMI), Introduction of Volunteers, Senator Betsy Johnson
Necanicum Room	**BOOTHS AND DISPLAYS:** Tsunami PREP, Seaside Tsunami Amateur Radio Society (STARS), Clatsop County Pre-Disaster Mitigation Planning, Providence Seaside Hospital, Columbia Memorial Hospital, Maltman Insurance, Pet Protection Squad, Department of Geology and Mineral Industries (DOGAMI), Horning Geosciences-Tom Horning, City of Cannon Beach, Sunset Empire Amateur Radio Club (SEARC), Seaside Chamber of Commerce, Northwest Senior and Disability Services, OSU O. H. Hinsdale Wave Lab, City of Seaside – Police, Fire, Planning, American Red Cross, Seaside CERT (Community Emergency Response Team), Astoria CERT, TAG (Tsunami Advisory Group), CACHE Project (survival supplies), Clatsop County Long Term Disaster Recovery Committee, MEDIX,			Closed
Outside Necanicum Room	**SEARC Mobile Communication Bus** – Tour the amazing Sunset Empire Amateur Radio Club's vehicle that provides invaluable MOBILE COMMUNICATIONS for emergencies and community events (like "Hood to Coast"). **American Red Cross Cache Trailer** – Check out the emergency supply container that will be provided to several communities in Clatsop County!			Closed

COUNTY-WIDE

EMERGENCY PREPAREDNESS FAIR

TSUNAMIS, EARTHQUAKES, STORMS AND NATURAL DISASTERS

SPONSORED BY THE CITY OF SEASIDE – FREE ADMISSION

April 30, 2008, 2:00-8:00pm,

Seaside Civic and Convention Center

Join the Honorable Senator Betsy Johnson, Honorable Representative Deborah Boone, Patrick Corcoran, OSU Extension Office-Coastal Hazards Clatsop County Hazard Mitigation Planning-Jay Flint, OSU O.H. Hinsdale Wave Lab-Dan Cox, Department of Geology & Mineral Industries (DOGAMI)-James Roddy, American Red Cross, Seaside Tsunami Amateur Radio Society (STARS) , Tom Horning – Seaside Geologist, Rich Mays, Cannon Beach City Manager, Doug Dougherty, School Superintendent

WHAT'S THE PURPOSE OF THE FAIR??

•Community Outreach – **inform citizens** about evacuation procedures, how to preparedness for winter storms – all aspects of **business, personal and family preparedness.**

20 Booths, 2 Panel Discussions – Q&A, CERT Demos, 5 Workshops, Videos and more….ALL UNDER ONE ROOF!!

WHAT WILL BE OFFERED AT THE FAIR??

•Printed materials, displays**, "hands-on"** activities, demonstrations, booths staffed by volunteers and professionals, **table-top exercises, workshops, panel discussions** with government officials, preparedness professionals and active volunteers, **video** presentations and **DOOR PRIZES. (See the reverse side of this flier for a FULL SCHEDULE OF EVENTS!)**

•Sunset Empire Parks and Recreation Department will provide **FREE CHILD CARE and ACTIVITIES FOR KIDS – 6 years and older.**

DON'T MISS THIS UNIQUE OPPORTUNITY !!

•PREP stands for People Ready with Emergency Plans! "Seaside Tsunami PREP" has been networking with Clatsop County Emergency Services, organizing local volunteers and developing work groups in the Seaside area since February, 2007. The mission of Tsunami PREP is to create an ongoing, community based, volunteer driven, tsunami preparedness program for the Seaside area.

CITY of SEASIDE

Seaside Tsunami PREP

For more information contact:

Deb Treusdell - Seaside Tsunami PREP 503-738-5085

deb@sterlingconcepts.biz

CERT volunteers help us all!

All ages can get prepared – and all ages can volunteer!

Ham radio operators saved the day during the December 2007 Super Storm. BECOME A HAM!

INFORMATION WORTH KNOWING ABOUT:

THE RISKS OF NATURAL HAZARDS TO CLATSOP COUNTY

- **EARTHQUAKE AND LANDSLIDE RISK:** A large portion of the County is at risk due to Mass Movement or Landslide Topography.
    - Approximately 4,809 existing dwelling units in the County are within a geological hazard area that is identified as Mass Movement or Landslide Topography.
    - Clatsop County's Analysis Report (July 2003) ranked Clatsop County's vulnerability to future earthquakes as high.
- **WILDFIRE:** Clatsop County scored "high" for wildfire probability. This score indicates that indicates that one incident is likely within a 35 to 75 year period.
- **VOLCANOES:** Mt. Hood and Mt St. Helens are the volcanoes that could impact Clatsop County
- **COASTAL EROSION:** Coastal erosion is a chronic hazard along the Clatsop County Coast, especially on sand spits, bluffed coastline, and dune-backed beaches. The damage caused by chronic hazards is usually gradual and cumulative. The regional, oceanic, and climatic environments that result in intense winter storms determine the severity of chronic hazards along the coast.
- **FLOOD:** Clatsop County has a "high" probability of future flooding. This ranking indicates that one incident is likely within a 10 to 35 year period.
- **TSUNAMI:** Tsunamis are another secondary earthquake hazard created by events occurring under the ocean. A tsunami, often incorrectly referred to a "tidal wave," is a series of gravity-induced waves that can travel great distances from the earthquake's origin and can cause serious flooding and damage to coastal communities. There are two sources of tsunamis that can effect Clatsop county: earthquakes in our near the County (CSZ) or earthquakes from distant areas (e.g., Japan)
    - The last large tsunami struck the Oregon coast in 1700 (average occurrences of these large tsunamis range from 300-500 years).
    - A tsunami wave can be as high as 90ft.
- **DROUGHT:** In the summer of 2001, due to a drought-like event several incorporated cities instituted water-rationing programs.

1964 Tsunami, Seaside

Pre-Disaster Mitigation Planning

Announcement of PUBLIC FORUMS

All residents of Clatsop County:

The County and its incorporated cities are developing a Natural Hazards Mitigation Plan to develop mitigation strategies that reduce the risk of a disaster caused by natural hazards, including floods, winter storms, coastal erosion, landslides, earthquakes, tsunamis, droughts, volcanic events and wildfires. Please come to one of the events listed below and provide YOUR input. We are looking for input on what types of mitigation activities to focus on and ideas for mitigation projects.

First Event: April 30, 2-8pm
Seaside Civic and Convention Center, Part of
Second Event: May 1, 6:30-8pm
Clatsop Community College, Performing Arts Center

For more information contact:
Jay Flint, Plan Coordinator (CREST)
(503) 325-0435
jflint@columbiaestuary.org

CITY OF SEASIDE EMERGENCY PREPAREDNESS FAIR

Earthquakes Tsunamis Storms Natural Disasters

April 30, 2008 2-8pm Seaside Civic and Convention Center

BOOTH REGISTRATION To reserve a booth for this event, please complete the following form and email it to: deb@sterlingconcepts.biz - REGISTRATION DEADLINE IS APRIL 18 !!

Name of Organization/Company: CREST/ Clatsop County		
Contact Name: Jay Flint, CREST	Title/Position: Coastal Planner	
Day Phone: (503) 325-0435	Evening:	Cell: (503) 484-5749
Email: jflint@columbiaestuary.org		Fax: (503) 325-0459

Brief description of your organization:
CREST has been contracted to facilitate the development of the Clatsop County Pre-Disaster Mitigation Plan (a FEMA-approved document that will open up funding sources for disaster mitigation).

How will your booth presentation relate to Emergency Preparedness?
As a part of our public involvement during the planning process, we will use this fair as a means to educate the public about the County's vulnerability to natural hazards and ask for input on the plan. We will present the risk assessment for the County and ask for disaster mitigation project ideas from the public that will help to reduce our risk to natural hazards.

Booth Information

Each booth will consist of a table and two chairs. (More may be available upon request.) NO pipe and drape or skirting will be used. Booths are reserved on a first come-first served basis. Booths may be set-up between 9am and Noon on April 30. Booths are to remain set-up and staffed until 7pm. (There will be a plenary session between 7-8pm. Booths may be unattended during this hour…but breakdown of the booth must not begin until the meeting is adjourned at 8pm.)

Electrical power is NOT included with the booth. Requests for power will be handled on an individual basis. Contact us for details.

Financial Issues:
There is NO charge for a booth.
NO selling, fundraising, etc. will be allowed at the convention center during the fair.

For Official Use Only:

THANK YOU FOR YOUR INTEREST IN EMERGENCY PREPAREDNESS!

If you have questions, please ask. Deb Treusdell – 503-739-2030 - deb@sterlingconcepts.biz

Clatsop County Pre-Disaster Mitigation Planning

Talking Points

Clatsop County seeks public input on the Natural Hazards Mitigation Plan at two upcoming events

Highlights:

- *Clatsop County and each of the 5 incorporated cities are developing a Natural Hazard Mitigation Plan that will open up new funding sources through FEMA for mitigation projects that aim to reduce the county's risk to natural hazards.*
- *The plan focuses on natural hazards that affect our county, such as: flood, earthquake, tsunami, severe winter storm, wildfire, drought, coastal erosion, landslide, and volcano.*
- *For every dollar spent on mitigation, society can expect an average savings of $4, according to a 2005 study by the National Institute of Building Science's Multi-Hazard Mitigation Council.*
- *Two upcoming events: Seaside, April 30, and Astoria, May 1*
    - *Asking for public input regarding the types of mitigation projects that the county and cities should focus on.*

Clatsop County is currently working on the Natural Hazards Mitigation Plan. This work is being performed in cooperation with the Oregon Partnership for Disaster Resilience, Oregon Emergency Management, and the Columbia River Estuary Study Taskforce (CREST) through a grant from the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Grant Program. Upon approval and adoption of the plan, the County will gain eligibility to apply for federal funding towards natural hazard mitigation projects.

Engaging in mitigation activities provides Clatsop County residents with a number of benefits, including reduced loss of life, property, essential services, critical facilities and economic assets; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community and region through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects. Natural hazard mitigation is any sustained action taken to reduce or eliminate long-term risks to human life and property from natural hazards. Examples of mitigation 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 non-English speaking residents or senior populations. Mitigation is the responsibility of individuals, private business and industries, state and local governments, and the federal government.

Throughout history, Oregon has been subject to a range of natural disasters that have brought devastating consequences to communities. Clatsop County's Natural Hazard Mitigation Plan focuses on the primary natural hazards that could affect the community, including winter storms, floods, tsunamis, wildfires, landslides and more. Dramatic increases in the costs associated with natural disasters over the past few decades have fostered interest in identifying and implementing effective means of reducing vulnerability. According to a 2005

study by the National Institute of Building Science's Multi-Hazard Mitigation Council, for every dollar spent on mitigation, society can expect an average savings of $4. It is impossible to predict exactly when natural hazards will occur, or the extent to which they will affect the region, but with careful planning and collaboration among public agencies, private sector organizations, and citizens within the region, it is possible to minimize the losses that can result from natural disasters.

Clatsop County's planning process began in October, 2007, and it will take about a year to complete and adopt a Natural Hazards Mitigation Plan. The local planning process includes representatives from the County, each of the incorporated cities in the County, and other members of the business and public sectors. The planning process is being harmonized through a joint collaboration between the Clatsop County Emergency Services Office and CREST.

To encourage public involvement, there will be two events open to the public to solicit public input in the process. The first opportunity to comment will be during the County-wide Emergency Preparedness Fair being held April 30, 2008, from 2pm-8pm at the Seaside Civic and Convention Center. Jay Flint, coordinator of the planning process, will be involved in two panel discussions, one at 2:30pm and the other at 5:30pm. In addition, the Pre-Disaster Mitigation Planning Committee will have a booth at the Fair. The booth will display the main points of the plan and welcome input from the public on what types of disaster mitigation activities they would like to see.

The second event is the following day on May 1st, from 6:30pm-8pm at the Clatsop Community College Performing Art Center. This will be a stand-alone event focusing solely on the Natural Hazards Mitigation Plan. City of Astoria mayor Willis Van Dusen will open the event, followed by a presentation on the main points of the plan by Jay Flint. A question and answer session, as well as a discussion about what types of disaster mitigation activities the public would like local governments to focus on will follow the presentation.

If you have any questions regarding these upcoming events or about the planning process in general, please call Jay Flint, Coastal Planner with CREST at (503) 325-0435 or by email: jflint@columbiaestuary.org.

Clatsop County Pre-Disaster Mitigation Planning

PRESS RELEASE

DATE:	April 22, 2008
TO:	Joe Gamm, Daily Astorian
CC:	Cassandra Profita, Daily Astorian
FROM:	Jay Flint, CREST
SUBJECT:	Press Release for Clatsop County Pre-Disaster Mitigation Planning – Upcoming public forums

For Immediate Release

Clatsop County seeks public input on the Natural Hazards Mitigation Plan at two upcoming events

(Astoria, OR) – Clatsop County is currently working on the Natural Hazards Mitigation Plan. This work is being performed in cooperation with the Oregon Partnership for Disaster Resilience, Oregon Emergency Management, and the Columbia River Estuary Study Taskforce (CREST) through a grant from the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Grant Program. Upon approval and adoption of the plan, the County will gain eligibility to apply for federal funding towards natural hazard mitigation projects. The local planning process includes representatives from the County, each of the incorporated cities in the County, and other members of the business and public sectors.

The planning committee will be seeking input and comments from the public during two upcoming events. The first opportunity to comment will be during the County-wide Emergency Preparedness Fair being held April 30, 2008, from 2pm-8pm at the Seaside Civic and Convention Center. Jay Flint, coordinator of the planning process, will be involved in two panel discussions, one at 2:30pm and the other at 5:30pm. In addition, the Pre-Disaster Mitigation Planning Committee will have a booth at the Fair. The booth will display the main points of the plan and welcome input from the public on what types of disaster mitigation activities they would like to see.

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If you have any questions regarding these upcoming events or about the planning process in general, please call Jay Flint, Coastal Planner with CREST at (503) 325-0435 or by email: jflint@columbiaestuary.org.

CREST
Columbia River Estuary Study Taskforce

750 Commercial Street, Room 205, Astoria, Oregon 97103
Phone: (503) 325-0435, Fax: (503) 325-0459
Email: crest@columbiaestuary.org
Website: www.columbiaestuary.org

DATE: **January 8, 2008**
TO:
CC:
FROM: **Jay Flint**
SUBJECT: **Press Release for Clatsop County Pre-Disaster Mitigation Planning**

For Immediate Release

Clatsop County Develops Plan to Reduce the Risk of Natural Hazards

(Astoria, OR) – Clatsop County is currently working to create a Natural Hazards Mitigation Plan. This work is being performed in cooperation with the Oregon Partnership for Disaster Resilience, Oregon Emergency Management, and the Columbia River Estuary Study Taskforce (CREST) through a grant from the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Grant Program. Upon approval and adoption of the plan, the County will gain eligibility to apply for federal funding towards natural hazard mitigation projects.

Engaging in mitigation activities provides Clatsop County with a number of benefits, including reduced loss of life, property, essential services, critical facilities and economic assets; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community and region through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects. Natural hazard mitigation is any sustained action taken to reduce or eliminate long-term risks to human life and property from natural hazards. Examples of mitigation 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 non-English speaking residents or senior populations. Mitigation is the responsibility of individuals, private business and industries, state and local governments, and the federal government.

Throughout history, Oregon has been subject to a range of natural disasters that have brought devastating consequences to communities. Clatsop County's Natural Hazard Mitigation Plan focuses on the primary natural hazards that could affect the community, including winter storms, floods, tsunamis, wildfires, landslides and more. Dramatic increases in the costs associated with natural disasters over the past few decades have fostered interest in identifying and implementing effective means of reducing vulnerability. According to a 2005

study by the National Institute of Building Science's Multi-Hazard Mitigation Council, for every dollar spent on mitigation, society can expect an average savings of $4. It is impossible to predict exactly when natural hazards will occur, or the extent to which they will affect the region, but with careful planning and collaboration among public agencies, private sector organizations, and citizens within the region, it is possible to minimize the losses that can result from natural disasters.

Clatsop County's planning process began in October, 2007, and it will take about a year to complete and adopt a Natural Hazards Mitigation Plan. The local planning process includes representatives from the County, each of the incorporated cities in the County, and other members of the business and public sectors. To encourage further public involvement, there will be a series of open forums around the County to solicit public input in the process. The dates and locations of the open forums will be made available once they have been finalized.

The planning process is being harmonized through a joint collaboration between the Clatsop County Emergency Services Office and CREST. If you have any questions regarding the planning process, please call either Gene Strong, Clatsop County Emergency Services Coordinator at (503) 325-8635, or Jay Flint, Coastal Planner with CREST at (503) 325-0435.

Open for Business

The purpose of this section is to document the Open for Business training that took place in conjunction with the development of this natural hazard mitigation plan.

Open for Business Workshop Summary

In February, 2008, The Oregon Partnership for Disaster Resilience (OPDR) partnered with the Institute for Business and Home Safety (IBHS) to conduct two *Open for Business Toolkit* trainings on the Oregon Coast. The purpose of these trainings was to provide small businesses and community service organizations with the tools and resources necessary for developing preparedness and recovery plans. Small businesses rarely have the resources or knowledge to assess disaster risks and develop comprehensive mitigation and recovery plans, and at least one-fourth of all businesses that close for a disaster never reopen.

The *Open for Business Toolkit* is an interactive, web-based program that businesses can follow to develop customized property protection and recovery plans (i.e., contingency plans). By participating in the trainings, community business and service organizations learned how to build resiliency to natural disasters by identifying vulnerabilities, and mitigating those risks. Training attendees additionally received access to the toolkit, a resource valued at $2,000.

Trainings were held in Seaside and North Bend on February 12 and 14 of 2008. Attendees included local business owners, public officials and city staff, as well as emergency managers, social service providers, and business development centers. Diana McClure, IBHS Vice President and Director of Business Protection, led both trainings and taught attendees to: 1) Understand the importance of planning for business interruptions; 2) Navigate the interactive, web-based *Open for Business* property protection and disaster recovery planning tool; 3)Begin developing their own plans during the training; and 4) Communicate the importance of disaster planning to their constituencies and/or colleagues in order to institutionalize disaster safety into every day decision making processes.

Trainings were hosted by the Clatsop Community College Small Business Development Center, Coos County Emergency Management, Coos County Citizen Corps, and the Oregon Partnership for Disaster Resilience. The Small Business Development Center and Coos County Citizen Corps distributed OPDR's invitations and outreach materials to community organizations, including chambers of commerce, downtown associations, and local businesses. In addition to spreading the word, local hosts posted advertisements on their websites, distributed flyers and posters, and fielded local questions and concerns. OPDR contacted city staff and emergency service providers via telephone and email.

Greetings!

You are invited to attend the **Open for Business** Toolkit Training, co-hosted by the Clatsop Community College Small Business Development Center, and The Oregon Partnership for Disaster Resilience.

The **Open for Business** Toolkit is an interactive web-based program that businesses can follow to develop customized property protection and recovery plans (also known as contingency plans), which are then stored securely on-line for future reference and updating.

Why should your organization attend the **Open for Business** Toolkit Training?

- To learn how to use the toolkit to develop disaster preparedness and recovery plans (also known as business continuity plans) to make your organization better prepared for disasters;
- To use the training's information to help other businesses and organizations in your community develop their own preparedness and recovery plans; and
- There is no training fee, (the interactive toolkit is valued at $2,000).

Who should attend the **Open for Business** Toolkit Training:

- Owners and managers;
- Risk managers; and/or
- Payroll and financial staff.

The **Open for Business** Toolkit training will take place:

Tuesday, February 12, 2008
9:00 am – 12:00 pm
Clatsop Community College, South County Campus
1455 N Roosevelt Drive, Seaside, OR 97138
503-738-3346

The opportunity to participate in the training is being offered on a first-come-first serve basis. The first 30 people will be guaranteed a spot at the training. To RSVP, or request resources, contact Megan Findlay at 541-346-2305 Please reserve your spot by February 7, 2008.

Even if the worst happens -

Open for Business *sm* **-**
A Disaster Planning Toolkit
for the Small Business Owner

PLAN NOW TO STAY…

DISASTER READINESS SELF-ASSESSMENT QUESTIONS

1. Are you concerned that your normal business operations might be interrupted by a natural or human-caused disaster?

2. Have you determined what parts of your business need to be operational as soon as possible following a disaster, and planned how to resume those operations?

3. Do you and your employees have a disaster response plan in place to help assure your safety and to take care of yourselves until help can arrive?

4. Could you communicate with your employees if a disaster happened during work hours or after work hours?

5. Can your building withstand the impact of a natural disaster, and are your contents and inventory sufficiently protected so they will not be damaged?

6. Are your vital records protected from the harm that could be caused by a disaster?

7. Are you prepared to stay open for business if your suppliers cannot deliver, your markets are inaccessible, or basic needs (e.g. water, sewer, electricity, transportation) are unavailable?

8. Do you have plans to stay open for business, even if you cannot stay in or reach your place of business?

9. Have you worked with your community — public officials and other businesses — to promote disaster preparedness and plan for community recovery?

10. Have you consulted with an insurance professional to determine if your insurance coverage is adequate to help you get back in business following a disaster?

Appendix C: Economic Analysis of Natural Hazard Mitigation Projects

This appendix was developed by the Community Service Center's Oregon Natural Hazards Workgroup at the University of Oregon. It has been reviewed and accepted by the Federal Emergency Management Agency as a means of documenting how the prioritization of actions shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

The appendix outlines three approaches for conducting economic analyses of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to 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.

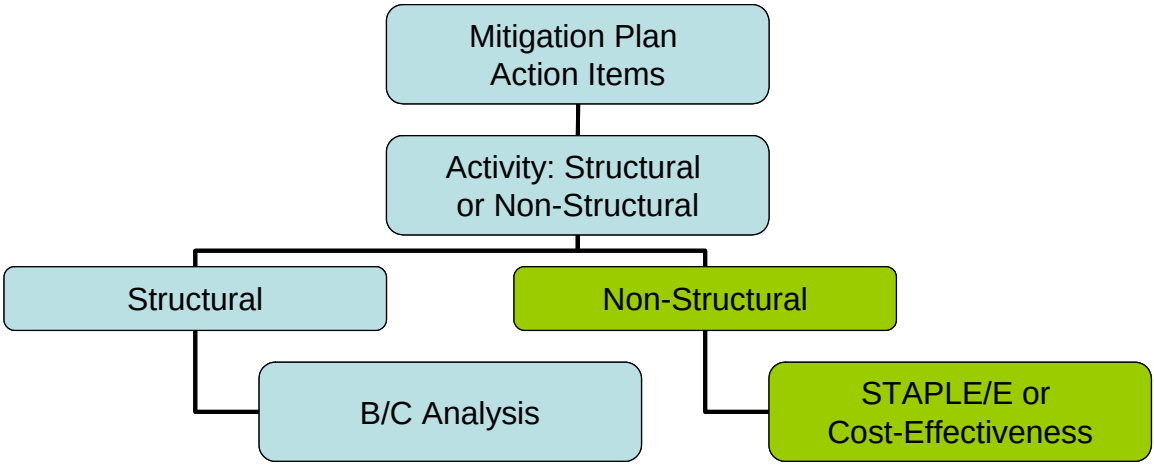
- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

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 A.1: Economic Analysis Flowchart



Source: Community Service Center's Oregon Natural Hazards Workgroup at the University of Oregon, 2005

Implementing the Approaches

Benefit/cost analysis, cost-effectiveness analysis, and the STAPLE/E are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating mitigation activities is outlined below. This framework should be used in further analyzing the feasibility of prioritized mitigation activities.

1. Identify the Activities

Activities for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation projects can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits

Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate activities. Potential economic criteria to evaluate alternatives include:

- ***Determine the project cost***. This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- ***Estimate the benefits***. Projecting the benefits, or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be

well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

- ***Consider costs and benefits to society and the environment***. These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.
- ***Determine the correct discount rate***. Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Activities

Once costs and benefits have been quantified, economic analysis tools can rank the possible mitigation activities. Two methods for determining the best activities given varying costs and benefits include net present value and internal rate of return.

- ***Net present value***. Net present value is the value of the expected future returns of an investment minus the value of the expected future cost expressed in today's dollars. If the net present value is greater than the projected costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.
- ***Internal rate of return***. Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project. Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk, project effectiveness, and economic, environmental, and social returns in choosing the appropriate project for implementation.

Economic Returns of Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or land owners as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Natural Hazards

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

Resources

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.

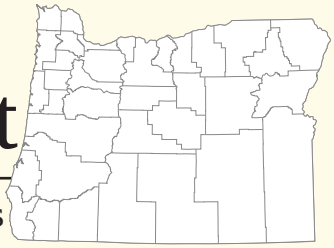
VSP Associates, Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects: Section 404 Hazard Mitigation Program and Section 406 Public Assistance Program, Volume 3: Seismic Hazard Mitigation Projects*, 1993.

VSP Associates, Inc., *Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model*, Volume 1, Federal Emergency Management Agency, FEMA Publication Number 255, 1994.

Appendix D:
Oregon Coast Regional Profile

Region 1: Oregon Coast

Profile and Risk Assessment



Clatsop, Coos, Curry, Douglas, Lane, Lincoln and Tillamook Counties

PARTNERSHIP FOR DISASTER RESILIENCE

WWW.OREGONSHOWCASE.ORG

Photos: Gary Halvorson, Oregon State Archives

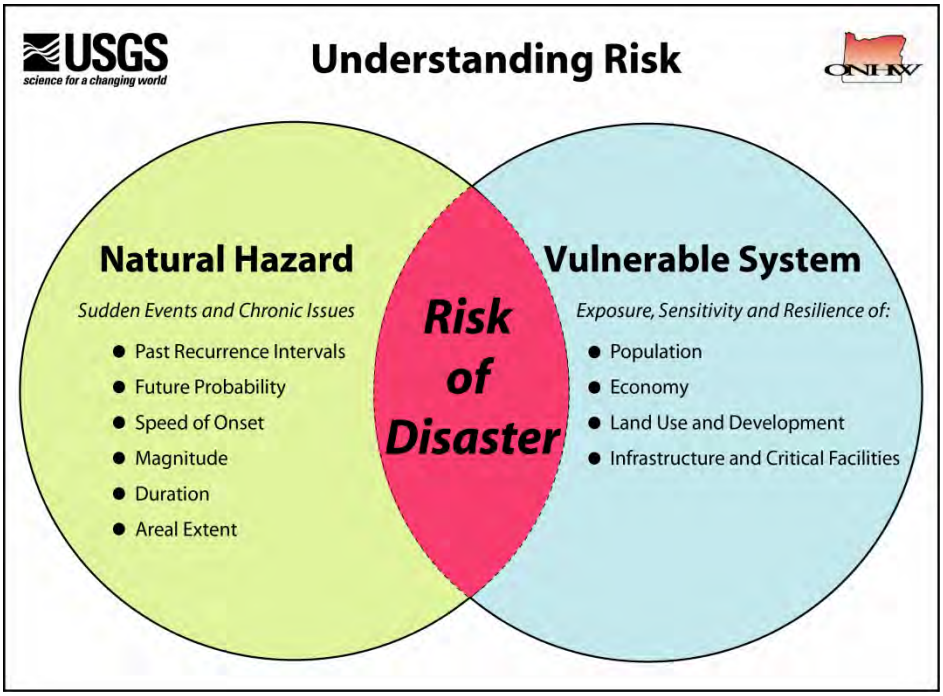
Region 1: Oregon Coast Natural Hazard Risk Profile

Clatsop, Coos, Curry, Douglas, Lane, Lincoln, & Tillamook Counties

Introduction and Purpose

Oregon faces a number of natural hazards with the potential to cause loss of life, injuries and substantial property damage. A natural disaster occurs when a natural hazard event interacts with a vulnerable human system. The following quote and graphic summaries the difference between natural hazards and natural disasters:

> *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 (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.*[1]



It is not always possible to predict exactly when a natural disaster 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. A report submitted to Congress by the National Institute of Building Science's Multihazard Mitigation Council (MMC) highlights that for every dollar spent on mitigation society can expect an average savings of $4.[2]

How to use this Report

The Partnership at the University of Oregon's Community Service Center developed this report as part of the regional planning initiative funded by the Pre-Disaster Mitigation Grant.* In addition to serving as a regional resource for local planning initiatives, this also serves as the regional profile for the State's enhanced natural hazard mitigation plan. This report is intended to be used as a planning process document by communities developing local natural hazard mitigation plans. This regional report should be reviewed and updated by locals using the best available local data as the local plans serve as the foundation for the State Plan.

The information in this report should be paired with local data to identify issues for which mitigation action items can be developed. The report can be used in conjunction with assistance from *Partnership* staff to develop and document community specific action items. For more information on *The Partnership* or the training series see: www.oregonshowcase.org.

Regional Overview

The Oregon Coast region (Region 1 as identified in the state's natural hazard mitigation plan) includes Clatsop, Coos, Curry, Douglas, Lane, Lincoln, and Tillamook Counties. Only the coastal portions of Douglas and Lane Counties are included in the Oregon Coast Region. Not all datasets referenced in this profile were available for the coastal areas only, when this was the case, data for the entire County has been provided. This region is at relatively high risk from coastal erosion, earthquakes, floods, landslides, and wind and winter storms. It also faces low to moderate risk from wildfires and volcanic events.

Organization of Report

This report includes three main sections that work together to develop a comprehensive picture of the region and its sensitivity to natural hazards.

Regional Maps

Critical Infrastructure Map

Using 2003 data from ODOT, this map shows the approximant location of critical infrastructure, including schools, hospitals, bridges, dams, and power stations. Knowing the location of critical infrastructure is important when determining the sensitivities of the region.

County Hazard Risk Analysis Maps

These maps depict the county's perceived risk for each natural hazard. Data for these maps comes from the County Hazard Risk Analysis in which each county develops risk scores for Oregon's major natural hazards. Scores are current as of March 2003.

* FEMA Pre-Disaster Mitigation Agreement Number - EMS-2006-PC-0003

Regional Profile and Sensitivity Analysis

Using the best readily available data, the regional profile includes a *Geographic Profile* that discusses the physical geography of the area, a *Demographic Profile* that discusses the population in the Oregon Coast region, an *Infrastructure Profile* that addresses the region's critical facilities and systems of transportation and power transmission, and an *Economic Profile* that discusses the scale and scope of the regional economy with a focus on key industries. In addition to describing characteristics and trends, each profile section identifies the traits that indicate sensitivity to natural hazards.

The data sources used in this section are all publicly available. This report examines the Oregon Coast region as a whole and by individual counties when possible. Much of the demographic data was sourced from the 2000 U.S. Census; the economic data came from the 2002 Economic Census, the Bureau of Economic Analysis and the Oregon Department of Agriculture. State agency reports and plans and websites for private companies were also important sources of information.

Regional Hazards Assessment

The regional natural hazard risk assessment section describes historical impacts, general location, extent, and severity of past natural hazard events as well as the probability for future events. This information is aggregated at the regional level and provides counties with a baseline understanding of past and potential natural hazards.

These assessments were based on best available data from various state agencies related to historical events, repetitive losses, county hazard analysis rankings, and general development trends. The risk assessment was written in 2003 as part of the State Natural Hazard Mitigation Plan.

Oregon Coast/Lower Columbia Region

Comprised of the state's costal line and the lower Columbia River, the Oregon Coast/Lower Columbia region has experienced an eight percent increase in population since 1990. This represents a lower rate of growth than other regions of the state. Just over half of the region's population lives in incorporated areas. Thirty percent of the region's houses were built before 1960, 35% between 1960 and 1980, and 35% were built after 1980. Transportation networks are an even greater consideration for the coastal region given the physical boundary of the ocean to the west and the Coast Range to the east. The average commute for workers in this region is 22 minutes each way. Seventy-five percent of the region's workers drive alone to work, 13% carpool, and five percent work from home. Most bridges in the area have not been seismically retrofitted, creating significant risk to the commuting population in areas at risk from earthquakes.

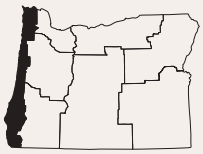
REGION FACTS

Population:

Total	208,000
Rural	93,010
Urban	114,990

Housing:

Single-Family	55%
Multi-Family	16%
Mobile Homes	18%
Boat, RV, Van, etc	2%

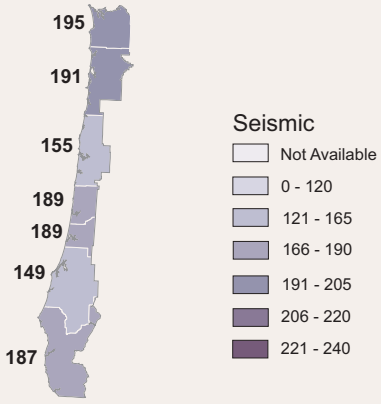


County	# of Hospitals	# of Hospital Beds	Police Stations	Fire & Rescue Stations	Power Plants	Dams	Bridges
Clatsop	2	60	7	19	2	6	186
Coos	3	152	9	19	0	14	258
Curry	1	24	5	13	0	4	91
Douglas	1	17	1	1	0	0	12
Lane	1	21	1	1	0	0	19
Tillamook	1	30	6	9	0	2	242

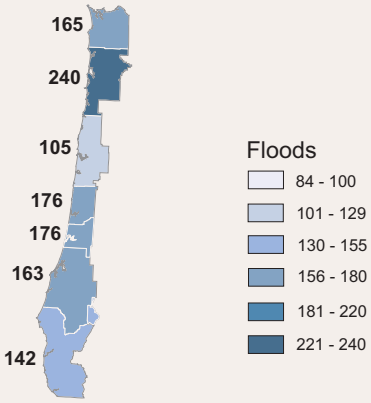
As part of the County Hazard Risk Analysis, each county develops risk scores for Oregon's major natural hazards. This score, ranging from 24 (low) to 240 (high), reflects the County's perceived risk for the particular hazard. Scores are current as of July 2003.

To obtain the most current scores, see http://www.oregonshowcase.org or contact Oregon State Police – Office of Emergency Management http://www.osp.state.or.us/oem/.

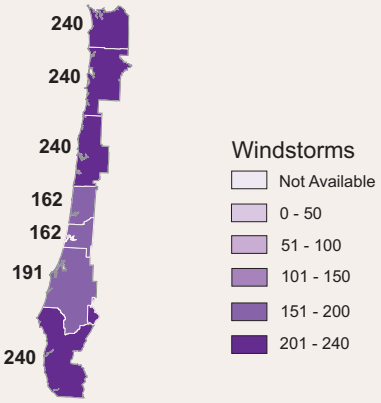
Seismic



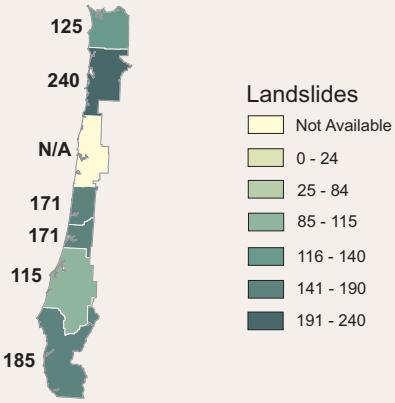
Floods



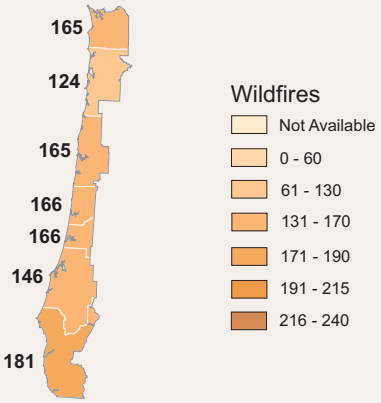
Windstorms



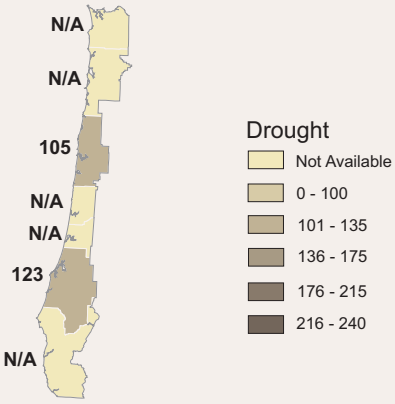
Landslides



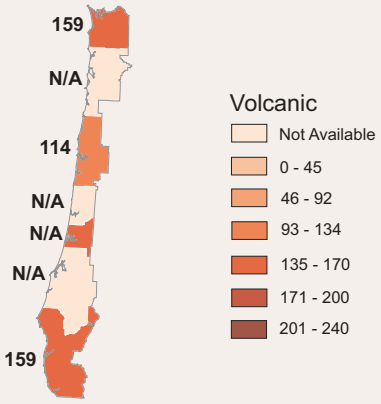
Wildfires



Drought



Volcanic



Regional Profile and Sensitivity

Section 1: Geography and Climate

The seven-county area of the Oregon Coast region is approximately 17,063 square miles. The Oregon Coast Range runs through the eastern part of the region and the Pacific Ocean borders the western part of the region. The Oregon Coast Range is volcanic in origin and is drained by hundreds of creeks, streams, rivers and lakes. Major rivers in the region include the Siuslaw, Umpqua, Nehalem, Rogue, Yaquina, Siletz, Nestucca, Trask, Wilson, Coos and Coquille. Average annual precipitation in the region ranges from 60 inches to 120 inches, with some locations receiving over 180 inches.[3]

Section 2: Demographic profile

This section describes the Oregon Coast region in terms of its population, demographics and development trends. Data is followed by a discussion of characteristics that indicate community vulnerability to natural hazards. Identifying populations that are particularly vulnerable enables communities to design targeted strategies to reduce their risk. Reviewing development trends provides further guidance on how communities can accommodate growth in a manner that increases resilience to natural hazards.

Population and Demographics

In 2006, the estimated population of the Oregon Coast Region was 634,920, representing an increase of 3.7% since 2000. This growth pattern in the Oregon Coast Region is projected to continue at a moderate rate over the next 20 years, according to the Oregon Office of Economic Analysis. Table 1 displays the population change in each Oregon Coast Region county, along with their respective average annual growth rates.

Table 1. Population Growth, Oregon Coast Region, 2000-2005

County	2000 Population	2006 Population	2000-2006 Population Change	% Change 2000-2006	AAGR, 2000-2006
Clatsop	35,630	37,045	1,415	4.0%	0.7%
Coos	62,779	62,905	126	0.2%	0.0%
Curry	21,137	21,365	228	1.1%	0.2%
Douglas*	100,399	103,815	3,416	3.4%	0.6%
Lane*	322,959	339,740	16,781	5.2%	0.9%
Lincoln	44,479	44,520	41	0.1%	0.0%
Tillamook	24,262	25,530	1,268	5.2%	0.9%
Regional Total	611,645	634,920	23,275	3.7%	0.6%

*Data for only the coastal portions of the Counties were not available.

Source: Portland State University, Population Estimates, 2006.

The impact in terms of loss and the ability to recover varies among population groups following a disaster. Historically, 80% of the disaster burden falls on the public.[4] Of this number, a disproportionate burden is placed upon special needs groups, particularly minorities, and the poor. Minorities and the poor 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. As of 2004, 14% of the region's population was living in poverty. (A large percentage of these people presumably fall into both categories.)

Median household income can be used to compare economic areas as a whole, but does not reflect how the income is divided among area residents. Table 2 displays the median household income for the Oregon Coast Region, which was $35,460 in 2004. This is below the national average of $44,334 and the state's average of $42,568. The three percent median household income growth between 2000 and 2004 in the region is larger than the two percent State, but smaller than the five percent National growth over the same time period.

Table 2. Median Household Income, Oregon Coast Region, 2000 and 2004

County	2000	2004	% Change 2000-2004
Clatsop	$36,945	$37,703	2.1%
Coos	$32,063	$33,178	3.5%
Curry	$31,131	$32,767	5.3%
Douglas*	$34,196	$36,041	5.4%
Lane*	$37,893	$37,905	0.0%
Lincoln	$33,431	$34,175	2.2%
Tillamook	$34,663	$36,451	5.2%
Regional Average:	**$34,332**	**$35,460**	**3.3%**

* Data for only the coastal portions of the Counties have been provided.

Source: U.S. Census Bureau Small Area Income Poverty Estimates, 2000 and 2004

In 2004, 13% of the nation's population was living in poverty, the same as Oregon's state poverty average of 13%. Oregon Coast's regional poverty level was 14%, slightly more than the national and state average. While the median household incomes are lower in the region than the state as a whole, the similar poverty rate may be due to a higher cost of living in the Oregon Coast Region. Table 3 details the county and regional poverty rates in 2004.

Table 3. Poverty Rates, Oregon Coast Region, 2004

	Total Population in Poverty		Children Under 18 in Poverty	
County	Number	%	Number	%
Clatsop	4,724	13%	1,413	18%
Coos	10,207	16%	2,909	23%
Curry	2,895	13%	724	19%
Douglas*	15,469	15%	4,715	21%
Lane*	49,293	15%	14,044	20%
Lincoln	7,008	15%	2,075	23%
Tillamook	3,222	13%	929	19%
Regional Average		**14%**		**20%**

* Data for only the coastal portions of the Counties have been provided.

Source: U.S. Census Bureau Small Area Income Poverty Estimates, 2004

For hazard mitigation, low-income populations need special considerations, because they may not have the savings to withstand economic setbacks, and if work is interrupted, housing, food, and necessities become a greater burden. Additionally, low-income households are more reliant upon public transportation,

public food assistance, public housing, and other public programs, all which can be impacted in the event of a natural disaster.

The age of the population is also an important consideration in hazard mitigation planning. In 2006, 35% of the regional population was under 14 or over 65 years of age.[5] Table 4 provides a breakdown of the percentages of youth and elderly in the Oregon Coast region counties.

Table 4. Oregon Coast Region Youth and Senior Populations, 2006

	0-14		65-74		75+	
County	**Number**	**%**	**Number**	**%**	**Number**	**%**
Clatsop	6,454	17%	2,856	8%	2,767	7%
Coos	10,207	16%	6,343	10%	5,822	9%
Curry	2,828	13%	3,015	14%	3,016	14%
Douglas*	18,175	18%	9,706	9%	9,346	9%
Lane*	58,573	17%	21,941	6%	23,619	7%
Lincoln	6,828	15%	4,639	10%	4,141	9%
Tillamook	3,996	16%	2,684	11%	2,476	10%
Regional Total and Average %:	**107,061**	**16%**	**51,184**	**10%**	**51,187**	**9%**

*Data for only the coastal portions of the Counties were not available.

Source: Portland State University Population Estimates, 2006

The high percentage of elderly individuals, particularly in Curry and Tillamook Counties, require special consideration due to their sensitivities to heat and cold, their reliance upon transportation for medications, and their comparative difficulty in making home modifications that reduce risk to hazards.

Young people also represent a vulnerable segment of the population. With the exception of Curry County, at least 15% of the population of all coast counties is within the 0-14 year age range. Special considerations should be given to young populations and schools, where children spend much of their time, during the natural hazard mitigation process. Children are more vulnerable to heat and cold, have fewer transportation options, and require assistance to access medical facilities.

Special consideration should also be given to populations who do not speak English as their primary language. These populations can be harder to reach with preparedness and mitigation information materials. They are less likely to be prepared if special attention is not given to language and culturally appropriate outreach techniques. In the Oregon Coast Region, most citizens speak English as their primary language. However, in every county in Oregon, Spanish is the second most prominent language. Table 5 shows the percentage of the individuals in the Oregon Coast region who do not speak English as their primary language. On average, 2% of the total population in the Oregon Coast region speaks a language other than English as a primary language.

Table 5. Oregon Coast Region Population over age 5 that Speaks English less than "Very Well", 2000

County	%Population
Clatsop	3%
Coos	1%
Curry	1%
Douglas*	1%
Lane*	1%
Lincoln	3%
Tillamook	3%
Regional Average:	**2%**

*Figures only include the coastal areas of Douglas and Lane Counties.
Source: US Census Bureau, 2000 Census Summary File 4

Housing and Development

To accommodate rapid growth, 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 and injury and property damage. Oregon has been successful in developing land use goals that incorporate mitigation while preserving rural and protected lands within urban growth areas. Measure 37 may impact the ability of communities to regulate land-use protection measures in communities. 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.

The urban and rural growth pattern impacts how agencies prepare for emergencies as changes in development can increase risks associated with hazards. The Oregon Coast Region is growing more urban, with two percent population growth in incorporated areas between 2000 and 2006, versus a two percent population loss in unincorporated areas during the same time period. Table 6 illustrates the trend in urban area population growth in the Oregon Coast counties between 2000 and 2006.

Table 6. Urban/Rural Populations, Oregon Coast Region, 2000-2006

	% Incorporated Population		% Change
County	**2000**	**2006**	**2000-2006**
Clatsop	63%	63%	0%
Coos	58%	60%	2%
Curry	40%	47%	6%
Douglas*	45%	47%	2%
Lane*	70%	72%	2%
Lincoln	57%	60%	3%
Tillamook	36%	37%	1%
Regional Average:	**53%**	**55%**	**2%**

*Data for only the coastal portions of the Counties were not available.

Source: Portland State University Population Estimates, 2006

In addition to location, the character of the housing stock also affects the level of risk that communities face from natural hazards. Table 7 provides a breakdown by county of the various housing types available in 2000. Mobile homes and other non-permanent housing structures, which account for 18% of the housing in some Oregon Coast counties, are particularly vulnerable to certain natural hazards, such as windstorms, and special attention should be given to securing these types of structures.

Table 7. County Housing Profile, Oregon Coast Region, 2000

County	Single-Family	Multi-Family	Mobile Homes	Boat, RV, Van, etc.
Clatsop	69%	22%	8%	1%
Coos	68%	14%	16%	1%
Curry	59%	11%	26%	4%
Douglas*	62%	17%	18%	3%
Lane*	62%	11%	25%	2%
Lincoln	66%	16%	16%	2%
Tillamook	77%	8%	14%	2%

*Figures only include the coastal areas of Douglas and Lane Counties.
Source: US Census Bureau, 2000 Census Summary File 3

Table 7 shows that the majority of the housing stock is in single-family homes and this trend is continuing with new construction. In 2006, an estimated 81% of new housing was single-family units.[6] This trend suggests that hazard mitigation efforts should provide outreach and information that specifically addresses preparedness in detached housing units.

Aside from location and type of housing, the year housing structures were built has implications for community vulnerability. The older a home is, the greater the risk of damage from natural disaster. This is because structures built after the late 1960s in the Northwest and California used earthquake resistant designs and construction techniques. In addition, FEMA began assisting communities with floodplain mapping during the 1970s, and communities developed ordinances that required homes in the floodplain to be elevated to one foot over Base Flood Elevation. Knowing the age of a structure is helpful in targeting outreach regarding retrofitting and insurance for owners of older structures. Table 8 illustrates the percentage of homes built per county during certain periods of time.

Table 8. Housing, Year Built, Oregon Coast Region

County	1939 or earlier - 1959	1960-1979	1980-2000
Clatsop	47%	26%	27%
Coos	38%	38%	24%
Curry	18%	37%	45%
Douglas*	33%	44%	23%
Lane*	19%	36%	46%
Lincoln	26%	35%	40%
Tillamook	34%	31%	36%

*Figures only include the coastal areas of Douglas and Lane Counties.
Source: U.S. Bureau of the Census, Profile of Housing Characteristics 2000

Section 3: Infrastructure Profile

This section of the report describes the infrastructure that supports Oregon Coast Region communities and economies. Transportation networks, systems for power transmission, and critical facilities such as hospitals and police stations are all vital to the functioning of the region. 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. The information that is provided in this section of the profile can provide the basis for informed decisions about how to reduce the vulnerability of Oregon Coast Region infrastructure to natural hazards.

Transportation

There are two primary modes of transportation in the region: highways and railroad. There are also many small airports scattered throughout the region that are used for passenger and freight service.

Roads and Bridges

There is one major highway that runs through the Oregon Coast region. US-101 is a major transportation corridor that runs north-south through the Oregon Coast Region. This is an important transportation corridor along the Oregon Coast. A variety of highways connect coastal communities to inland communities.

- US Highway 26, intersects US-101 in Clatsop County and near Cannon Beach, respectively, on its way through the Portland Metropolitan area and points farther east;

- US Highway 42 intersects with US-101 and connects Coos Bay with Roseburg, and Interstate 5 and points north and south;
- Highway 28 intersects with US-101 and connects Reedsport with the Interstate 5 corridor just south of Cottage Grove;
- Highway 18 intersects with US-101 and connects Lincoln City with Salem and Interstate 5 and points farther north, south, and east;
- US Highway 30 intersects with US-101 and connects Astoria with the Portland Metropolitan area;
- Route 20 intersects with US-101 and connects Newport with Corvallis and Interstate 5 and points farther north, south and east; and
- US State highway 126 intersects with US-101 and connects Florence with Eugene/ Springfield, and Interstate 5 and points farther north, south and east.

Highways are also heavily utilized by local traffic. According to the 2000 Census, 74% of workers in the Oregon Coast Region commute by driving alone. The average commute for workers in the Oregon Coast Region is just over twenty-two minutes each way.[7] Additionally, in 2003, 26% of employees living in counties in the Oregon Coast Region worked outside of their home county.[8] A severe winter storm or tsunami has the potential to disrupt the daily driving routine of thousands of people.

Over the last decade, the population growth in the region has contributed to an increase of automobiles on the roads:

- Average daily traffic volume on U.S. 101 recorded at the intersection of 25th Street in Newport increased by 12% between 1997 and 2005.[9]
- On U.S. 101 recorded 2.2 miles south of Rockaway, the average daily traffic between 1996 and 2005 increased by 7%.[10]
- Average daily traffic counts also increased by 15% between 1996 and 2005 on OR 126, 2.6 miles west of Elmira in Lane County. Judging from these trends, traffic levels will continue to increase [11]

A large increase of automobiles can place stress on roads, bridges and infrastructure within the cities, and also in rural areas where there are fewer transit roads. Natural hazards can disrupt automobile traffic and shut down local transit systems across the area or region and make evacuations difficult.

The condition of bridges in the region is also a factor that affects risk from natural hazards. Most bridges are not seismically retrofitted, which is a particularly important issue for the Oregon Coast region because of its risk from earthquakes. Incapacitated bridges can disrupt traffic and exacerbate economic losses because of the inability of industries to transport services and products to clients. Table 9 shows the number of state, county, and city maintained bridges and culverts, and the number of historic covered bridges in the region. The bridges in the region are part of the state and interstate highway and maintained by the Oregon Department of Transportation.

Table 9. Bridges and Culverts

County	State Highway Bridges	State Highway Culverts	County Highway Bridges	County Highway Culverts	City/ Municipal Highway Bridges	City/ Municipal Highway Culverts	Historic Covered Bridges	2006 Total
Clatsop	109	72	65	78	12	4	0	340
Coos	138	49	115	159	4	2	1	468
Curry	60	29	30	39	1	1	0	160
Douglas*	8	71	2	276	2	1	0	360
Lane*	12	112	3	347	3	3	1	481
Lincoln	137	105	85	170	3	4	4	508
Tillamook	144	81	91	147	7	4	0	474

*Data for only the coastal portions of the Counties were not available.

Source: Oregon Department of Transportation, 2006, Oregon Department of Fish and Wildlife, Statewide Culvert Inventory

Railroads

Railroads are major providers of regional and national cargo and trade flows. Railroads that run through the Oregon Coast region provide vital transportation links from the Pacific to the rest of the country. There are three major coastal railroads: Willamette and Pacific (W&P), Central Oregon and Pacific (CORP), Longview Portland & Northern (LPN), Portland and Western (P&W), and Port of Tillamook Bay (POTB). These railroad lines connect to the Union Pacific (UP), CORP, and P&W north-south lines that run through the Willamette Valley farther east.[12]

Sixteen million tons of goods produced in Oregon are shipped out of state by railroad per year. The goods include lumber and wood products, pulp and paper, and miscellaneous mixed shipments.[13] Over 23 million tons of products originating in other states are annually shipped into Oregon by rail including wood, farm products, coal, and waste materials.[14] More than 22 million tons of products are shipped through Oregon annually by rail. More than 6 million tons of these products include grains and soybeans transported from the Northern Midwest to Washington.[15]

Rails are sensitive to icing from the winter storms that are common in the Oregon Coast region. For industries in the region that utilize rail transport, these disruptions in service can result in economic losses. As mentioned above, the potential for rail accidents caused by natural hazards can also have serious implications for the local communities if hazardous materials are involved.

Airports

The Oregon Coast Region has several airports. North Bend Municipal and Astoria Regional are the two largest airports in the region. Other airports in the region include Bandon State, Florence Municipal, Gold Beach Municipal, Newport Municipal, Seaside Municipal, Siletz Bay State, Tillamook, Cape Blanco State, Lakeside State, Nehalem Bay State, Pacific City State, Vernonia Airfield and

Wakonda Beach State.[16] North Bend Municipal, the largest airport in the region, transported 200 tons of freight in 2003.[17]

Flights face the potential for closure from a number of natural hazards that are common in the Oregon Coast Region, including windstorms and winter storms. Airports have strict guidelines regarding when conditions are safe for flight.

Ports

Ports in the Oregon Coast Region are a major contributor to the local, regional, and national economies. There are three major deep draft ports in the region – Coos Bay/North Bend, Newport, and Astoria. In 1998, the port in Coos Bay shipped 3 million tons of goods, 97% of which were forest products. [18]

Critical Facilities

Critical facilities are those facilities that are essential to government response and recovery activities (e.g., police and fire stations, public hospitals, public schools). Critical facilities in the Oregon Coast Region are displayed in Table 10 by county.

Table 10. Oregon Coast Region Critical Facilities by County

County	Hospitals		Police Station	Fire & Rescue Station	School Districts & Colleges
	# of Hospitals	# of Beds			
Clatsop	2	83	6	11	5 SDs, 1 Community College
Coos	3	151	7	17	7 SDs, 1 Community College
Curry	1	24	4	11	3 SDs
Douglas*	2	198	8	27	14 SDs, 1 Community College
Lane*	4	578	8	24	15 SDs, 1 Community College, 1 State University
Lincoln	2	85	4	8	1 SD, 1 Community College
Tillamook	1	49	5	8	3 SDs, 1 Community College

*Data for only the coastal portions of the Counties were not available.

Sources: State Hospital Licensing Department, USAcops.com, Oregon State Fire Marshall, Oregon Department of Education.

In addition to those listed in Table 10, there are other critical and essential facilities that are vital to the continued delivery of key governmental services or that may significantly impact the public's ability to recover from emergencies. Some of these facilities, such as correctional institutions, public services buildings, law enforcement centers, courthouses, juvenile services buildings, public works facilities, and other public facilities should be detailed in local and regional mitigation plans.

Power Generation and Transmission

Most of the Oregon Coast's oil and gas pipelines are connected to main lines that run through the Willamette Valley. The infrastructure associated with power generation and transmission plays a critical role in supporting the regional economy, and is therefore crucial to consider during the natural hazard planning process.

There are no major dams in the Oregon Coast region, but just east of the region, there are several major dams: Bonneville, Round Butte, Lookout Point, Carmen-Smith, Detroit, and Pelton dams all have maximum generating capacities of over 100 megawatts (mw's) of electricity.[19]

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. However, the potential for severe damage and fatalities does exist, and the National Inventory of Dams (NID) has developed a listing of High Threat Potential Hazard dams for the nation. The state has developed a complementary inventory of dams in Oregon. Table 11 lists the dams included in the state inventory.

Table 11. Oregon Coast Region Power Plants and Dams by County

County	Power Plants	Dams	
		Dams† (State)	Threat Potential
Clatsop	0	7	3 High Threat
Coos	0	24	2 High Threat
Curry	0	13	0 High Threat
Douglas*	0	86	9 High Threat
Lane*	1 - 51.2 MWs	54	11 High Threat
Lincoln	0	8	4 High Threat
Tillamook	0	5	0 High Threat

*Data for only the coastal portions of the Counties were not available.

Sources: Oregon Department of Energy, Oregon State Water Resources

The electric, oil, and gas lines that run through the Oregon Coast region are privately owned. A network of electricity transmission lines, owned by Bonneville Power Administration and Pacific Power run through the Oregon Coast region.[20]

† Note: The National Inventory of Dams includes all dams with either:
a) a high or significant hazard rating
b) a low hazard dam that exceeds 25 feet in height AND 15 acre-feet storage
c) a low hazard dam that exceeds 6 feet in height AND 50 acre-feet storage

Most of the natural gas Oregon uses originates in Alberta, Canada. Northwest Natural Gas serves the central region of the Oregon Coast.[21] These electric, oil, and gas lines may be vulnerable to severe, but infrequent natural hazards, such as earthquakes. There are three Liquid Natural Gas (LNG) projects currently being proposed in the Region – 2 in Clatsop County and one in Coos County.[22]

Section 4: Economic Profile

The following economic profile addresses the regional economy and its sensitivities to natural hazards. The sensitivities that are relevant to the Oregon Coast Region are a function of the types and diversity of industries and the composition of businesses that are present. To highlight key industries, this report will look at:

- The largest revenue sectors, since interruptions to these industry sectors would result in significant revenue loss for the region.
- The largest employment industries, since interruptions to these industry sectors would result in high unemployment in the region.
- The industry sectors with the most businesses, since interruptions to these industry sectors would result in damage to the most businesses regionally.

By examining these key industry sensitivities and other economic sensitivities, such as industry diversity and the number of small businesses that exist in the Oregon Coast Region, informed decisions can be made about how to mitigate risk.

Economic Overview

The Oregon Coast Region enjoys some economic advantages due to its coastal location. In addition, the region's close proximity to the Coast Range, California, Washington, and the beach itself provide year-round sporting and tourism activities.

According to the Oregon Employment Department, the Oregon Coast Region economy is experiencing an economic upturn and downturn. Natural resource industries are declining in Coos and Curry County. Tillamook, Clatsop and Lincoln have experienced strong growth in the tourism and recreation industries. The retirement sector has experienced growth for Tillamook, Coos and Curry County. Unemployment had decreased in the first part of 2007 for all coastal counties, but by June, was on the rise.[23] As of 2006, the region employed 209,486 people with a combined payroll of over one billion dollars. Table 12 displays the payroll and employee figures per county.

Table 12. Oregon Coast Employment and Payroll by County, 2006

County	# of Employees	Annual Payroll
Clatsop	13,237	82,410,000
Coos	17,023	85,485,000
Curry	5,498	26,441,000
Douglas*	30,571	205,121,000
Lane*	122,810	911,209,000
Lincoln	13,649	75,754,000
Tillamook	6,698	33,677,000
Total	**209,486**	**1,420,097,000**

*Data for only the coastal portions of the Counties were not available.

Source: Oregon Employment Department[24]

In 2006, there were 17,122 businesses in the Oregon Coast Region. Of these, 91%, or 15,518, were small businesses with less than 20 employees.[25] The prevalence of small businesses in the Oregon Coast region is an indication of sensitivity to natural hazards because small businesses are more susceptible to financial uncertainty.[26] When 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.[27]

The economic diversity of the businesses in the Oregon Coast Region varies markedly between counties. Lane County has the highest statewide economic diversity, while the other counties have more homogenous economies. Low economic diversity means that certain industries are dominating the economic structure of the community, and are therefore extremely important to the Oregon Coast Region. Table 13 displays the diversity ranking for each county with 1 being the most diverse economic county in Oregon, 36 being the least diverse economic county in Oregon.

Table 13. County Economic Diversity Ranking, 1999

County	Economic Diversity Index Ranking
Clatsop	20
Coos	22
Curry	17
Douglas*	11
Lane*	1
Lincoln	25
Tillamook	18

*Data for only the coastal portions of the Counties were not available.

Source: Oregon Employment Department[28]

An economy that is heavily dependent upon a few key industries may have a more difficult time recovering after a natural disaster than one with a more diverse economic base. While a community with a diverse economic base may suffer from an industry sector being damaged during a natural disaster, they have a broader base of operating industry sectors to continue to rely upon. However, a community that relies upon specific key industry sectors may have a harder time recovering their economic base if one of those key industry sectors is damaged. Recognizing that economic diversification is a long-term issue, more immediate strategies to reduce vulnerability should focus on risk management for the dominant industries.

Key Industries

Key industries are those that represent major employers, major revenue generators, and for the purposes of hazard mitigation planning, industries that are represented by a high number of businesses. 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. The effect is especially great when the businesses concerned belong to a basic sector industry. Basic sector industries are those that are dependent on sales outside of the local community; they bring money into a local community via employment. 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.

Basic sector businesses have a multiplier effect on a local economy, whereby the jobs and income they bring to a community allow for the creation of new non-basic sector jobs. Their presence can therefore help speed the recovery process following a natural disaster. If, on the other hand, basic sector industry production is hampered by a natural hazard event, the multiplier effect could be experienced in reverse. In this case, a decrease in basic sector purchasing power results in lower profits (and potentially job losses) for the local non-basic businesses that are dependent on them.

High Revenue Sectors

The Oregon Coast Region's top revenue generating industries are a mix of basic and non-basic sectors. In 2002, the three sectors in the Oregon Coast Region with the highest revenue were Manufacturing (33%), Retail Trade (28%), and Wholesale Trade (15%).[29] ‡

Within individual counties in the Oregon Coast Region, however, the industries' relative contribution to revenue differs. For instance, in Coos and Lincoln counties, the Health Care and Social Assistance sector garners the second highest amount of revenue. Table 14 shows the percent of total county revenue that is contributed by various sectors.

Table 14. Percent of Revenue in Oregon Coast Counties by Industry, 2002

	Industry									
County	Retail Trade	Wholesale Trade	Accommodation and Food Services	Health Care/ Social Assistance	Professional, Scientific and Technology	Other (except Public Admin)	Real Estate and Rental and Leasing	Arts/ Entertainment	Administrative/ Waste Services	Manufacturing
Clatsop	45%	8%	11%	12%	2%	2%	2%	1%	1%	17%
Coos	35%	13%	5%	16%	2%	3%	2%	n/a	3%	22%
Curry	46%	n/a	9%	9%	n/a	n/a	3%	1%	2%	31%
Douglas*	25%	14%	5%	11%	2%	1%	1%	0%	1%	39%
Lane*	26%	18%	3%	10%	3%	2%	2%	0%	2%	33%
Lincoln	35%	4%	13%	11%	n/a	2%	3%	n/a	2%	31%
Tillamook	21%	3%	4%	7%	7%	2%	1%	1%	n/a	55%

*Data for only the coastal portions of the Counties were not available.

Source: U.S. Census 2002

‡ Note: US Census Total Sales figures were not available for all sectors and counties in Region 1. These figures represent the closest estimate.

Table 15. Gross in Oregon Coast Counties for Farm and Ranch Industry, 2006

County	Dollar amount
Clatsop	17,257,000
Coos	46,493,000
Curry	27,086,000
Douglas*	75,120,000
Lane*	133,727,000
Lincoln	12,646,000
Tillamook	108,359,000

*Data for only the coastal portions of the Counties were not available.

Source: USDA National Agriculture Statistics Service[30]

In 2002, the *Manufacturing sector* generated 33% of all revenue in the Oregon Coast Region, making it the largest earning sector.[31] Manufacturers are highly dependent upon the transportation network in order to access supplies and send finished products to outside markets. As base industries they are not, however, dependent on local markets for sales, which contributes to the economic resilience of this sector.

The *retail trade sector* in the Oregon Coast region generated 28% of all revenue, making it the second-largest earning sector.[32] Retail trade is largely dependent on wholesale trade and the transportation network for the delivery of goods for sale. Disruption of the transportation system could have severe consequences for retail businesses. Retail trade typically relies on local residents and tourists and their discretionary spending ability. Residents' discretionary spending diminishes after a natural disaster when they must pay to repair their homes and properties. In this situation, residents will likely concentrate their spending on essential items that would benefit some types of retail (e.g. grocery) but hurt others (e.g. gift shops). The potential income from tourists also diminishes after a natural disaster as people are deterred from visiting the impacted area. In summary, depending on the type and scale a disaster could affect specific segments of retail trade, or all segments.

Wholesale trade is closely linked with retail trade but it has a broader client base than retail trade, with local and non-local businesses as the typical clientele. Local business spending will be likely to diminish after a natural disaster, as businesses repair their properties and wait for their own retail trades to increase. Distanced clients may have difficulty reaching local wholesalers due to transportation disruptions from a natural disaster. Both would adversely impact the profitability of this sector.

Major employment sectors

Economic resilience to natural disasters is particularly important for the major employment sectors in the region. If these sectors are negatively impacted by a natural hazard, such that employment is affected, the impact will be felt throughout

the regional economy. Thus, understanding and addressing the sensitivities of these sectors is a strategic way to increase the resiliency of the entire regional economy.

The five sectors in the Oregon Coast region with the most employees in 2004 were Government (14%), Retail Trade (13%), Accommodation and Food Services (11%), Health Care and Social Assistance (10%), and Manufacturing (9%).[33]§

Within the six Oregon Coast counties, the percent of county employment by various sectors differs. For example, in Clatsop and Lincoln counties, Accommodation and Food Services is a large employer, though across the region, Accommodation and Food Services accounts for a medium percentage of total employment. Table 16 shows the distribution of each county's employees across the five largest regional employment sectors.

Table 16. Percent of County Employment by the Five Largest Regional Employment Sectors, Oregon Coast Region, 2004

	Industry				
County	Government	Health Care and Social Services	Retail Trade	Manufacturing	Accommodation and Food Services
Clatsop	13%	10%	14%	10%	16%
Coos	18%	10%	12%	5%	8%
Curry	11%	n/a	14%	6%	11%
Douglas*	15%	11%	11%	12%	6%
Lane*	14%	12%	12%	10%	6%
Lincoln	15%	9%	14%	5%	17%
Tillamook	14%	9%	11%	12%	9%

*Data for only the coastal portions of the Counties were not available.

Source: Bureau of Economic Analysis 2004[34]

Sectors that are anticipated to be major employers in the future also warrant special attention in the hazard mitigation planning process. Between 2005 and 2014, the largest job growth in the Oregon Coast Region is expected to occur in Professional and Business Services, Health and Educational Services and Construction.[35]

The *professional and business services* sector is sensitive to a loss of power from a disaster and to disruptions of physical transmission cables (phone lines, etc.). There may also be a disruption of employees' ability to work as a result of damages/problems at home. If prepared and organized, however, this sector has the

§ Note: The Bureau of Economic Analysis did not disclose employment figures in some counties where an industry was represented by only a few businesses. These figures represent the closest estimate.

potential to have moderate resilience to many disasters. Some of the targeted consumers of this sector's services are located outside the region and their purchasing power would not be impacted by a localized natural disaster. The sector may also be more insulated from disruptions to the transportation network than others because there is a potential for many of the employees to work from home and because some services are offered via internet and phone.

The *health and education service* sector includes medical facilities and schools, both of which are considered critical facilities. This sector is vital in the response and recovery phases of an event. If these critical facilities are not prepared, the ability of the community to recover can be diminished.

The *construction* sector can be a key player in the recovery and reconstruction phases of a disaster if construction related businesses have make attempts to become disaster resilient. However, in the event of wildfires, floods, earthquakes, or other types of destructive natural disasters, the demand for reconstruction services may be expected to increase. Business from local residents looking to re-build their homes and businesses may boost construction revenue. If transportation routes have been affected, construction businesses may have difficulty accessing necessary supplies from outside the impacted area. Protecting infrastructure and transportation will help to enable the construction sector to continue operating and re-building communities after a natural disaster.

Common Business Types

Identifying sectors that are represented by a large number of businesses can guide the development of targeted mitigation strategies for those sectors. Approximately 30% of all businesses in the Oregon Coast Region fall into two industry sectors. In the Oregon Coast Region, 15% (2,969) of all businesses are engaged in *retail trade* and 12% (2,328) of all businesses are engaged in *construction*.[36]

The retail trade and health care sector's sensitivities to natural hazards are addressed above. The large number of businesses engaged in the *construction* industry warrants attention to its specific vulnerabilities. First, it should be noted that 96% of construction businesses in the region have fewer than 20 employees; small businesses tend face more financial uncertainty than larger ones. These businesses may therefore be particularly sensitive to any temporary decreases in demand following a moderate natural hazard event.

Regional Profile and Sensitivity Conclusion

Information presented in the Community, Infrastructure, and Economic Profiles can be used to help communities identify areas of sensitivity and vulnerability to natural hazards. Once the areas of sensitivity are identified, communities should identify appropriate, corresponding action items.

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http://www.oregon.gov/Aviation/docs/AirportsbyCategory.pdf

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[24] Oregon Employment Department, "First Quarter 2006 Covered Employment and Wages Size-of-Firm Report"

[25] Ibid.

[26] Alesch, Dan, et al. 2001. *Organizations at Risk: What Happens When Small Businesses and Non-for-Profits Encounter Natural Disasters*. http://www.riskinstitute.org/uploads/ptrdocs/Organizations_at_Risk.pdf.

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[29] U.S. Census Bureau, 2002 Economic Census, NAICS Detail: Table 1

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[32] Ibid.

[33] U.S. Department of Commerce, Bureau of Economic analysis, Regional Economic Information System 2004, http://www.bea.gov/regional/reis/default.cfm#step3

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REGION 1
Oregon Coast[1]
Hazards Assessment

[1] Region 1 includes all of Oregon's coastal counties: Clatsop, Coos, Curry, Douglas (coastal section), Lane (coastal section), Lincoln, Tillamook. The lower estuarine Columbia River is also included in Region 1 (Clatsop County).

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DROUGHT

Characteristics and Brief History

Droughts are not uncommon in the State of Oregon, nor are they just an "east of the mountains" phenomenon. They occur in all parts of the state, in both summer and winter. They appear to be cyclic, and can have a profound effect on the State's economy, particularly the hydropower and agricultural sectors. The environmental consequences also are far-reaching, including insect infestations in Oregon forests and a reduction in the stream flows that support endangered fish species. Severe drought conditions preceded the four disastrous Tillamook fires (1933, 1939, 1945, 1951) and pitted farmer against fish protection groups during the Klamath County drought of 2001. In recent years, the State has addressed drought emergencies through the Oregon Drought Council. This interagency (state/federal) council meets to discuss climate outlooks, water and soil conditions, and advise the Governor as the need arises. Significant droughts are depicted in Table 1.

TABLE 1. SIGNIFICANT DROUGHTS

DATE	DESCRIPTION
1904-1905	A drought period of about 18 months throughout Oregon
1917-1931	A very dry period, punctuated by brief wet spells in 1920-21 and 1927 throughout Oregon
1939-1941	A three-year intense drought in Oregon
1976-1981	Intense drought in western Oregon; 1976-77 single driest year of century
1985-1997	Generally a dry period, capped by statewide droughts in 1992 and 1994
2000-2001	General statewide drought

Source: Taylor, George H., and Ray Hatton, 1999, *The Oregon Weather Book.*

Recurrence

Oregon's drought history reveals many short-term and a few long-term events. The average recurrence interval for severe droughts in Oregon is somewhere between 8 and 12 years. Table 1 provides an overview of some severe droughts in Oregon.

Vulnerability

Region 1 is less vulnerable to drought impacts than most of Oregon, but droughts can still be problematic. Potential impacts to community water supplies are the greatest threat. Long-term drought periods of more than a year can impact forest conditions and set the stage for potentially devastating wildfires.

The probability that Region 1 will experience droughts and the region's vulnerability to their effects are depicted in Table 2 below. These scores are based on an analysis of risk conducted by county emergency program managers, usually with the assistance of a team of local public safety officials.

The scores below address the likelihood of a future major emergency or disaster within a specific period of time, as follows:

High = One incident likely within a 10 to 35 year period.

Moderate = One incident likely within a 35 to 75 year period.

Low = One incident likely within a 75 to 100 year period.

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

High = More than 10% affected

Moderate = 1-10% affected

Low = Less than 1% affected

In some cases, counties either did not rank a particular hazard or did not find it to be a significant consideration. These cases are noted with a dash (-) in the table below.

TABLE 2. Vulnerability and Probability Assessment of Drought

	Clatsop	Coos	Curry	Douglas	Lane	Lincoln	Tillamook
Vulnerability	-	M	-	-	-	L	-
Probability	-	H	-	-	-	H	-

Source: Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

EARTHQUAKE

Characteristics and Brief History

The geographical position of Region 1 makes it susceptible to earthquakes from three sources: (1) the off-shore Cascadia Fault Zone, (2) deep intra-plate events within the subducting Juan de Fuca plate, and (3) shallow crustal events within the North America Plate. All have some tie to the subducting or diving of the dense, oceanic Juan de Fuca Plate under the lighter, continental North America Plate. Stresses occur because of this movement. (See Oregon Technical Resource Guide: Seismic Hazards.)

When crustal faults slip, they can produce earthquakes with magnitudes (M) up to 7.0 and can cause extensive damage, which tends to be localized in the vicinity of the area of slippage. Deep intraplate earthquakes occur at depths between 30 and 100 kilometers below the earth's surface. They occur in the subducting oceanic plate and can approach M7.5. Subduction zone earthquakes pose the greatest hazard. They occur at the boundary between the descending oceanic Juan de Fuca Plate and the overriding North American Plate. This area of contact, which starts off the Oregon coast, is known as the Cascadia Subduction Zone (CSZ). The CSZ could produce an earthquake up to 9.0 or greater.

There is no historic record of crustal earthquakes centered in this region in the past 153 years, although Oregon has experienced crustal earthquakes that originated outside the region. The geologic record shows that movement has occurred along numerous offshore faults as well as a few onshore faults in Coos and Tillamook counties. The faulting has occurred over the last 20,000 years. Intraplate earthquakes are very rare in Oregon, although such earthquakes originating outside of the state have been felt in this region. It is believed that the M7.3 near Brookings in 1873 was an intraplate quake.

In Region 1, earthquake hazards include severe ground shaking, liquefaction of fine-grained soils, landslides and flooding from local and tele-tsunamis. The severity of these effects depend on several factors, including the distance from the earthquake source, the ability of soil and rock to conduct seismic energy and the degree (angle) and composition of slope materials.

Earthquake risk in Region 1 is reflected in the Uniform Building Code's (UBC) Earthquake Hazard maps (i.e., seismic zones 1-4). The higher the numerical designation, the more stringent the building standards become. Region 1 is within UBC Seismic Zone 3 and 4. The northern coast is designated Seismic Zone 3; Coos and Curry Counties and the coastal strip in Douglas, Lane and Lincoln County up to Otter Rock (just north of Newport) have been designated as Seismic Zone 4.

Table 3 describes significant earthquakes that have affected the region.

TABLE 3. SIGNIFICANT EARTHQUAKES

DATE	LOCATION	MAGNITUDE (M)	REMARKS
Approximate Years 1400 BCE* 1050 BCE 600 BCE 400 750 900	Offshore, Cascadia Subduction Zone	Probably 8-9	Based on studies of earthquake and tsunami at Willapa Bay, Washington. These are the mid-points of the age ranges for these six events.
01/1700	Offshore, Cascadia Subduction Zone	Approximately 9.0	Generated a tsunami that struck Oregon, Washington, and Japan; destroyed Native American villages along the coast
11/1873	Brookings area	7.3	Chimneys fell at Port Orford, Grants Pass, and Jacksonville. No aftershocks. Origin probably Gorda block of the Juan de Fuca plate. Intraplate event
11/1962	Portland	5.2 to 5.5	Damage to many homes (chimneys, windows, etc.). Crustal event
03/1993	Scotts Mills	5.6	$28 million in damage. Damage to homes, schools, businesses, state buildings (Salem). Crustal Event (FEMA-985-DR-OR)
09/1993	Klamath Falls	5.9 to 6.0	Two earthquakes causing two deaths and extensive damage. $7.5 million in damage to homes, commercial, and government buildings. Crustal event (FEMA-1004-DR-OR)

Source: Wong, Ivan and Bolt, Jacqueline, November 1995, A Look Back at Oregon's Earthquake History, 1841-1994, *Oregon Geology,* p.125-139.

Notes: *BCE: Before the Common Era

Probability

It is difficult to estimate recurrence intervals from available data. Paleoseismic studies along the Oregon coast indicate that the state has experienced seven Cascadia Subduction Zone events possibly as large as M9 in the last 3500 years. These events are estimated to have an average recurrence interval between 500 and 600 years, although the time interval between individual events ranges from 150 to 1000 years. The last CSZ event occurred approximately 300 years ago.

Vulnerability

Region 1 is especially vulnerable to earthquake hazards. This is because of the built environment's proximity to the Cascadia Subduction Zone (CSZ), regional seismicity, topography, bedrock geology and local soil profiles. For example, a large number of buildings are constructed of unreinforced masonry (URM) or are constructed on soils that are subject to liquefaction during sever ground shaking. Also, some principal roads and highways are susceptible to earthquake-induced landslides. Bridges and tunnels need to be retrofitted to withstand ground shaking and the ability of dams to withstand earthquake forces should be considered. This is especially important as 12 dams in Region 1 have been designated as "high hazard." Problem areas within the region are readily identifiable on earthquake hazard maps prepared by the Oregon Department of Geology and Mineral Industries (DOGAMI).

DOGAMI has developed two earthquake loss models for Oregon based on the two most likely sources of seismic events: (1) the Cascadia Subduction Zone (CSZ), and (2) combined crustal events (500-year Model). Both models are based on HAZUS, a computerized program, currently used by the Federal Emergency Management Agency (FEMA) as a means of determining potential losses from earthquakes. The CSZ event is based on a potential 8.5 earthquake generated off the Oregon coast. The model does not take into account a tsunami, which probably would develop from the event. The 500-Year crustal model does not look at a single earthquake (as in the CSZ model); it encompasses many faults, each with a 10% chance of producing an earthquake in the next 50 years. The model assumes that each fault will produce a single "average" earthquake during this time. Neither model takes unreinforced masonry buildings into consideration

DOGAMI investigators caution that the models contain a high degree of uncertainty and should be used only for general planning purposes. Despite their limitations, the models do provide some approximate estimates of damage. Results are found in Tables 4-6.

Other useful resources for planning for earthquakes include the following:

- **Maps of earthquake hazard areas:** DOGAMI has mapped urban areas and relative Environmental Quality hazard maps for all

of the Region 1 counties except Lane and Lincoln counties. DOGAMI has only mapped urban areas for these two counties.

- **Map of coastal critical facilities vulnerable to hazards:** DOGAMI has developed these maps for all Region 1 counties.
- **Environmental Geology of Land Use Geology maps:** DOGAMI has developed these maps for all Region 1 counties.
- **Nuclear energy/hazardous waste sites inventories**: No Region 1 counties have nuclear facilities.

TABLE 4. PROJECTED DOLLAR LOSSES BASED ON A M8.5 SUBDUCTION EVENT AND A 500-YEAR MODEL

REGION 1 COUNTIES	ECONOMIC BASE IN THOUSANDS (1999)	GREATEST ABSOLUTE LOSS IN THOUSANDS (1999) FROM AN M8.5 CSZ EVENT[1]	GREATEST ABSOLUTE LOSS IN THOUSANDS (1999) FROM A 500-YEAR MODEL[1,2]
Clatsop	$2,198,000	$549,000	$760,000
Coos	$3,263,000	$1,339,000	$1,429,000
Curry	$1,093,000	$371,000	$388,000
Douglas[3]	$4,631,000	$275,000	$546,000
Lane[3]	$15,418,000	$1,614,000	$3,044,000
Lincoln	$2,668,000	$624,000	$793,000
Tillamook	$1,539,000	$226,000	$364,000

Source: DOGAMI, 1999, Special Paper 29: Earthquake Damage in Oregon.

Table 4 Notes:

[1] "…there are numerous un-reinforced masonry structures (URMs) in Oregon, the currently available default building data does not include any URMs. Thus, the reported damage and loss estimates may seriously under-represent the actual threat" (page 126 – 1998, DOGAMI)

[2]Every part of Oregon is subject to earthquakes. The 500-year model is an attempt to quantify the risk across the state. The estimate does not represent a single earthquake. Instead, the 500-year model includes many faults, each with a 10% chance of producing an earthquake in the next 50 years. The model assumes that each fault will produce a single "average" earthquake during this time. More and higher magnitude earthquakes than used in this model may occur (DOGAMI, 1999).

[3]Entire county

TABLE 5. ESTIMATED LOSSES ASSOCIATED WITH A M8.5 SUBDUCTION EVENT

	Region 1 Counties							
	Clatsop	**Coos**	**Curry**	**Douglas[1]**	**Lane[1]**	**Lincoln**	**Tillamook**	**Remarks**
INJURIES	298	854	221	151	1,036	358	132	Cascadia Subduction Zone (CSZ) is the most dangerous fault in Oregon. The entire coastline is essentially the epicenter. The earthquake could have a magnitude 8.5 (or M9.0). The event might last as long as four minutes. Within a few minutes, a tsunami would follow. (Tsunami damages are not included in the estimates for this earthquake, and would dramatically increase losses for coastal counties). A CSZ earthquake could affect a very large area. If the entire fault ruptures, destruction could occur from northern California to Canada. The number of deaths and injuries depends on the time of day, building type, occupancy class, and traffic pattern. (DOGAMI, Special Paper 29, 1999, p.4).
DEATHS	6	16	3	2	19	7	3	
DISPLACED HOUSEHOLDS	788	2,069	430	255	2,345	592	158	
OPERATIONAL THE DAY AFTER THE QUAKE[2]:								
Fire stations	16%	10%	9%	66%	49%	26%	31%	
Police stations	15%	6%	5%	57%	42%	22%	44%	
Schools	16%	8%	6%	44%	46%	19%	32%	
Bridges	58%	44%	34%	74%	76%	51%	58%	
ECONOMIC LOSSES TO[2]:								
Highways	$18 mil	$44 mil	$48 mil	$43 mil	$39 mil	$16 mil	$25 mil	
Airports	$5 mil	$20 mil	$11 mil	$5 mil	$11 mil	$9 mil	$7 mil	
Communications	$6 mil	$25 mil	$18 mil	$7 mil	$11 mil	$9 mil	$5 mil	
DEBRIS GENERATED (thousands of tons)	383	853	267	222	1,341	446	158	

Source: DOGAMI, 1999, Special Paper 29: Earthquake Damage in Oregon.

Table 5 Notes:

[1]Entire county

[2]"…there are numerous un-reinforced masonry structures (URMs) in Oregon, the currently available default building data does not include any URMs. Thus, the reported damage and loss estimates may seriously under-represent the actual threat" (page 126 – 1998, DOGAMI).

TABLE 6. ESTIMATED LOSSES ASSOCIATED WITH A 500-YEAR MODEL[1]

COUNTIES	Clatsop	Coos	Curry	Douglas[2]	Lane[2]	Lincoln	Tillamook
INJURIES	397	845	212	294	2,254	436	181
DEATHS	8	16	3	4	45	9	4
DISPLACED HOUSEHOLDS	1,182	2,521	486	534	4,543	847	275
ECONOMIC LOSSES FOR BUILDINGS[3]	$760 mil	$1.4 bil	$328 mil	$546 mil	$3 bil	$792 mil	$364 mil
OPERATIONAL THE DAY AFTER THE QUAKE	N/A[4]	N/A	N/A	N/A	N/A	N/A	N/A
Fire stations	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Police Stations	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Schools	N/A	N/A	N/A	N/A	N/a	N/A	N/A
Bridges							
ECONOMIC LOSSES TO:[3]	$33 mil	$49 mil	$44 mil	$69 mil	$74 mil	$22 mil	$39 mil
Highways	$7 mil	$20 mil	$12 mil	$9 mil	$20 mil	$12 mil	$8 mil
Airports	$8 mil	$2 mil	$15 mil	$12 mil	$20 mil	$10 mil	$6 mil
Communications							
DEBRIS GENERATED (thousands of tons)	474	864	261	411	2,424	525	224

Source: DOGAMI, 1999, Special Paper 29: Earthquake Damage in Oregon.

Table 6 Notes:

[1]Every part of Oregon is subject to earthquakes. The 500-year model is an attempt to quantify the risk across the state. The estimate does not represent a single earthquake. Instead, the 500-year model includes many faults, each with a 10% chance of producing an earthquake in the next 50 years. The model assumes that each fault will produce a single "average" earthquake during this time. More and higher magnitude earthquakes than used in this model may occur. (DOGAMI, 1999)

[2]Entire county

[3] "…there are numerous un-reinforced masonry structures (URMs) in Oregon, the currently available default building data does not include any URMs. Thus, the reported damage and loss estimates may seriously under-represent the actual threat" (page 126 – 1998, DOGAMI)

[4]NA - Because the 500-year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated

The probability that Region 1 will experience earthquakes and the region's vulnerability to their effects are depicted in Table 7 below. These scores are based on an analysis of risk conducted by county emergency program managers, usually with the assistance of a team of local public safety officials.

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

High = One incident likely within a 10 to 35 year period.

Moderate = One incident likely within a 35 to 75 year period.

Low = One incident likely within a 75 to 100 year period.

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

High = More than 10% affected

Moderate = 1-10% affected

Low = Less than 1% affected

TABLE 7. Vulnerability and Probability Assessment of Earthquakes

	Clatsop	Coos	Curry	Douglas	Lane	Lincoln	Tillamook
Vulnerability	H	H	H	H	H	M	H
Probability	H	H	H	H	H	H	H

Source: Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

FIRES IN THE WILDLAND/URBAN INTERFACE

Characteristics and Brief History

Oregon has a very lengthy history of fire in the undeveloped wildlands and in the developing wildland/urban interface. In recent years, the cost of fire suppression has risen dramatically; a large number of homes have been threatened or burned, more fire fighters have been placed at risk, and fire protection in wildland areas has been reduced. These factors have prompted the passage of Oregon Senate Bill (SB) 360 (Forestland / Urban Interface Protection Act, 1997). This bill: (1) establishes legislative policy for fire protection, (2) defines urban/wildland interface areas for regulatory purposes, (3) establishes standards for locating homes in the urban/wildland interface, and (4) provides a means for establishing an integrated fire protection system.

Coastal and Lower Columbia River counties are heavily timbered and have a long history of devastating forest fires. Some of the history is derived from Native Americans who recall extensive forest fires before the arrival of Euro-Americans. Fires involving the wildland interface occur in portions of the state where urbanization and natural vegetation fuels allow a fire to spread rapidly from natural fuels to structures and vice versa. Especially in the early stage of such fires, structural fire suppression resources can be quickly overwhelmed increasing the number of structures destroyed. Such fires are known for the large number of structures that are simultaneously exposed to fire, increasing the total losses per structure ignited. Nationally, wildland interface fires commonly produce widespread, extreme losses. Thus far, Oregon has escaped the level of property losses experienced by neighboring states.

Table 9 describes the history of some of the significant wildland fires experienced in Region 1 and Oregon.

TABLE 9. SIGNIFICANT WILDFIRES

DATE	NAME OF FIRE	LOCATION	CHARACTERISTICS	REMARKS
1846	Yaquina	Lincoln & Lane counties	Burned over 450,000 acres.	Event related by Native American hunters
1853	Nestucca		Burned over 320,000 acres	
1868	Coos Bay	Coos	296,000 acres burned	
1922	Astoria	Downtown, City of Astoria	Many Buildings (32 city blocks burned!)	Early December structural fire most likely not related to wildfire
1933	Tillamook		240,000 acres burned	The Tillamook Forest burned every six years between 1933 and 1951. Total acreage burned was over 350,000 acres. Together, the four events are called the Tillamook Burn. Dry forest conditions seems to have been a major factor (Taylor)
1936	Bandon		143,000 acres burned	
1939	Saddle Mountain	Clatsop County	207,000 acres burned	
1945	Wilson River / Salmonberry	Tillamook County	173,000 acres	
1951	North Fork / Elkhorn	Tillamook County	33,000 acres burned	
2002	Florence/Biscuit	S.W. Oregon	Almost 500,000 acre (perimeter) burned	Largest forest fire in Oregon since arrival of Euro-Americans (FEMA Fire Suppression Authorization on 7/29/02). The perimeter contained many unburned islands within the overall acreage.

Source: Brian Ballou, 2002, A Short History of Oregon Wildfires, Oregon Department of Forestry, unpublished; and Oregon Emergency Management, State Natural Hazard Mitigation Plan, 2003, Wildland/Urban Interface chapter.

Probability

The natural ignition of forest fires is largely a function of weather and fuel; human-caused fires add another dimension to the probability. Dry and diseased forests can be mapped accurately and some statement can be made about the probability of lightening strikes. Each forest is different and consequently has different probability/recurrence estimates.

This document defines wildfire as an uncontrolled burning of forest, brush, or grassland. Wildfire always has been a part of these ecosystems and sometimes with devastating effects. Table 9 provides an overview of the significant wildfires in Region 1. Wildfire results from natural causes (e.g., lightening strikes), a mechanical failure (Oxbow Fire), or human-caused (unattended campfire, debris burning, or arson). The severe fire season of 1987 resulted in a record setting mobilization of fire fighting resources. Most wildfires can be linked to human carelessness.

The intensity and behavior of wildfire depends on a number of factors including fuel, topography, weather, and density of development. There are a number of often-discussed strategies to reduce the negative impacts of these phenomena. They include land-use regulations, management techniques, site standards, building codes, and a recently passed Oregon Forestland-Urban Interface Fire Protection Act (1997). All of these things have a bearing on a community's ability to prevent, withstand, or recover from a wildfire event.

Vulnerability

An understanding of risk begins with the knowledge that wildfire is a natural part of forest and grassland ecosystems. Past forest practices included the suppression of all forest and grassland fires. This practice, coupled with hundreds of acres of dry brush or trees weakened or killed through insect infestation, has fostered a dangerous situation. Present state and national forest practices include the reduction of understory vegetation through thinning and prescribed (controlled) burning.

Each year a significant number of people build homes within or on the edge of the forest (urban/wildland interface), thereby increasing wildfire hazards. In Many Oregon communities (incorporated and unincorporated) are within or abut areas subject to serious wildfire hazards. Oregon, there are about 240,000 homes worth around $6.5 billion within the urban/wildland interface. Such development has greatly complicated firefighting efforts and significantly increased the cost of fire suppression. These communities have been designated "Interface Communities" and include those in Table 10.

A detailed community inventory of factors that affect vulnerability is important in assessing risk and is beyond the scope of the statewide assessment.

When assessing the risks from natural hazards, established mitigation practices already provide benefits in reduced disaster losses. It is important for communities to understand the benefits of past mitigation practices when assessing their risks, being mindful of opportunities to further reduce losses.

Possible mitigation practices include:

- Identify and map current hazardous forest conditions such as fuel, topography, etc.;
- Identify forest / urban interface communities - List of interface communities, Federal Register, 08/17/01. V. 66, N. 160;
- Identify and map Forest Protection Districts;
- Identify and map water sources;
- Implement effective addressing system in rural forested areas;
- Clearly mark evacuation routes;
- Identify and locate seasonal forest users. Initiate information program through schools, summer camps, forest camping grounds, lodges, etc;
- Identify and map bridges that can (and can not) support the weight of emergency vehicles. This is a basic requirement for fire suppression;
- Form committees to implement Oregon Senate Bill 360. This is required in Oregon Senate Bill 360; and
- Create road standards in interface areas to reflect fire suppression needs. Roads must be wide enough for fire suppression vehicles to turn around. Road grades cannot be too steep for large, heavy vehicles.

TABLE 10. WILDLAND/URBAN INTERFACE COMMUNITIES

COUNTIES							
Clatsop	**Coos**	**Curry**	**Douglas**	**Lane**	**Lincoln**	**Tillamook**	
Arch Cape	Bandon	Agness	Gardiner	Dunes City	Depoe Bay	Bay City	Oceanside
Astoria	Charleston	Brookings	Reedsport	Florence	E. Lincoln Co.	Beaver	Oretown
Brownsmead	Coos Bay	Gold Beach	Winchester Bay	Mapleton	Elk City	Blaine	Pacific City
Cannon Beach	Coquille	Langlois		Swisshorne	Lincoln City	Cape Meares	Pleasant Valley
Coastal Strip	Dora	Nesika Beach		Triangle Lake	Newport	Cloverdale	Rockaway
Elsie-Vinemaple	Fairview	Port Orford			Otter Rock	Foley Creek	Sandlake
Fern Hill	Green Acres				Rose Lodge	Garibaldi	Siskeyville
Ft. Clatsop	Lakeside				Seal Rock	Hebo	Tierra del Mar
Hamlet	Millington				Siletz	Hemlock	Tillamook
Hewell	Myrtle Point				Tidewater	Jordan Creek	Winema Beach
Knappa-Svensen	North Bend				Toledo	Lees Camp	Woods
Lewis & Clark	Powers				Waldport	Nehalem Bay	
Necanicum	Saunders Lake				Yachats	Neskowin	
Olney	Sumner					Netarts	
West Port							

Source: August 17, 2001, *Federal Register*: V.66, N.160.

The probability that Region 1 will experience wildfires in interface areas and the region's vulnerability to their effects are depicted in Table 11 below. These scores are based on an analysis of risk conducted by county emergency program managers, usually with the assistance of a team of local public safety officials.

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

High = One incident likely within a 10 to 35 year period.

Moderate = One incident likely within a 35 to 75 year period.

Low = One incident likely within a 75 to 100 year period.

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

High = More than 10% affected

Moderate = 1-10% affected

Low = Less than 1% affected

TABLE 11. Vulnerability and Probability Assessment of Fires in Interface Areas

	Clatsop	Coos	Curry	Douglas	Lane	Lincoln	Tillamook
Vulnerability	M	M	M	H	H	M	M
Probability	H	H	H	H	H	M	H

Source: Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

FLOOD

Riverine Flooding

Characteristics and Brief History

In general, three types of flooding occur in this region: (1) riverine, (2) ocean flooding from high tides and wind-driven waves, and (3) flooding associated with a tsunami event. There are two distinct periods of riverene flooding in this region, winter and late spring. The most serious flooding occurs during December, January, and February. The situation is especially severe when riverene flooding, caused by prolonged rain and melting snow, coincides with high tides and coastal storm surges. In short, the rivers back up and flood the lowlands. This type of flooding is especially troublesome in the Tillamook Bay area where homes and livestock can be isolated for several days. There are other circumstances, as well. Several coastal rivers carry heavy silt loads that originated in areas burned during the "Tillamook Burn" fires (1933 to 1951) or from areas covered with volcanic ash during the Mt. St. Helens eruption (1980). Consequently, some rivers actually may be elevated above local floodplains, which increases flood hazards. The costs and long-term benefits of dredging these rivers have not been determined.

Table 12 describes the history of significant floods in the region. Table 13 describes flood sources.

TABLE 12. SIGNIFICANT FLOODS

DATE	LOCATION	DESCRIPTION	TYPE OF FLOOD
1813	NW Oregon	Said to exceed “Great Flood” of 1861 (Source: Native Americans)	unknown
12/1861	Coastal rivers	The “Great Flood”; largest flood of known magnitude on the Rogue	Rain on snow
02/1890	Coastal rivers	Widespread flooding; Siuslaw River dammed by a large debris flow	Rain on snow
01/1923	Lower Columbia	Mild temperatures; large amount of rain. Flooded roads / railroads	Rain on snow
03/1931	Western Oregon	Extremely wet and mild; saturated ground	Rain on snow
12/1933	Northern Oregon	Intense warm rains; Clatskanie River set record	Rain on snow
12/1937	Western Oregon	Heavy coastal rain; large number of debris flows	Rain on snow
10/1950	SW Oregon coast	Heavy October rain	Rain on snow
12/1953	Western Oregon	Heavy rain accompanied major windstorm; serious log hazards on Columbia	Rain on snow
12/1955	Columbia & coastal streams	Series of storms; heavy, wet snow; many homes and roads damaged	Rain on snow
12/1962	SW Oregon	Severe flooding, especially the Rogue River	Rain on snow
03/1964	Coast & Columbia River estuary	Ocean flooding	Tsunami
12/1964	Entire state	Two storms; intense rain on frozen ground	Rain on snow
01/1972	Northern coast	Severe flooding and mudslides; 104 evacuated from Tillamook	Rain on snow
01/1974	Western Oregon	Series of storms with mild temperatures; large snowmelt; rapid runoff	Rain on snow
12/1978	Coastal streams	Intense warm rain; two fatalities on Yaquina River; widespread flooding	Rain on snow
02/1986	Entire state	Warm rain and melting snow; numerous homes evacuated	Rain on snow
02/1987	Western Oregon	Heavy rain; mudslides; flooded highways; damaged homes	Rain on snow
12/1989	Clatsop, Tillamook & Lincoln	Warm Pacific storm system. High winds. Fatalities. Mudslides	Rain on snow
01/1990	W. Oregon	Significant damage in Tillamook Co. Many streams had all-time records	Rain on snow
04/1991	Tillamook County	48-hour rainstorm. Wilson River 5 ft. above flood stage. Businesses closed	Rain on snow
02/1996	NW Oregon	Deep snow pack. Warm temperatures. Record-breaking rains.	Rain on snow
11/1996	W. Oregon	Record-breaking precipitation. Flooding. Landslides. (FEMA-1149-DR-OR)	Rain on snow

Source: Taylor and Hannon, 1999, *The Oregon Weather Book*, pp.96-103.

TABLE 13. PRINCIPAL RIVERENE FLOOD SOURCES

CLATSOP	COOS	CURRY	DOUGLAS	LANE	LINCOLN	TILLAMOOK
Lewis & Clark R	Coquille R	Chetco R	Umpqua R	Siuslaw R	Alsea R	Kilchis R
Little Walluski R	Willicoma R	Elk R	Smith R	Munsel Cr	Salmon R	Miami R
Necanicum R	Ten Mile Cr	Pistol R	Scholfield Cr		Siletz R	Nehalem R
Nehalem R	Palouse Cr	Rogue R			Yachats R	Nestucca R
Bear Cr	Larson Cr	Sixes R			Yaquina R	Three Rivers
Beerman Cr	Kentuck Sl	Winchuck R			Drift Cr	Tillamook R
Big Cr	Willanch Sl	Hunter Cr			Depot Cr	Trask R
Cow Cr	Pony Cr				Ollala Cr	Wilson R
Fishhawk Cr					Schooner Cr	Dogherty Sl
Humbug Cr						Hoquarten Sl
Little Cr						
Neacoxi Cr						
Neawanna Cr						
Northrup Cr						
Plymton Cr						

Sources: Federal Emergency Management Agency (FEMA), Clatsop County Flood Insurance Study (FIS), 7/17/01, FEMA, Coos County FIS, 5/15/84, FEMA, Curry County FIS, 2/04/98, FEMA, Douglas County FIS, 4/21/99, FEMA, Lane County FIS, 06/02/99, FEMA, Lincoln County FIS, 3/01/80, FEMA, Tillamook County FIS, 8/20/02.

Probability

FEMA has mapped the streams listed in Table 13 for 10, 50, 100, and 500-year flood events, with the probability of flooding in a year being 10%, 2%, 1%, and 0.2%, respectively. Areas subject to these floods are depicted on FEMA Flood Insurance Rate Maps (FIRMs), and profiled in an accompanying Flood Insurance Study (FIS). Recurrence intervals can differ between reaches of the same stream. For example, certain reaches of the Wilson River may experience a 100-year (1%) flood while other sections of the river may be having a 50-year (2%) or perhaps a 500-year (0.2%) flood event.

Flood Insurance Rate Maps (FIRM) depict flood conditions; however, many old maps are inaccurate. Communities may generate their own flood data with FEMA approval. The following is a list of Region 1 counties and the date of their most recent FIRM:

- Clatsop, June 16, 1999
- Coos, November 15, 1984
- Curry, February 04, 1998
- Douglas, April, 21, 1999
- Lane, June 02, 1999
- Lincoln, September 03, 1980
- Tillamook, September 28, 1980

Citizens of counties that participate in the Community Rating System (CRS) receive lower flood insurance rates. Douglas and Tillamook counties participate in this program.

Vulnerability

Low-lying coastal areas in Region 1 are particularly vulnerable to flood hazards that can be exacerbated by high tides. The lower Siletz and Siuslaw rivers and the rivers that feed Tillamook Bay all experienced significant flood losses in 1996 and on other occasions in the following years. In fact, the significance of the 100-year flood event was lost when repetitive flood events impacting the City of Tillamook exceeded the base flood elevation numerous times especially in 1996, 1998 and 1999. Many pre- and post-FIRM buildings have experienced repetitive flood losses along Highway 101 in north Tillamook city and will likely continue to experience losses without mitigation.

The northern half of Region 1 is more susceptible to riverene flood damage that that to the south. This is because the northern half of the region is more densely populated and consequently contains much of the region's infrastructure. Physical location also makes a difference.

For example, five rivers empty into Tillamook Bay, thereby increasing risk from riverene flooding on the relatively flat valley floor. Prudent emergency managers will consider physical location and at-risk populations and facilities during the preparation of all-hazard mitigation plans. Considerations include:

Structures At-Risk from a 1% Flood Event (excluding tidal / wind effects):

- Pre-FIRM structures (residential and commercial)
- Pre-FIRM structures (state-owned / occupied)
- Repetitive Loss structures
- Manufactured Homes (inside and outside manufactured home parks)

Critical Facilities At-Risk from a 1% Flood to include:

- Hospital, Police, Fire, National Guard, Emergency Management (Ingress /Egress);
- Transportation to include highway, rail, and airport;
- Sewer and water treatment plants;
- Energy facilities;
- Communications

Economic Activities At- Risk from a 1% Flood to include:

- Motel / hotel operations
- Highway oriented businesses (especially in Tillamook area)
- Buoyant materials storage (e.g., logs, fuel drums)
- Food outlets (e.g., grocery stores)

Special Considerations to include:

- Special populations (e.g., minority, handicapped, non-English speaking)
- Institutions / incarceration facilities
- Schools / Day-Care
- Hazardous materials sites
- The physical condition of dams

The physical condition of dams on the Umpqua and Rogue rivers warrants special consideration. These two large rivers rise in the Cascade Mountains and consequently are subject to heavy snow packs at higher elevations. Rapid snowmelt in the upper watershed can produce serious flood conditions. The flood potential is somewhat mitigated by several impoundments. Dam failure, for whatever reason,

seriously threatens downstream communities --- and this is a consideration for Region 1 emergency managers. High hazard dams are discussed in the section dealing with Critical Facilities, Infrastructure, and High Hazard Installations.

The probability that Region 1 will experience floods and the region's vulnerability to their effects are depicted in Table 14 below. These scores are based on an analysis of risk conducted by county emergency program managers, usually with the assistance of a team of local public safety officials.

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

High = One incident likely within a 10 to 35 year period.

Moderate = One incident likely within a 35 to 75 year period.

Low = One incident likely within a 75 to 100 year period.

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

High = More than 10% affected

Moderate = 1-10% affected

Low = Less than 1% affected

TABLE 14. Vulnerability and Probability Assessment of Riverene Flooding

	Clatsop	Coos	Curry	Douglas	Lane	Lincoln	Tillamook
Vulnerability	M	M	M	M	M	L	H
Probability	H	H	M	H	H	H	H

Source: Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

A number of local governments in Region 1 have initiated and accomplished building elevation and /or buy-out programs. And the concept of a 100-year flood seems to have been replaced with that of a 1% flood. Also, dairy farmers and other businesses have made considerable progress in protecting their investments. Project Impact, which produced partnerships between local government and the business community probably was more successful on the Oregon Coast (i.e., Region 1) than anywhere else in the state. But much remains to be done. Prudent Region 1 communities will:

1. Revisit the effectiveness of dikes and other hardened structures. This is especially noteworthy in the lower Rogue and Smith rivers where levees and riprap do not offer 100-year protection (Curry County FIS, pp. 6-7; Coos County FIS, p.10; Douglas Co. FIS, p.6);

2. Consider the costs and benefits of constructing dikes in vulnerable populated areas (e.g., City of Florence, Lane County FIS, p.12); and
3. Revisit problems associated with the accumulation of streamside debris. The accumulation of woody debris often forms dams which inevitability fail during periods of high water (Lane County FIS, p. 12). The result can be devastating. Much of the problem is linked to efforts to enhance fish habitat. Despite the availability of some fish-friendly floodplain ordinances, the streamside debris problem has not been resolved. There is a discernible need for county officials to discuss the problem with appropriate state and federal agencies.

Ocean Flooding / Wave Action

Characteristics and History

Flooding from wind-driven waves is a common event on the Oregon coast. This is particularly true during the winter storm season, during El Niño events, and when spring and perigean tides occur. The Federal Emergency Management Agency has identified and mapped coastal areas subject to direct wave action (V zones) and sand dune over-topping (AH and AO zones). Direct wave action was especially severe during the winter storm events of 1972 (Siletz Spit), 1978 (Nestucca Spit), and the El Niño events of 1982-83 and 1997-98. Beach and cliff erosion were significant during these periods and a number of homes were destroyed. The following lessons were learned (and oftentimes forgotten between damaging events):

- Oregon coastal processes are complex and dynamic, sometimes eroding, sometimes aggrading;
- Some sections of the Oregon coast are rising in relation to ocean levels, others remain fairly constant or are becoming lower (Komar 1992, 40-41);
- Primary frontal dunes provide protection from ocean storms;
- Sand spits are not permanent features;
- Erosion rates vary and are dependent on several factors including storm duration and intensity, composition of sea cliff, time of year, and impact of human activities (e.g., altering the base of sea cliffs, interfering with the natural movement of beach sand).

Probability

Ocean storms can be expected every year. El Niño effects, which tend to raise ocean levels, occur about every three to five years (Taylor and Hannan, 1999). V (wave velocity) zones, depicted on FEMA's Flood Insurance Rate Maps, are areas subject to 100-year events (i.e., 1% chance in any given year). The Flood Insurance Rate Maps show areas

vulnerable to wave action (V zones), ponding and sheet-flow from waves over-topping dunes (AO and AH zones). All of the counties in Region 1 have hazardous areas identified on the maps. DOGAMI and FEMA also provide information about wave action.

Vulnerability

A number of buildings, parks, infrastructure, and critical facilities in Region 1 are vulnerable to ocean storms. This is most obvious in low-lying areas adjacent to bays or the ocean; It is also evident at higher elevations where buildings and infrastructure have been located on readily erodable materials (e.g., consolidated sand, weakly cemented sandstone, siltstone, etc.). The problem is historic. There are numerous examples of buildings and infrastructure destroyed by wave attack / erosion --- some of which are classic (e.g., Bay Ocean development, Salishan Spit, Jumpoff Joe, Rogue Shores, The Capes development, etc.). Buildings and infrastructure probably will continue to be built in harm's way despite stringent building requirements and enlightened planning commissions.

Unlike the East and Gulf coasts, only a few of Oregon's coastal developments are within FEMA-designated Velocity (V) zones. Those that are, appear to be constructed according to V-zone standards.

A number of coastal developments are protected by primary frontal dunes (as defined in 44 CFR) that are in various stages of accretion or erosion. In some situations, FEMA has allowed accreting dunes to be lowered in order for property owners to retain unobstructed ocean views. The vulnerability of the homes has not been increased. This policy would change, however, should erosion surpass accretion. Many residential structures are located in areas subject to flooding from wave over-topping (e.g., AO and AH zones). However, very few appear to have been flooded, probably because of elevation requirements.

Region 1 counties have not inventoried all buildings that are vulnerable to wave action (i.e., in V zones), however some pertinent information is available from the National Flood Insurance Program (NFIP). These data are provided to the state and include the address of buildings insured through the NFIP, flood zones in which they are located, claims, and location of repetitive loss structures.

Coastal highways are always problematic. In Region 1, much of the problem is linked to the local geology. This has been mapped as part of DOGAMI's environmental geology series. Bedrock conditions can and do change abruptly within very short distances. This results in an inconsistent highway foundation; some sections are more susceptible to wave action than others and require continuous maintenance. There is no practical solution outside of relocation of the highway; this option is not financially feasible at this point in time. On the positive side, the State Highway Division and Region 1 counties are adept in rerouting traffic. This will continue to be part of the solution.

LANDSLIDES / DEBRIS FLOWS

Characteristics and Brief History

Landslides and debris flows always have and always will shape Oregon's landscape. Landslides become problematic, however, when people place buildings and infrastructure in harm's way. Additionally, development practices can cause or contribute to the severity of landslides.

There are several categories of landslides, based on configuration (slide mechanism), slide materials, and rate of movement. Some slides are ancient, deep-seated, and slow moving. Others move rapidly as a mass of rock, mud, and large woody debris. All can be problematic when in the vicinity of buildings and infrastructure. Fast-moving landslides, or debris flows, occur throughout Oregon, but are especially noteworthy in the Cascade and Coast Ranges.

Debris flows (mudslides, mudflows, debris avalanches) are a common type of rapidly moving landslide that generally occur during intense rainfall on previously saturated ground. They usually begin on steep hillsides as slumps or slides that liquefy, accelerate to speeds as great as 35 mph or more, and flow down slopes and channels onto gently sloping ground. Their consistency ranges from watery mud to thick, rocky, mud-like wet cement, dense enough to carry boulders, trees, and automobiles. Debris flows from different sources can combine in canyons and channels, where their destructive power is greatly increased. In general, slopes that are over 25% or have a history of landslides might signal a landslide problem.

Landslides / debris flows probably accompany every major storm system that impacts western Oregon. In recent events, particularly noteworthy landslides accompanied storms in 1964, 1982, 1966, and 1996. Two major landslide producing winter storms occurred in Oregon during November 1996. Intense rainfall on recently and past logged land as well as previously un-logged areas triggered over 9,500 landslides and debris flows that resulted directly or indirectly in eight fatalities. Highways were closed and a number of homes were lost. The fatalities and losses resulting from the 1996 landslide events brought about the passage of Oregon Senate Bill 12, which set site development standards, authorized the mapping of areas subject to rapidly moving landslides and the development of model landslide (steep slope) ordinances.

Oregon's landslide / debris flow warning system primarily involves three state and one federal agency: the Oregon Department of Forestry (ODF), the Oregon Department of Geology and Mineral Industries (DOGAMI), the Oregon Department of Transportation (ODOT), and the National Oceanic and Atmospheric Administration (NOAA). The warning system is triggered by rainfall and monitored in areas that have been determined to be hazardous.

As the lead agency, ODF is responsible for forecasting and measuring rainfall from storms that may trigger debris flows. Advisories and warnings are issued as appropriate. Information is broadcast over NOAA weather radio and on the Law Enforcement Data System. DOGAMI provides additional information on debris flows to the media; ODOT provides information concerning the location of landslides / debris flows, alternate transportation routes, etc.

Counties with the highest percentage of reported landslides are: Lane (24%), Douglas (11%), Linn (10%), Tillamook (9%), Lincoln (8%), and Multnomah (7%).[2] Table 16 describes the history of more significant landslides and debris flows in the area.

TABLE 16. NOTABLE LANDSLIDE / DEBRIS FLOWS

DATE	INCIDENT
02/1926	Landslide closed Roosevelt Highway between Coos Bay and Coquille causing at least $25,000 in damages.
02/1961	A large section of Ecola State Park slid into the Pacific Ocean.
02/1996	Heavy rains and rapidly melting snow contributed to hundreds of landslides/debris flows across the state. Many occurred on clear cuts that damaged logging roads. (FEMA-1099-DR-OR)
11/1996	Heavy rain triggered mudslides in Lane and Douglas Counties. Five fatalities and several injuries in Douglas County. (FEMA-1149-DR-OR)
02/1999	Two timber workers killed in a mud and rockslide south of Florence.
01/2000	A landslide north of Florence closed Highway 101 for 3 months, resulting in major social and economic disruption to nearby communities.

Source: Taylor and Hatton, 1999, *The Oregon Weather Book;* and FEMA After-Action Report, 1996 events; and interviews, Oregon Department of Transportation representatives.

Probability

The probability of rapidly moving landslides occurring depends on a number of factors; these include steepness of slope, slope materials, local geology, vegetative cover, human activity, and water. There is a strong correlation between intensive winter rainstorms and the occurrence of rapidly moving landslides (debris flows); consequently, the Oregon Department of Forestry tracks storms during the rainy season, monitors rain gages and snow melt, and issues warnings as conditions warrant. Given the correlation between precipitation / snow melt and rapidly moving landslides, it would be feasible to construct a probability curve. The installation of slope indicators or the use of more

[2] Hofmeister, YEAR, *Slope Failures in Oregon*; and DOGAMI, 2000, Special Paper 34.

advanced measuring techniques could provide information on slower moving slides.

The Department of Forestry has mapped debris flow hazards for all of the counties in Region 1. In addition, all the counties have an operation debris flow warning system.

Vulnerability

Rain-induced landslides and debris flows can potentially occur during any winter in Region 1. Fortunately, little developed property is exposed to the hazard; the greatest impacts occur to the east-west roadways that carry traffic to and from the coast … with the potential for injuries and loss of life from rapidly moving landslide events. However, to minimize future landslide impacts to new development, hazards areas must be identified and siting standards applied.

Since 1950, at least 21 deaths have been attributed to rapidly moving landslides (i.e., debris flows). Statistically, the risk of being killed is relatively low (about .02 fatalities per 1,000 people/ year). However, the risk would be greater for that segment of the population that lives, works, or commutes through high hazard debris flow areas.

The probability that Region 1 will experience landslides and the region's vulnerability to their effects are depicted in Table 17 below. These scores are based on an analysis of risk conducted by county emergency program managers, usually with the assistance of a team of local public safety officials.

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

High = One incident likely within a 10 to 35 year period.

Moderate = One incident likely within a 35 to 75 year period.

Low = One incident likely within a 75 to 100 year period.

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

High = More than 10% affected

Moderate = 1-10% affected

Low = Less than 1% affected

In some cases, counties either did not rank the hazard or did not find it to be a significant consideration. These cases are noted with a dash (-) in the table below.

TABLE 17. Vulnerability and Probability Assessment of Landslides

	Clatsop	Coos	Curry	Douglas	Lane	Lincoln	Tillamook
Vulnerability	M	H	H	M	M	-	H
Probability	H	H	H	H	H	-	H

Source: Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

TSUNAMI

Characteristics and Brief History

Tsunami waves are infrequent events, but can be extremely destructive. They may be generated by earthquakes, submarine volcanoes, or landslides, and travel hundreds of miles before striking land. Hardly discernible at sea, tsunami waves travel as fast as 500 mph across open water until, at landfall, they slow-down significantly and can reach heights up to 20 feet or more. Seward, Alaska, experienced tsunami waves as high as 25 feet during the 1964 earthquake-tsunami event.

Most tsunami waves have been described as an onrushing, rapidly rising tide, which can be seen in the few motion pictures that have captured the tsunami phenomenon. The size and behavior of tsunamis depend on a number of factors, including distance traveled, submarine topography and the shape and orientation of the coastline. Much of the damage results from water-borne debris, which can act as battering rams against on-shore development. Wave-borne fuel drums are especially hazardous because of their propensity to cause or exacerbate fires.

All Region 1 counties are susceptible to tsunami hazards. Oregon's 60 coastal communities have experienced, to various degrees, tsunamis that have originated in the oceanic regions near Russia's Kamchatka Peninsula, Japan, Chile, Hawaii, the Gulf of Alaska and northern California. Additionally, the geologic record implies that several tsunamis have been generated locally off the Oregon Coast along the Cascadia Subduction Zone. This is the region's greatest concern (see earthquake section). An anticipated M8-9 earthquake along the Cascadia Subduction Zone could generate tsunamis that would reach the Oregon coast in a very short period of time – between 15 and 30 minutes. This underscores the need to plan for such an event.

Table 18 describes some of the tsunami history of Region 1.

TABLE 18. NOTABLE TSUNAMIS

DATE	ORIGIN OF EVENT	AFFECTED COMMUNITY	DAMAGE	REMARKS
04/1868	Hawaii	Astoria		Observed
08/1868	N. Chile	Astoria		Observed
08/1872	Aleutian Is	Astoria		Observed
11/1873	N. California	Port Orford		Debris at high tide line
04/1946	Aleutian Is	Bandon		Barely perceptible
04/1946		Clatsop Spit		Water 3.7m above MLLW
04/1946		Depoe Bay		Bay drained. Water returned as a wall
04/1946		Seaside		Wall of water swept up Necanicum River
11/1952	Kamchatka	Astoria		Observed
11/1952		Bandon	Log decks broke loose	
05/1960	S. Cent. Chile	Astoria		Observed
05/1960		Seaside	Bore on Necanicum River damaged boat docks	
05/1960		Gold Beach		Observed
05/1960		Newport		Observed for about four hours
05/1960		Netarts	Some damage observed	
03/1964	Gulf of Alaska	Cannon Beach	Bridge and motel unit moved inland. $230,000 damage	
03/1964		Coos Bay	$20,000 damage	
03/1964		Depoe Bay	$5,000 damage; 4 children drowned at Beverly Beach	
03/1964		Florence	$50,000 damage	
03/1964		Gold Beach	$30,000 damage	
03/1964		Seaside	1 fatality (heart attack); Damage to city: $41,000; Private: $235,000; Four trailers, 10-12 houses, two bridges damaged	
05/1968	Japan	Newport		Observed
04/1992	N. California	Port Orford		Observed
10/1994	Japan	Coast		Tsunami warning issued, but no tsunami observed

Source: NOAA, 1993, Tsunamis Affecting the West Coast of the United States: 1806-1992.

Probability

It is difficult to predict when the next tsunami will occur. With respect to distant sources, Oregon has experienced 10 tsunamis in the last 135 years with only 3 causing measurable damage (Table 18). Thus, the average recurrence interval for tsunamis on the Oregon coast from distant sources would be about 15 years. However, the time interval between events has been as little as one year and as much as 73 years. The two most destructive tsunamis occurred only four years apart (1960 and 1964) and originated from two different source areas (south central Chile and the Gulf of Alaska). Since only a few tsunamis caused measurable damage, a recurrence interval for distant tsunamis does not have much meaning for this region.

A tsunami originating from a Cascadia Subduction Zone (CSZ) event could be exceedingly destructive and thus is of greater concern than distant tsunamis. The average recurrence interval for a CSZ event is between 500 and 600 years. There have been seven CSZ events in the last 3500 years with time between individual events varying from 150 to 1000 years. It is assumed that all Cascadia tsunamis would cause extensive damage. The last CSZ event occurred approximately 300 years ago.[3]

Vulnerability

The Oregon coast is at risk from tsunamis that originate from local and distant sources. All communities in low-lying coastal areas in Region 1 are especially vulnerable to tsunamis because of its coastal setting and the location of many of its communities in low-lying areas. Seaside is the most vulnerable city due to its low elevation and high numbers of residents and tourist population. Although many communities have evacuation maps and evacuation plans, many casualties are expected. The built environment in the inundation zone will be especially hard hit.

Communities can engage in the following activities to prepare for tsunamis:

- **Map areas subject to tsunami inundation** – DOGAMI has mapped all Region 1 counties.
- **Establish NOAA warning system –** All counties have a warning system established.
- **Participate in NOAA's Tsunami-Ready program** - The only Oregon community participating in this program is Cannon Beach Rural Fire District

[3]Kenji Satake et al., 1995.

The probability that Region 1 will experience tsunami and the region's vulnerability to their effects are depicted in Table 19 below. These scores are based on an analysis of risk conducted by county emergency program managers, usually with the assistance of a team of local public safety officials.

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

High = One incident likely within a 10 to 35 year period.

Moderate = One incident likely within a 35 to 75 year period.

Low = One incident likely within a 75 to 100 year period.

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

High = More than 10% affected

Moderate = 1-10% affected

Low = Less than 1% affected

TABLE 19. Vulnerability and Probability Assessment of Tsunami

	Clatsop	Coos	Curry	Douglas	Lane	Lincoln	Tillamook
Vulnerability	H	M	H	M	M	M	H
Probability	M	M	H	H	H	H	M

Source: Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

VOLCANO-RELATED HAZARDS

Characteristics and Brief History

The volcanic Cascade Mountain Range is not within Region 1 counties; consequently, the risk from local volcano-associated hazards (e.g., lahars, pyroclastic flows, lava flows, etc.) is not a priority consideration. However, there is some risk from air-borne tephra (volcanic ash). This fine-grained material, blown aloft during a volcanic eruption, can travel many miles from its source. The cities of Yakima and Spokane, Washington, were inundated with ash during the May 1980, Mt. Saint Helens eruption. Air borne tephra can reduce visibility to zero, and bring street, highway, and air traffic to an abrupt halt. The material is noted for its abrasive properties and is especially damaging to machinery. It would be prudent for vulnerable communities to identify disposal areas for large quantities of tephra.

Part of Clatsop County borders the Columbia River -- which in theory makes it vulnerable to lahars or mudflows carried by the river. Although remote, such an event cannot be dismissed out of hand. A lahar or mudflow that traveled down Washington's Cowlitz River following the eruption of Mt. Saint Helens, filled the Columbia River channel overnight from its previous 40-foot depth to a mere 14 feet. This delayed ship movements in the vicinity of the Cowlitz for months.[4]

Probability

Mt. St. Helens is a probable source of air borne tephra and lahar mudflows that can reach the Columbia River. The probability of coastal counties receiving air-borne tephra is about 1 in 10,000 --- with a large portion of Curry county being even less[5]. A lahar mudflow that traveled down Washington's Cowlitz River following the 1980 eruption of Mt. Saint Helens filled the Columbia River channel overnight from its previous 40-foot depth to a mere 14 feet. This delayed ship movements for months.

Vulnerability

The probability that Region 1 will experience volcanic activity and the region's vulnerability to their effects are depicted in Table 20 below. These scores are based on an analysis of risk conducted by county emergency program managers, usually with the assistance of a team of local public safety officials.

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[4] USGS Open File Report 95-497, 1995, pp.5-6.

[5] Sherrod, David et al, 1997.

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

High = One incident likely within a 10 to 35 year period.

Moderate = One incident likely within a 35 to 75 year period.

Low = One incident likely within a 75 to 100 year period.

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

High = More than 10% affected

Moderate = 1-10% affected

Low = Less than 1% affected

In some cases, counties either did not rank the hazard or did not find it to be a significant consideration. These cases are noted with a dash (-) in the table below.

TABLE 20. Vulnerability and Probability Assessment of Volcano Related Hazards

	Clatsop	Coos	Curry	Douglas	Lane	Lincoln	Tillamook
Vulnerability	H	-	H	-	-	L	-
Probability	L	-	L	-	-	L	-

Source: Oregon Emergency Management, July 2003, County Hazard Analysis Scores.

WINDSTORMS

Characteristics and Brief History

High winds can be expected throughout Region 1. Destructive wind storms are less frequent, and their pattern is fairly well known. They form over the North Pacific during the cool months (October through March), move along the coast and swing inland in a northeasterly direction. Wind speeds vary with the storms. Gusts exceeding 100 miles per hour have been recorded at several coastal locations (Table 20), but lessen as the storm moves inland. These storms can be very destructive as documented in the now infamous Columbus Day Storm of October, 1962. Less destructive storms usually topple trees, power lines, and cause building damage. Flooding can be an additional problem. A large percentage of Oregon's annual precipitation comes from these events.[6]

[6] Taylor and Hatton, 1999, *The Oregon Weather Book*, p. 139; and FEMA-1405-DR-OR, YEAR, Reducing Windstorm Damage to Property and Electrical Utilities.

TABLE 21. SIGNIFICANT WINDSTORMS

DATE	LOCATION	DESCRIPTION	REMARKS
01/1880	Western Oregon	Very high winds. 65-80 mph near Portland	Flying debris; fallen trees
01/1921	Oregon coast / Lower Columbia	Winds 113 mph at mouth of Columbia. Gusts at Astoria, 130 mph	Widespread damage
04/1931	Western Oregon	Unofficial reports of wind speeds up to 78 mph	Widespread damage
11/1951	Most of Oregon	Winds 40-60 mph with 75-80 mph gusts	Widespread damage, especially to transmission lines
12/1951	Most of Oregon	Winds, 60-100 mph, strongest along coast	Many damaged buildings. Telephone / power lines down
12/1955	Western Oregon	Wind gusts at North Bend 90 mph	Significant damage to buildings and farms
01/1956	Western Oregon	Heavy rains, high winds, mud slides	Estimated damage: $95,000 (1956 dollars)
11/1958	Most of Oregon	Wind gusts to 75 mph at Astoria. Gusts to 131 mph at Hebo	Damage to buildings and utility lines
11/1962	Statewide	Wind speeds of 131 mph on the Oregon coast (Columbus Day Windstorm Event)	Oregon's most destructive storm. 23 fatalities. Damage at $170 million
03/1963	Coast and N.W. Oregon	100 mph gusts (unofficial)	Widespread damage
10/1967	Western and N. Oregon	Winds on Oregon Coast 100-115 mph	Significant damage to buildings, agriculture, and timber
03/1971	Most of Oregon	Notable damage in Newport	Falling trees took out power lines. Building damage
01/1986	N and Cent. Oregon Coast	75 mph winds	Damaged trees, buildings, power lines
01/1987	Oregon Coast	Wind gusts to 96 mph at Cape Blanco	Significant erosion (highways and beaches). Several injuries
12/1987	Oregon Coast / N.W. Oregon	Winds on coast 60 mph	Saturated ground enabled winds to uproot trees
03/1988	N. and Central Coast	Wind gusts 55-75 mph	One fatality near Ecola State Park. Uprooted trees
01/1990	All of Oregon	100 mph winds in Netarts and Oceanside	One fatality. Damaged buildings. Falling trees (FEMA-853-DR-OR)

DATE	LOCATION	DESCRIPTION	REMARKS
02/1990	Oregon Coast	Wind gusts of 53 mph at Netarts	Damage to docks, piers, boats
01/1991	Most of Oregon	Winds of 63 mph at Netarts. 57 at Seaside	75 foot trawler sank NW of Astoria
11/1991	Oregon Coast	Slow-moving storm. 25- foot waves off shore	Buildings, boats, damaged. Transmission lines down.
01/1992	Southwest Oregon	Wind gusts of 110 mph at Brookings	Widespread damage
01/1993	Oregon coast / N. Oregon	Tillamook wind gusts at 98 mph	Widespread damage, esp. Nehalem Valley
12/1995	Statewide	Wind gusts over 100 mph. Sea Lion Caves: 119 mph. Followed path of Columbus Day Storm (12/1962)	Four fatalities; many injuries. Widespread damage (FEMA-1107-DR-OR)
11/1997	Western Oregon	Winds of 89 mph at Florence. 80 mph at Netarts and Newport	Severe beach erosion. Trees toppled
2/2002	SW Oregon	75-100 mph on the SW Coast (Douglas, Coos and Curry counties)	Widespread loss of electricity and damage to public utility infrastructure (FEMA-1405-DR-OR)

Source: Taylor and Hatton, 1999, *The Oregon Weather Book*, p.151-157.

Tornadoes

Most people do not associate tornadoes with the State of Oregon, and certainly not in coastal areas. Nevertheless, they have occurred in Region 1, the first of which was recorded in 1897. They are characteristically brief and small --- but also damaging. The recurrence interval, based on the list compiled by Taylor and Hatton (1999, pp. 130-137), is about every nine years. In some cases, events are separated over 20 or 30 years (Table 15 below).

Table 15. TORNADOES RECORDED

DATE	LOCATION	REMARKS
June, 1897	Bay City	Observed, but no damage recorded
October, 1934	Clatskanie	Observed. No damage
April, 1960	Coquille	Accompanied by heavy rain. No damage
November, 1965	Rainier	Crossed Columbia River. Two buildings damaged
October, 1966	Seaside	Windows broken, telephone lines down, outdoor signs destroyed
October, 1967	Near Astoria airport	Began over ocean and moved inland. Several homes and commercial buildings damaged
December, 1973	Newport	Some roof damage
December, 1975	Tillamook	90 mph wind speed. Damage to several buildings
August, 1978	Scappoose	Manufactured home destroyed; Other damage
March, 1983	Brookings	Minor damage
November, 1984	Waldport	Damage to automobiles and roofs
February, 1994	Near Warrenton	Damage in local park

Source: Taylor and Hatton, 1999, *The Oregon Weather Book,* pp. 130-137

Probability

High windstorms occur yearly. More destructive storms occur once or twice per decade. High wind events on the order of the 1962 Columbus Day storm are thought to have a 100-year recurrence interval.

Vulnerability

Many buildings, utilities, and transportation systems within Region 1 are vulnerable to wind damage. This is especially true in open areas, such as along the Oregon Coast, natural grasslands, or farmland. It also is true in forested areas, along tree-lined roads and electrical transmission lines, and on residential parcels --- where trees have been planted or left for aesthetic purposes. Oregon's history of wind damage underscores the need for a comprehensive wind-hazard mitigation program. The necessity of such an action is partly supported in an after-action report focusing on western Oregon's high wind event of February 7, 2002 (Hazard Mitigation Survey Team Report, FEMA-1405-DR-OR). Other historic events (e.g., 1962 Columbus Day Storm) provide additional insights.

Structures most vulnerable to high winds in Region 1 include insufficiently-anchored manufactured homes and older buildings in need of roof repair. Section 307 of the Oregon Building Code identifies high wind areas along the Oregon Coast and sets anchoring standards for manufactured homes located in those areas. It is essential that coastal counties ensure that the standards are enforced. The Oregon Department of Administrative Service's inventory of state-owned and operated buildings includes an assessment of roof conditions as well as the overall condition of the structure. Oregon Emergency Management has arranged this information by county.

Fallen trees are especially troublesome. They can block roads and rails for long periods, which can affect emergency operations. In addition, uprooted or shattered trees can down power and/or utility lines, effectively bringing local economic activity and other essential activities to a standstill. Much of the problem may be attributed to a shallow or weakened root system in saturated ground. Many roofs have been destroyed by uprooted ancient trees growing next to a house. In some situations, strategic pruning may be the answer. Prudent counties will work with utility companies in identifying problem areas and establishing a tree maintenance / removal program.

Tree-lined coastal roads and highways present a special problem. This is because much of the traveling public enjoys the beauty of forested corridors and most certainly would be concerned with any sort of tree removal program. In short, any "safety" program involving tree removal must be convincing, minimal, and involve a variety of stakeholders.

Wind-driven waves are common along the Oregon coast and are responsible for road and highway wash-outs and the erosion of beaches

and headlands. These problems are addressed under Flood Hazards (i.e., Ocean flooding and wave action). Unlike Oregon's Willamette Valley (Regions 2 and 3), there are no water-borne ferry systems in Region 1 whose operations would be affected by high winds. Bridges spanning bays or the lower Columbia River would be closed during high wind periods.

The probability that Region 1 will experience windstorms and the region's vulnerability to their effects are depicted in Table 22 below. These scores are based on an analysis of risk conducted by county emergency program managers, usually with the assistance of a team of local public safety officials.

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

High = One incident likely within a 10 to 35 year period.

Moderate = One incident likely within a 35 to 75 year period.

Low = One incident likely within a 75 to 100 year period.

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

High = More than 10% affected

Moderate = 1-10% affected

Low = Less than 1% affected

TABLE 22. Vulnerability and Probability Assessment of Windstorms

	Clatsop	Coos	Curry	Douglas	Lane	Lincoln	Tillamook
Vulnerability	H	H	H	M	M	H	H
Probability	H	H	H	H	H	H	H

Source: Oregon Emergency Management, July 2003, County Hazard Analysis Scores

Appendix E:
Household Survey

Region 1: Oregon Coast Household Natural Hazards Preparedness Survey

Survey Report for:

Clatsop County, Oregon
Tillamook County, Oregon
Lincoln County, Oregon
Lane County, Oregon
Douglas County, Oregon
Coos County, Oregon
Curry County, Oregon

Prepared by:

Oregon Partnership for Disaster Resilience

Community Service Center
1209 University of Oregon
Eugene, OR 97403-1209
Phone: 541.346.3588
Fax: 541.346.2040
Email: kristam@uoregon.edu
http://www.oregonshowcase.org

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Project Staff:

Krista Dillon, Associate Director, Oregon Partnership for Disaster Resilience

André LeDuc, Executive Director, Oregon Partnership for Disaster Resilience

Robert Parker, Managing Director, Community Service Center

Bethany Johnson, Associate Director, Community Planning Workshop

Jenny Pearce, Intern, Oregon Partnership for Disaster Resilience

Natural Hazard Household Preparedness Survey

The Oregon Partnership for Disaster Resilience (*Partnership, OPDR*) is a coalition of public, private, and professional organizations working collectively toward the mission of creating a disaster resilient and sustainable state. The *Partnership* is recognized by the Institute for Business & Home Safety (IBHS) as a Showcase State for Disaster Resilience. Developed and coordinated by the Community Service Center (CSC) at the University of Oregon the *Partnership* employs a service learning model to increase community capacity and enhance disaster safety and resilience statewide.

The *Partnership's* current planning initiatives cover over two-thirds of the geographic area of Oregon. It is working with Central Oregon, Southeast Oregon, Northeast Oregon, and the Oregon Coast through Pre-Disaster Mitigation Planning Grants to support staff in developing local natural hazard mitigation plans. CSC staff serve as the lead project coordinator providing plan development support, technical resources, and a proven planning process / framework for each county.

As part of the PDM Program, OPDR is assisting the Coastal region of Oregon with the citizen involvement components of the natural hazard mitigation planning process. Citizen involvement is a key component in the natural hazard mitigation planning process. Citizens have the opportunity to voice their ideas, interests and concerns about the impact of natural disasters on their communities. To that end, the Disaster Mitigation Act of 2000[1] requires citizen involvement in the natural hazard mitigation planning process. It states:

> "An open public involvement process is essential to the development of an effective plan. In order to develop a more 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

[1] National Archives and Records Administration. 2002. Federal Emergency Management Agency 44 CFR Parts 201 and 206 Hazard Mitigation Planning and Hazard Mitigation Grant Program; Interim Final Rule in Federal Register.

agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process."

The benefits of citizen involvement, according to Bierle[2], include the following: (1) educate and inform public; (2) incorporate public values into decision making; (3) improve substantially the quality of decisions; (4) increase trust in institutions; (5) reduce conflict; and (6) ensure cost effectiveness. To gather public input into the planning process, OPDR administered a survey to randomly selected households.

This report summarizes the results of the Oregon Coast Household Natural Hazards Preparedness Survey. The survey helps the counties of the Coastal region - Clatsop, Tillamook, Lincoln, Lane (only coastal portion), Douglas (only coastal portion), Coos, and Curry Counties - realize Bierle's five benefits of citizen involvement in the natural hazard mitigation planning process.

Methodology

To conduct the household survey, OPDR used a modified version of a survey administered statewide in 2002. The purpose of the 2002 survey was to better understand the perceptions of risk to natural hazards held by citizens, as well as the level of preparedness and types of risk reduction activities in which citizens have engaged. The primary goal of the 2002 survey was to gauge the overall perception of natural disasters and determine a baseline level of loss reduction activity for residents in the community. OPDR adapted the statewide survey to include questions about citizens' support for different types of community planning actions. Planning actions mentioned included protecting critical facilities, disclosing natural hazard risks during real estate transactions, and the use of tax dollars to compensate land owners for not developing in hazardous areas.

This survey was sent to 1200 households in the Coastal region, which includes: Clatsop, Tillamook, Lincoln, Lane (only coastal portion), Douglas (only coastal portion), Coos, and Curry Counties. The households were randomly selected and population weighted based on registered voter lists provided to OPDR by each of the counties.

The mailing contained a cover letter, the survey instrument, and a postage-paid return envelope. Completed surveys were returned to OPDR at the University of Oregon. A second postcard was sent to remind households to send in the survey or to access an online version of the survey. OPDR received 206 valid responses from the mailed survey, for a 20% response

[2] Bierle, T. 1999. "Using social goals to evaluate public participation in environmental decisions." *Policy Studies Review*. 16(3/4) ,75-103.

rate. (Only 1034 of the 1200 addresses were valid addresses.) Only two people completed the online version of the survey; therefore, these responses were not analyzed because of the very low sample size.

Limitations

The study identifies key issues about how members of Coastal Oregon communities perceive their risk to natural hazards, providing a snapshot of those perceptions at a single point in time. As such, survey responses may reflect external issues, such as heightened concern about terrorism or the current state of the economy. This study was not intended to be representative of the perceptions of all residents, and cannot be generalized to the public.

Organization of Report

The survey results are organized into the following sections:

Characteristics of Survey Respondents: This section reports information about respondent characteristics including: educational attainment, age, and length of time as an Oregon resident.

Perception of Risk: This section identifies the general level of concern over natural hazards risk.

Household Preparedness and Risk Reduction: This section describes the types of structural and nonstructural measures that are being implemented by survey respondents, and the types of resources or programs that might increase risk reduction activities.

Community Natural Hazard Preparedness: This section describes citizens' priorities for planning for natural hazards and the community-wide strategies respondents support.

Written Responses to Open-Ended Questions: This section includes summarizes the responses of the open-ended questions and comments.

Section II. Characteristics of Survey Respondents

Demographic survey questions provide a statistical overview of the characteristics of the respondents. This section of the survey asked respondents about their age and gender, their level of education, and how long they have lived in Oregon. The survey also included questions regarding respondents' present housing.

There were 206 individuals who responded to the survey, giving the survey a 20% response rate. Of the seven counties the survey was mailed to, the majority of surveys (31%) returned came from residents of Coos County (Table 1). This is not surprising as Coos County has the greatest number of residents in the region with 62,905 of the total region residents (PSU population estimate). It is difficult to know the exact number of

residents living in the region as only part of Lane and Douglas counties are included in the coastal region. If all of Lane and Douglas counties are included in the resident total, the region would contain 634,920 (2006 Region 1:Profile and Risk Assessment, OPDR).

Zip codes provide a more specific location of the survey respondents than the county level data. Of the 37 different zip codes indicated, the most respondents live in the 97103 zip code (Astoria) (Table 2).

Table 1. Per County Sample Distribution and Survey Response

County	Sample Distribution	Survey Responses
Coos	30%	31%
Lincoln	21%	19%
Clatsop	17%	17%
Tillamook	12%	12%
Lane	7%	9%
Curry	10%	9%
Douglas	3%	3%

Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (Nov. 2007).

Table 2. Percent of Surveys by Zipcode

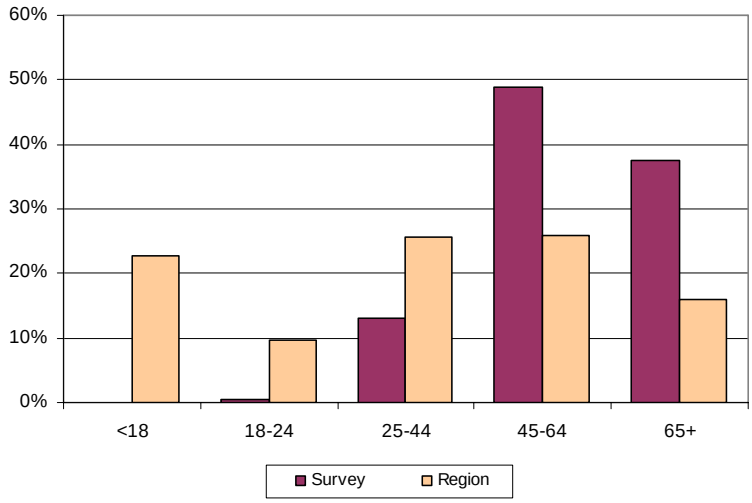
Zip Code	City	Percent
97103	Astoria	17.2
17420	Coos Bay	11.8
97439	Florence	8.3
97459	North Bend	6.9
97415	Brookings	6.4
97423	Coquille	5.4
97365	Newport	4.9
97141	Tillamook	4.4
Other		34.7

Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (Nov. 2007).

Age and Gender

Figure 1 compares the ages of survey respondents to the 2000 U.S. Census. This shows that younger people were underrepresented while older people were overrepresented in the sample. Women accounted for 58% of survey respondents.

Figure 1. Percentage of Coastal Oregon Population and Survey Respondents by Age Category (persons 18 and over)

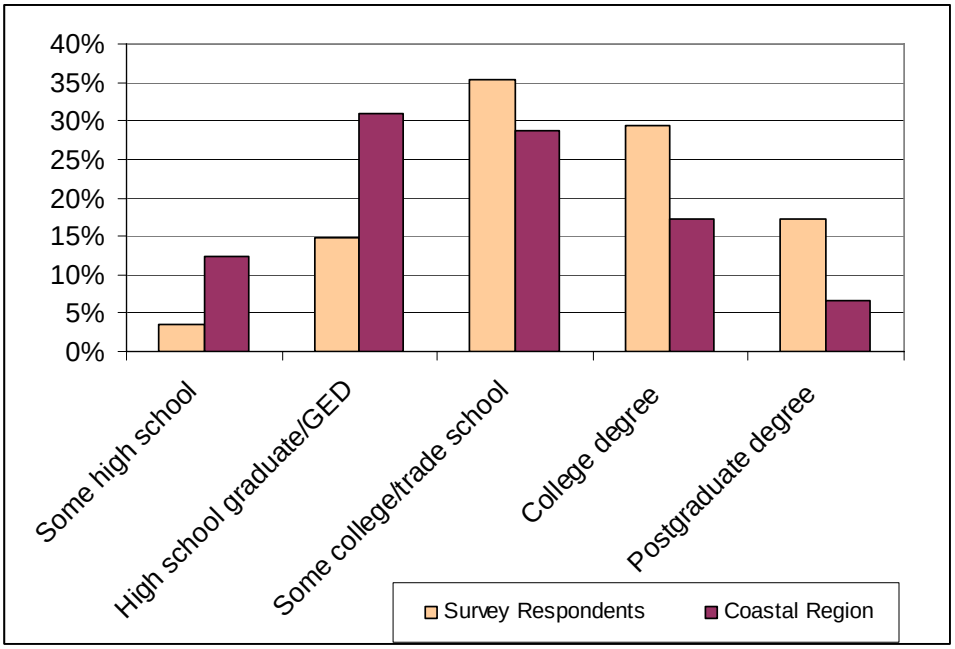


Source: U.S. Census Bureau: www.census.gov (2000) and Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (Nov. 2007).

Level of Education

In general, survey respondents were relatively well educated. Figure 2 compares the level of education of survey respondents with the 2000 U.S. Census for the region. About 80% of survey respondents have attended some college or gone to a trade school, obtained a college degree, or have a postgraduate degree. In contrast, figures from the Census show that approximately 50% of Coastal residents have achieved this level of educational attainment. Survey respondents were much more likely to have completed a higher educational level than the overall population of the Coastal region.

Figure 2. Level of Education of Coastal Oregon Population and Survey Respondents

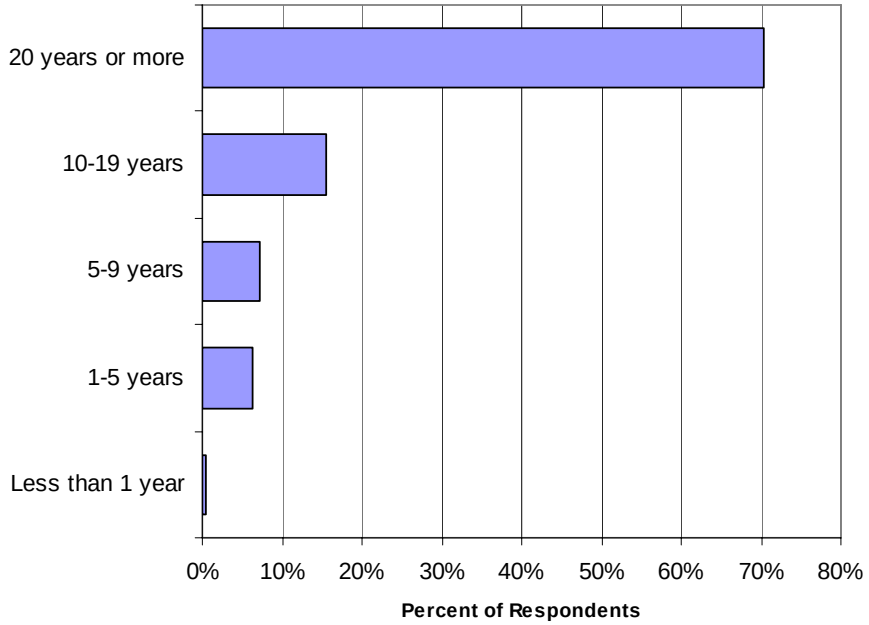


Source: U.S. Census Bureau: www.census.gov (2000) and Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Preparedness, (Nov. 2007)

Oregon Residency

Approximately 70% percent of survey respondents have lived in Oregon for 20 years or more (see Figure 3). Respondents who have lived in Oregon for fewer than 20 years have most commonly moved from California (17%).

Figure 3. Length of Time Survey Respondents Have Lived in Oregon



Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (Nov. 2007)

Housing Characteristics

Housing characteristics are important variables in creating effective education and outreach programs. Knowledge of the percentage of homeowners in a community can help target the programs. Homeowners might be more willing to invest time and money in making their homes more disaster resilient. The majority of survey respondents own their own home (88%). Almost 79% of survey respondents live in single-family homes, 11% live in manufactured homes, 3% in apartments of 5 or more units, 2% live in duplexes, and less than 0.5% live in condominiums/townhomes or apartments with 3-4 units. In addition, 79% said they have access to the internet.

Section III. Perception of Risk

It is helpful to understand community members' experiences and their perceptions of risk to natural hazards to make informed decisions about natural hazard risk reduction activities. The survey asked respondents about their level of concern for specific hazards in the Coastal region. The primary objective of this question was to create a "natural hazard profile" of respondents to better understand how Coastal residents perceive natural hazards.

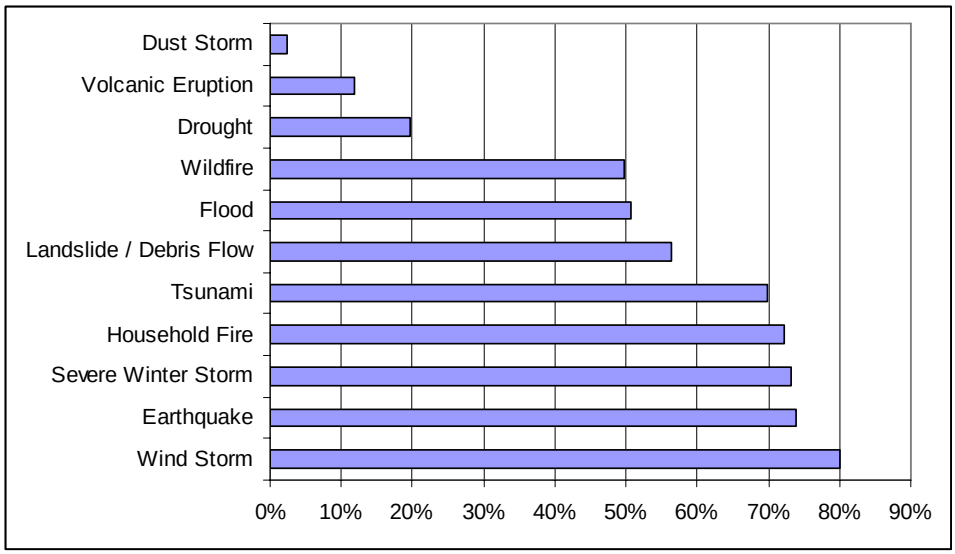
The survey asked respondents to rank their personal level of concern for specific natural disasters affecting their community (Table 3). The results show that respondents were most concerned about windstorm, earthquake, severe winter storm and household fire. The respondents are least concerned about volcanic eruptions and dust storm. Figure 5 shows the percent of respondents that identified their level of concern as either "Very Concerned" or "Somewhat Concerned".

Table 3. Survey Respondents' Level of Concern Regarding Natural Hazards in the Coastal Region

Natural Disaster	Very Concerned	Somewhat Concerned	Neither Concerned nor Unconcerned	Not Very Concerned	Not Concerned
Drought	5.9%	13.7%	18.1%	22.5%	39.7%
Dust Storm	0.5%	2.0%	10.3%	17.2%	70.0%
Earthquake	19.7%	54.2%	9.9%	10.8%	5.4%
Flood	14.9%	35.8%	14.4%	16.4%	18.4%
Landslide / Debris Flow	20.8%	35.6%	10.9%	18.3%	14.4%
Wildfire	16.7%	33.0%	14.3%	20.2%	15.8%
Household Fire	21.9%	50.2%	11.4%	12.9%	3.5%
Volcanic Eruption	1.5%	10.4%	17.9%	16.9%	53.2%
Wind Storm	32.8%	47.3%	10.4%	5.5%	4.0%
Severe Winter Storm	24.3%	49.0%	11.4%	7.9%	7.4%
Tsunami	26.1%	43.8%	13.3%	6.4%	10.3%

Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (Nov. 2007)

Figure 4. Percentage of Survey Respondents' Who Are "Very Concerned" or "Somewhat Concerned" about Natural Hazards



Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (Nov. 2007)

Section IV. Household Preparedness and Risk Reduction

There are many steps people can take to prepare their households for a natural disaster or emergency. Preparing for a disaster can improve the safety and comfort of the members of a household immediately following a natural disaster or emergency. The survey asked respondents about what steps their households have taken or plan to take to increase their disaster preparedness.

Property Protection

Exactly half (50%) of the respondents considered the possible occurrence of a natural hazard when they bought or moved into their current homes. The need to have adequate provisions for financial and property recovery when natural disasters do occur is a necessary component of natural hazard preparedness. Only ten percent of the respondents indicated they have flood insurance leaving 90% without insurance. However, 65% of those who don't have flood insurance indicated the reason is because their home is not located in the floodplain and 15% felt it was not necessary. Many more respondents (37%) indicated they have earthquake insurance. The top two reasons given by those who don't have earthquake insurance were "not familiar with it/don't know" (30%) or "it is not necessary" (20%).

Table 4. Survey Respondents' Reasons For Not Having Flood and/or Earthquake Insurance

Flood Insurance		Earthquake Insurance	
Not located in the floodplain	64%	Not familiar with it/don't know	30%
Not necessary	14%	Not necessary	20%
Not familiar with it/don't know	7%	Too Expensive	19%
Too Expensive	6%	Deductible too high/not worth it	14%
Not available	3%	Other	10%
Other	3%	Not available	7%
Deductible too high/not worth it	3%		

Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (Nov. 2007)

Over sixty percent of respondents have talked with members of their households about what to do in the case of a natural disaster or emergency whereas only twenty percent have braced unreinforced masonry, concrete walls and chimneys. Table 5 summarizes the activities respondents indicated they have done, plan to do, have not done, or were unable to do to prepare for natural disasters.

Table 5. Survey Respondents' Household Disaster Preparedness Activities

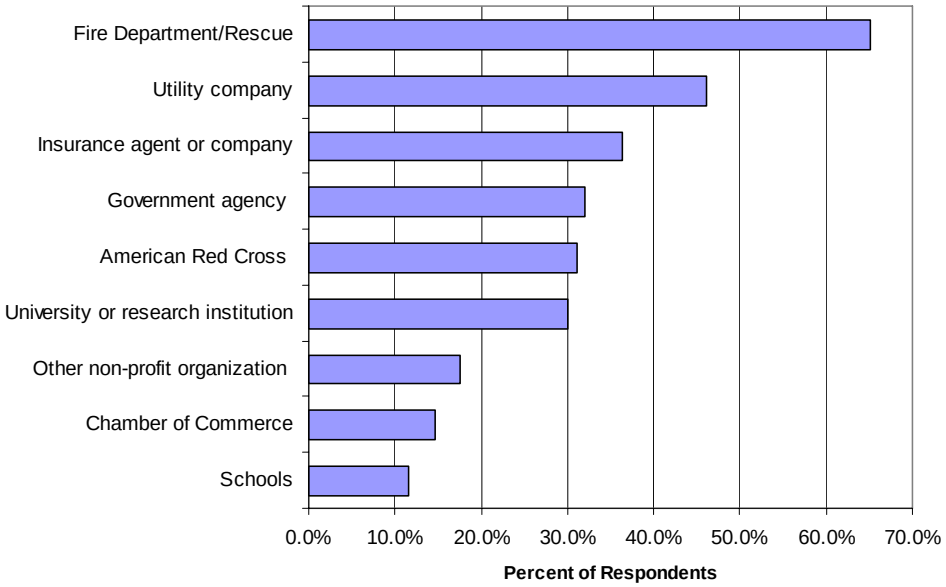
In your household, have you or someone in your household:	Have Done	Plan To Do	Not Done	Unable To Do	Does Not Apply
A. Attended meetings or received written information on natural disasters or emergency preparedness?	52.7%	5.4%	40.9%	1.0%	
B. Talked with members in your household about what to do in case of a natural disaster or emergency?	62.4%	13.9%	20.1%	3.6%	
C. Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a disaster?	38.5%	24.6%	33.8%	3.1%	
D. Prepared a "Disaster Supply Kit" (Stored extra food, water, batteries, or other emergency supplies)?	46.2%	27.1%	26.1%	0.5%	
E. In the last year, has anyone in your household been trained in First Aid or Cardio-Pulmonary Resuscitation (CPR)?	35.4%	3.1%	57.9%	3.6%	
F. Have you secured your water heater, cabinets and bookcases to the wall?	31.8%	6.0%	56.7%	3.0%	2.5%
G. Have you fit your gas appliances with flexible connections?	25.6%	1.0%	14.1%	2.0%	57.3%
H. Used fire-resistant building or roofing materials?	54.0%	2.5%	28.3%	6.1%	9.1%
I. Secured your home to its foundation?	54.4%	2.1%	26.4%	7.3%	9.8%
J. Braced unreinforced masonry, concrete walls, and chimney?	20.3%	2.0%	31.5%	9.1%	37.1%
K. Elevated your home in preparation for floods?	6.5%	1.0%	20.1%	9.5%	62.8%

Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (November 2007)

Preferred Sources and Formats of Information

To develop and implement effective outreach and education activities, it is important to understand the mechanisms for information dissemination. Of the listed organizations that might provide information to households about household preparedness for natural disasters, respondents most frequently preferred the fire department or rescue organization. Figure 5 shows that schools were the least preferred organization to be the primary information source.

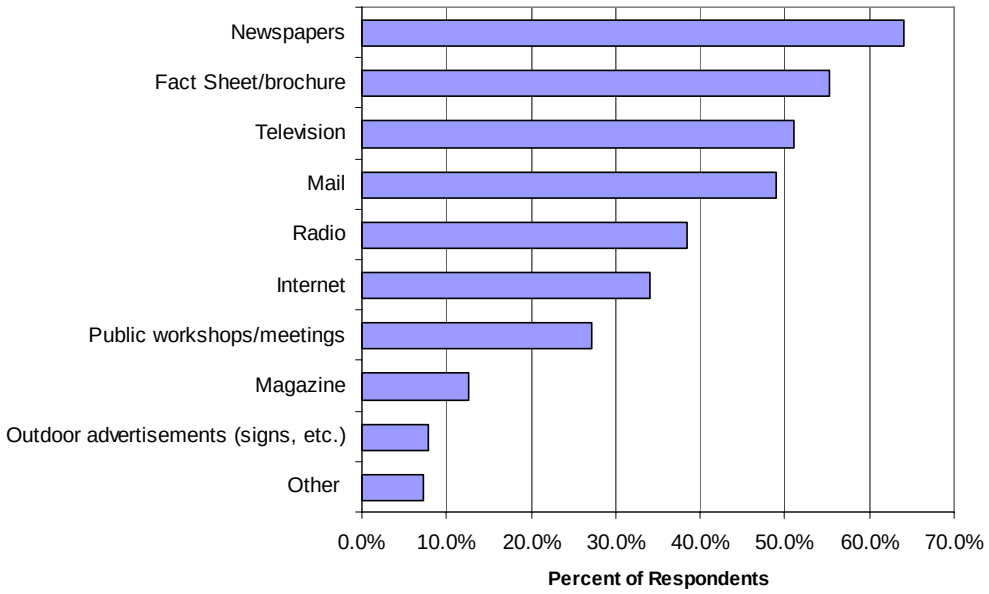
Figure 5. Survey Respondents' Preferred Sources of Information Regarding Household Preparedness



Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (Nov. 2007)

When asked what the most effective way was to receive information, respondents indicated that the local newspaper (64%), fact sheet/brochure (55%), television (51%), and mail (49%) were the most effective. Figure 6 shows how survey respondents rated the effectiveness of dissemination methods presented in the survey.

Figure 6. Survey Respondents' Ranking of Effectiveness of Selected Preparedness Outreach Methods



Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (November 2007)

Section V. Community Natural Hazard Preparedness

To assist the preparation of natural hazard mitigation plans, it is essential to understand the importance community members place on specific community-level risk reduction actions. These questions could help Coastal communities determine their citizens' priorities when planning for natural hazards. They also provide an idea of which types of risk reduction strategies citizens would be willing support. Table 6 illustrates the importance respondents placed on each potential natural hazard goal.

Over 95% of respondents indicated that it is very important or somewhat important to protect private property, protect critical facilities, and protect and reduce damage to utilities. The statement with the lowest priority (74%) is to protect historical and cultural landmarks.

Table 6. Survey Respondents' Goal Prioritization

Statements	Very Important	Somewhat Important	Neither Important nor Unimportant	Not Very Important	Not Important
A. Protecting private property	66.0%	29.0%	2.0%	2.5%	0.5%
B. Protecting critical facilities (e.g., transportation networks, hospitals, fire stations)	90.5%	8.5%	0.5%	0.5%	0.0%
C. Preventing development in hazard areas	58.7%	28.9%	9.0%	2.0%	1.5%
D. Enhancing the function of natural features (e.g., streams, wetlands)	49.0%	32.0%	11.5%	5.0%	2.5%
E. Protecting historical and cultural landmarks	26.4%	48.3%	15.9%	5.0%	4.5%
G. Protecting and reducing damage to utilities	74.1%	24.4%	1.0%	0.0%	0.5%
H. Strengthening emergency services (e.g.,- police, fire, ambulance)	73.4%	20.7%	3.9%	1.5%	0.5%
I. Disclosing natural hazard risks during real estate transactions	64.9%	25.7%	6.4%	2.0%	1.0%

Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (Nov. 2007)

There are a number of activities a community can undertake to reduce the risk from natural hazards. These activities can be both regulatory and non-regulatory. Table 7 shows respondents' general level of agreement regarding the community-wide strategies included in the survey.

Table 7. Survey Respondents' General Level of Agreement by Percentage Regarding Community-wide Strategies

Community-wide Strategies	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Not Sure
A. I support a regulatory approach to reducing risk.	19.4%	36.7%	20.4%	9.2%	9.7%	4.6%
B. I support a non-regulatory approach to reducing risk.	15.1%	41.1%	27.6%	7.3%	3.1%	5.7%
C. I support a mix of both regulatory and non-regulatory approaches to reducing risk.	27.3%	37.9%	18.7%	7.1%	3.5%	5.6%
D. I support policies to prohibit development in areas subject to natural hazards.	37.0%	36.0%	15.0%	6.5%	2.0%	3.5%
E. I support the use of tax dollars (federal and/or local) to compensate land owners for not developing in areas subject to natural hazards.	6.1%	8.1%	28.4%	33.5%	20.3%	3.6%
F. I support the use of local tax dollars to reduce risks and losses from natural disasters.	8.5%	46.3%	23.4%	9.0%	6.5%	6.5%
G. I support protecting historical and cultural structures.	12.5%	50.5%	27.0%	5.5%	2.5%	2.0%
H. I would be willing to make my home more disaster-resistant.	23.0%	52.0%	19.5%	2.0%	0.5%	3.0%
I. I support steps to safeguard the local economy following a disaster event.	21.6%	52.8%	18.6%	1.5%	1.5%	4.0%
J. I support improving the disaster preparedness of local schools.	39.8%	46.8%	10.9%	1.5%	0.0%	1.0%
K. I support a local inventory of at-risk buildings and infrastructure.	24.8%	46.5%	21.3%	2.5%	1.0%	4.0%
L. I support the disclosure of natural hazard risks during real estate transactions.	8.5%	46.3%	23.4%	9.0%	6.5%	6.5%

Source: Household Natural Hazards Preparedness Survey, Oregon Partnership for Disaster Resilience, (Nov. 2007)

As shown in Table 7, 87% of respondents indicated that they strongly agree or agree improving the disaster preparedness of local schools. Conversely, only 14% indicated that they strongly agree or agree to the use of tax dollars to compensate land owners for not developing in areas subject to natural hazards.

Summary

Survey respondents are most concerned about wind storms, earthquakes, and severe winter storms. Only half of them considered the possible occurrence of a natural hazard when they bought their homes. However, approximately sixty percent have talked with members of their household about what to do in the case of a natural hazard and twenty-five percent plan to develop a "Household/Family Emergency Plan". The best way to

communicate with these survey respondents is through the newspaper and they prefer information from the fire or rescue department. They think that the community should be involved in preparing for natural disasters, specifically by improving the preparedness of schools and developing a local inventory of at-risk buildings.

Open-ended Survey Responses

Q3.1 If "NO" for flood, what is the main reason your household doesn't not have insurance for flood events? (Other)

- Location not likely to be flooded
- The insurance companies use "act of god" as a clause for getting out of paying Insurers
- Located 200 ft above Col. River
- Had flood insurance 3 years. They did not send yearly bill around 2002. By the time I realized it my policy lapsed. To renew the premium doubled.

Q4.1 If "NO" for earthquake, what is the main reason your household does not have insurance for earthquake events? (Other)

- Never talked to insurance agent about it
- An insurance company likely not to pay out on large catastrophic widespread events…example is Katrina.
- Have not checked
- Rent
- The insurance companies use "act of god" as a clause for getting out of paying Insurers
- Would have to modify foundation
- Inspection rq'd not done
- Event unlikely
- Did not cover in the event of tsunami tidal surge
- No common earthquake action, but they expect a big one
- Faults offshore, homes on solid rock

Q12 County

- Clatsop (38)
- Coos (61)
- Curry (14)
- Douglas (5)
- Lane (18)
- Lincoln (36)
- Tillamook (24)

Q15 Please indicate your level of education (Other)

- Hotel-Motel MGMT
- Art

- State Certified CNA
- CDA
- Fire/police certified

Q17 Do you rent/own? (Other)

- Trailer (3)
- Single apartment over garage
- Cattle Ranch
- Mobile
- Farm
- Travel Trailer
- Business
- 2nd home/commercial
- Lakefront property

Q18 If you have lived in Oregon for less than 20 years, in what state did you live before you moved to Oregon? (Other)

- Arizona (2)
- Arkansas
- Florida (2)
- Louisiana
- Maine
- Maryland
- Minnesota
- Missouri
- Nevada (3)
- New York (3)
- North Carolina
- Ohio
- Pennsylvania
- Texas
- Utah (2)
- Vermont
- Wisconsin
- U.S.A.F-moved a lot
- 4th gen. Oregon
- Canada

Please feel free to provide any additional comments in the space provided below.

- Had earthquake insurance with Allstate, but the now no longer cover earthquakes. Terribly expensive to pick it up elsewhere!!!
- I do not believe the government (i.e. tax dollars) or insurance co. should be required to cover losses in areas known to be subjected to frequent natural risk.

- If building in known hazard area- any services needed in time of an emergency-should be paid by the builder/owner.
- Living on high hill in Astoria, Oregon. Have summer home at Cannon Beach, Oregon. Risky, as close to the ocean, but town has warning whistles, and good escape routes to high hills for safety.
- If this questionnaire is being used to assess individual preparedness in the event of a disaster, then I applaud it. I f it is going to be used to implement invasive, expensive gout programs to "safeguard" us, please reconsider. Political finger-pointing, has never been a good, substitute for well-trained, organized local efforts by police, fire, church, and individuals. Some will always be unprepared and some will be capable.
- Some areas of our valley (Hidden Valley-Toledo, OR) are in flood plain. I have neighbors with a great deal of their ranch –that is wetlands-for last several months-they have been spreading human waste over a large area. Water sources have been affected-Animals have been affected-also bringing in untreated animals-running them on human waste-they have brought in black-leg and pink eye-among other disasters in our area-including overuse of Round Up.
- I would be interested to hear your findings from this survey.
- I work for Oregon State Parks about 15 miles from our community. In order to take the job, I had to agree to have an emergency survival pack fro 2 persons, including an axe and first-aid kit for sutures, or sign a waiver stating OSP would not be responsible if I got stuck unprepared. I was amazed; given a list of necessary items I would need but never thought of (i.e. can opener, alcohol (whiskey), and H2O purification tabs). Educate.
- We took down a beautiful fir tree in front yard in 2006 because of possible falling hazard to house, wires and neighbors. More people should do more tree/shrub/brush trimming for falling/other hazards.
- New buildings should be required to be built to current knowledge for protection of feature occupants and hazards should be revealed on sale of any property.
- I hope you are using this information to educate. Non-regulatory education programs should be an incentive for home owners/land owners to get breaks on their insurance. Personally, I feel Insurance/other agencies use disasters to pump up economics (Disaster economics).
- With on degree in Geology and one in Biology, I'm painfully aware of where I live and I'm probably more prepared for an earthquake or tsunami than anyone living in my town. Enough said…
- Volunteer firefighter for 35 years. When possible, own generator.
- We live in a flood, fire, landslide, earthquake prone state…Most citizens are ignorant of that fact…That needs to change!
- Too many are either unaware or hazards or choose to disregard them, especially if doing so is more financially beneficial to them personally. Thank you for your efforts and interest pertaining to disaster preparedness.

- People who insist on developing in flood hazard and landslide hazard areas should not receive tax dollars to rebuild after a disaster.
- Since I live alone and in a very rural area, a lot of the questions do not necessarily affect me.
- Government intervention stops many projects near our small community. I am leery or our Willamette Valley. They control our communities with their uneducated ideas. What is happening in my community?
- Thank you.
- This state does not need more government to regulate citizens. LCDC is an excellent example of polarizing the public!
- A lot of planning needs to be done. We live in an area where there are many senior citizens who would need help in an emergency. With our tall trees, fire could easily cause a great problem, but no one seems to be concerned. We are! Thanks for your efforts. Keep it going.
- We need to plan to deal with the possibility that bridges along the Oregon coast might be damaged such as from an earthquake or tsunami. If bridges cannot be reinforced, then they should be replaced with more earthquake resistant structures. Also, if the coastal area would be cut off, can supplies be airlifted in? Is there such a plan in place? What about fuel supplies for emergency vehicles? How much medicine should one stockpile for emergencies?
- I would gladly do all I could to protect my family & home – cost is an obstacle, especially for home reinforcement. It is certainly hard to trust FEMA, et al – easier to trust local author. As more personally invested, but again, resources are a likely problem. Thanks for the chance to be involved.
- Disaster preparedness procedures for the disabled in resource poor areas.
- Preparing for natural disasters falls off the radar screen for most busy households! Unless it is in front of us (like the "Enter tsunami zone" signs) to remind us that we should be prepared, aware, plan for, etc. it just won't happen. The California wildfires showed us that recently.
- Living on the coast in Pacific City, the concern of a tsunami and its impact. How to deal with loss of roads, bridges, possibly home, etc.
- Our neighborhood has a disaster preparedness committee & information in our local phone book. We store water & water.
- The one disaster prep in this area is the tsunami warning. Every time they announce a trial run the locals all run to the ocean to see the "big wave" arrive. I can only envision more tax dollars wasted on such endeavors.
- I spent several hours reviewing this before answering. In my opinion it tells you nothing!! The information requested is too vague! It is biased in both political & financial concepts of the person filling it out. An example – I am totally opposed to development in hazard areas, but I support Measure 39 & oppose Measure 49. Government doesn't belong in this business because the wealthy are opposed can fight regulation,

but the middle & lower class cannot!! You have not dealt w/the interagency & intra-agency jurisdictional process that resulted in the Katrina fiasco. No one wants to be in charge (except egoist law enforcement) due to issues of liability & probably court & legal processes. No one has budgets for interagency tracking nor will agencies respond using the NIMNS structure. No agency is willing to release authority nor take on responsibility beyond what scope is provided by legislative action. I worked 27 years in emergency response in 4 different counties – you just can't make it happen. When the big one comes you better duck!!

- I believe it is unethical & often tragic to allow building on hazardous areas. Extremely short-sighted – self-defeating – to allow building on fragile ecosystems. I have to work to remember that the word "developer" is not a curse. Obviously, some developers are meticulous ethical. I feat that very few are & money motivates!
- Both husband & wife answered questions.
- Q-6. None of these choices are what I would describe as a "preferred choice!"
- I support any federal money to help/assist families upgrading homes and so on. Also, to assist emergency services (medical, FD), use of National Guard/Military to enforce public safety. DO NOT SUPPORT any spending for local gov. Private business, developers – these only help rich get richer at the expense of poor & middle class.
- Coastal communities are isolated by mountains to the east. Hwy 101 is the only link north & south and to roads leading east. Tsunamis are forecasted to hit Hwy 101, isolating many communities. I have seen nothing to indicate any planning to help isolated areas, nor plans to build additional roads.
- I think this subject is important and there are reasons why to bring it up. However, the chance of a natural disaster is very slim. I worry more about being in war with other nations. I also worry about issues like finding a better job, my son to go to a drug-free school, and to improve my financial and moral status for the good of my family!

Appendix F:
Community Organizations and Programs

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The County can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on a number of issues, one of which could be natural hazard preparedness and mitigation.

The tables on the following pages highlight organizations that are active within the community and may be potential partners for implementing mitigation actions. The three involvement methods are defined below.

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

Clatsop County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
4-H OSU Extension Service 2001 Marine Drive Astoria, OR 97103 (503) 325-8573 http://oregon.4h.oregonstate.edu	4-H	Clatsop County		✓						Youth resources
Alder Court 235 SW Alder Ave Warrenton OR 97146 (503) 861-3652	Subsidized housing available for the disabled	Warrenton			✓					Housing for Disabled
American Legion 1132 Exchange Astoria OR 97103 (503) 325-5771	Food Bank	Clatsop County				✓			✓	Emergency food for north county veterans
American Red Cross 1054 Exchange Astoria OR 97103 (503) 325-472	Red Cross	Clatsop County								CPR & First Aid training, provide comfort & care to victims, secure temporary shelters, provide snack or meals, address First Aide needs, offer crisis counseling & help with recovery planning.
Angel Adult Foster Home 3579 Harrison Ave Astoria OR 97103 (503) 325-6206	Disabled Adult Foster Home	Astoria			✓	✓				

Clatsop County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Astor Apartments Provides 342 14th St Accepts NOHA. Warrenton OR 97146 (503) 325-0171	Provides housing for the disabled	Warrenton			✓					Housing for Disabled
Astoria Clothing Bank Astoria Church of Christ 692 12th Street Astoria OR 97103 (503) 325-7398	Clothing Bank	Astoria						✓	✓	Provides free clothing to families.
Astoria Rescue Mission 62 W Bond Astoria OR 97103 (503) 325-6243	Homeless Shelter	Clatsop County							✓	Provides emergency shelter to men in a Christian based environment. Provides free clothing, food and beds
Astoria Senior Center Astoria OR 97103 (503) 325-3231	Senior Center	Astoria			✓					Provides senior needs, transportation
Bay View Care 1912 SE Front St Astoria OR 97103 (503) 325-4751	Disabled Adult Foster Home	Astoria			✓	✓				
Bev's Cupboard 91196 Hwy 101 Warrenton OR 97146 (503) 861-2041	Food Bank	Clatsop County							✓	Provides emergency food

Clatsop County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Boy Scouts of America 819 S Main Ave Warrenton OR 97146 (503) 861-9300 www.cpcbsa.org	Boy Scouts	Clatsop County		✓						Youth resources
Caring Options Child Care Resource & Referral #10 6th Street Suite 205-B Astoria OR 97103 (503) 325-1053	Child Care	Clatsop County		✓				✓		Provides a list of approved child care providers.
Clatsop Community Action 364 9th St Astoria OR 97103 (503) 325-1400 www.ccaservices.org	Administers a Lifespan Respite program which coordinates respite for caregivers of friends or family members.	Clatsop County			✓	✓		✓		Caregiver services
Clatsop Community Action 364 9th St Astoria OR 97103 (503) 325-1400 www.ccaservices.org	The mission of Clatsop Community Action is to help the working poor, the homeless & near homeless. We endeavor to help our clients meet basic needs like housing, food and other needs as they emerge in importance. We work as advocates on behalf of those we serve	Clatsop County		✓	✓	✓		✓	✓	• Housing for the homeless • Emergency Food Boxes • Store- personal & infant care items • Prescription Drug Assistance • Energy Assistance • Temporary Rental Assistance • Wood Lot in Astoria & Knappa offered October-May

Clatsop County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Clatsop Community College 1653 Jerome Astoria, OR 97103 (503) 325-0910 www.clatsopcollege.com	Community College	Clatsop County					✓			Offers classes in English as a Second Language (ESL).
Clatsop Emergency Food Bank First Presbyterian Church Get 1103 Grand Street Astoria OR 97103 (503) 325-1702	Food Bank	Astoria							✓	Provides emergency food
Clatsop Regional Food Bank Clatsop Community Action 364 9th St Astoria OR 97103 (503) 325-1400 www.ccaservices.org	Food Bank	Clatsop County							✓	Provides food to pantries, meal sites & shelters.
Coast Rehabilitation Services (503) 861-3372 65 N. Hwy 101, Warrenton, OR 97146	Developmental Disability Services			✓	✓	✓		✓		

Clatsop County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Coast Rehabilitation Services 65 N. Hwy 101 Suite 205 Warrenton OR 97146 (503) 861-3372	Residential group home care for developmentally disabled adults	Warrenton			✓					Housing for Disabled
Coastal Family Health Center 2055 Exchange St Suite 210 Astoria OR 97103 (503) 325-8315 www. coastalfhc.org	General health services	Clatsop County		✓		✓		✓		• Case management • pharmacy services • Immunizations • Laboratory services • Physicals
Columbia Community Mental Health Inc. (503) 325-9179, Ext. 332 or (503) 397-5211 Astoria, OR 97103	Developmental Disabilities Case Management: Provides service coordination to developmentally disabled persons of all ages.	Coumbia County (Clatsop County too)		✓	✓	✓		✓	✓	
Columbia Memorial Hospital 2111 Exchange Astoria OR 97103 (503) 325-4321 (800) 962-2407 www.columbiamemorial.org	Hospital	Clatsop County		✓	✓	✓		✓		Health services

Clatsop County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Commission on Children and Families Commission (503) 325-8500 Fax: (503) 325-8678 820 Exchange Street Suite 100 Astoria, OR 97103	Supports and distributes state funds to programs promoting the wellness of children and families. Leads the county planning process for assessing community needs and strengths.	Clatsop County		✓				✓	✓	
Community Dinner Program Grace Episcopal Church 1545 Franklin Astoria OR 97103 (503) 325-4691	Meal Services	Astoria							✓	Free meals on site
Dial-A-Ride / North West Ride Center 465 NE Skipanon Warrenton OR 97146 (800) 776-6406 www.ridethebus.org	Senior transportation	Clatsop County			✓	✓				Provides county-wide transportation for seniors & disabled persons.
Draper Senior Care 690 Jerome Astoria OR 97103 (503) 325-0565	Disabled Adult Foster Home	Astoria			✓	✓				

Clatsop County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Elk Creek Terrace 357 Elk Creek Road Cannon Beach OR 97110 (503) 436-9562 www.guardianmanagementllc.com	Provides affordable disabled housing.	Cannon Beach			✓					Housing for Disabled
Elks 324 Ave A Seaside OR 97138 (503) 738-6651	Elks lodge	Seaside								Will loan wheelchairs, walkers & crutches.
Forever Friends AFH 89529 Manion Dr Warrenton OR 97146 (503) 717-0763	Disabled Adult Foster Home	Warrenton			✓	✓				
Grace Food Pantry Emergency Grace Episcopal Church 1545 Franklin Astoria OR 97103 (503) 325-4691	Food Bank	Clatsop County							✓	Provides emergency food

Clatsop County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Health and Human Services Joell Archibald, Director 820 Exchange Street, Suite 100 Astoria, OR 97103 (503) 325-8500 www.co.clatsop.or.us	Immunizations, communicable disease control, HIV counseling and testing and sexually-transmitted disease testing and services, vital statistics, maternal and child health, WIC nutrition program, family planning, education and community outreach.	Clatsop County		✓		✓		✓	✓	
Hearts Care 296 Tyee St Hammond OR 97121 (503) 861-2518	Disabled Adult Foster Home	Hammond			✓	✓				
Hideaway Inn & Hostel Rooms 443 14th St Astoria OR 97103 (503) 325-6989 www.hideawayinnandhostel.com	Hostel / Shelter	Astoria						✓	✓	Emergency housing available.
Joyce Graber 501 Railroad Ave Gearhart OR 97138 (503) 738-6714	Disabled Adult Foster Home	Gearhart			✓	✓				

Clatsop County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Judy Shoop's AFH 52 NW Birch Ct Warrenton OR 97146 (503) 861-2535	Disabled Adult Foster Home	Warrenton			✓	✓				
Knappa Food Pantry 42889 Old Hwy 30 Knappa OR 97103 (503) 458-6492	Food Bank	between Fern Hill Rd & Bradley Point							✓	Provides emergency food boxes for the areas between Fern Hill Rd & Bradley Point.
LifeWorks Northwest (503) 338-6990 2911 Marine Drive, Suite B, Astoria, OR 97103 also 575 S Roosevelt Drive Suite B Seaside, OR 97138 Phone: 503-738-4074 Fax: 503-738-4059	Alcohol and Drug Prevention and Treatment Services			✓		✓		✓	✓	
Loaves & Fishes Peace Lutheran Church 565 12th St Astoria OR 97103 (503) 325-9693	Free Meal Services	Astoria			✓	✓				Meals-on-Wheels and on-site
Martin's Foster Home 91180 Hwy 101 Warrenton OR 97146 (503) 861-0356	Disabled Adult Foster Home	Warrenton			✓	✓				

Clatsop County
Existing Community Organizations

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			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Medix Ambulance Service, Inc. 2325 SE Dolphin Ave Warrenton OR 97146 (503) 861-1990	Private pre-hospital emergency care & ambulance transportation									Ambulance services
Meriweather Village 101 Madison Ave Astoria OR 97103 (503) 325-3072	Subsidized housing available to people who meet HUD's median family income limits & who are at least 62 or disabled.	Astoria			✓	✓			✓	Housing for Disabled
Northwest Oregon Housing Authority 147 S Main Ave Warrenton OR 97146 (503) 861-0119 (800) 927-9275 www.oraoha.org	We manage public housing and also transfer millions of dollars in federal rent assistance into local communities. Our partnerships with local non-profits and private sector businesses help build and preserve affordable housing that is vital to enhancing the livability of our communities. Meet the housing needs not being met by the private marketplace.	Clatsop, Columbia, and Tillamook Counties			✓			✓	✓	• Affordable Housing Units • Developmentally Disabled Housing • Elderly Housing • Housing for the Mentally Ill

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Existing Community Organizations

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			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
NorthWest Senior & Disability Services www.nwsds.org 450 West Marine Drive Suite 100 Astoria OR 97103 (503) 325-4543 or: 809 S Holladay Dr Seaside OR 97138 (503) 738-7050 (503) 738-8136 (TTY) (800) 442-8614 (toll free)	NWSDS provides a single point of entry to many government-sponsored services for seniors and people with disabilities through a network of program offices.	Clatsop, Marion, Polk, Tillamook and Yamhill Counties			✓	✓				o Food stamps o Medicaid o Administers Oregon Health Plan (OHP) o Adult Protective Services o Caregiver Registry for families who want to hire a caregiver
Oregon Disabilities Commission 1257 Ferry SE Salem OR 97310 (800) 358-3117 TTY www.odc.state.or.us	Advocate on behalf of Oregonians with disabilities.	Oregon			✓					Disability Services
Our Lady of Victory Catholic Church 120 Oceanway Seaside OR 97138 (503) 738-6161	Meal Services	Seaside							✓	Free meals on site
Our Savior's Lutheran Church 320 First Avenue Seaside OR 97138 (503) 738-6791	Food Bank	Seaside							✓	Provides emergency food

Clatsop County
Existing Community Organizations

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			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Owens-Adair Apartments 1508 Exchange St Astoria OR 97103 (503) 325-4785	Subsidized housing available to people who meet HUD's median family income limits & who are at least 62 or disabled.	Astoria			✓	✓			✓	Housing for Disabled
Pioneer House 76 W. Bond Astoria OR 97103 (503) 325-5510	Hostel / Shelter	Astoria						✓	✓	Provides emergency & transitional housing for families, couples, men with children & single women.
Providence Seaside Hospital 725 S Wahanna Rd Seaside OR 97138 (503) 717-7000 www.providence.org/northcoast/seaside_hospital/	Hospital	Clatsop County		✓	✓	✓		✓		Health services
Restoration House 208 N Holladay Seaside OR 97103 (503) 717-1102	Hostel / Shelter	Seaside			✓				✓	Serves as a men's halfway house
Riverside Recovery Center Thugz Off Drugz 1530 S Roosevelt Dr Seaside OR 97138 (503)-440-9357	Drug rehabilitation services	Clatsop County							✓	access to housing, food, clothing and structured living for addicts

Clatsop County
Existing Community Organizations

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			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
Riverview Place 940 Ridge Dr Astoria OR 97103 (503) 325-3252	Disabled Adult Foster Home	Astoria			✓	✓				
Robynn's Nest 110 South Place Astoria OR 97103 (503) 325-8830	Disabled Adult Foster Home	Astoria			✓	✓				
Seaside Headstart 1225 2nd Ave Seaside OR 97138 (503) 738-0873	Child & Family Development Preschool program for those who meet income guidelines &/or special needs children ages 3-4.	Seaside		✓				✓	✓	Child and Family Services
Seaside Youth Center 1140 Broadway Seaside OR 97138 (503) 738-3311 www.sunsetempire.com	Youth and Senior Center	Seaside		✓		✓				youth and senior resources
Seger House 20 Skyline Place Astoria OR 97103 (503) 325-3738	Disabled Adult Foster Home	Astoria			✓	✓				
Sharon's House 91371 Lewis & Clark Rd Astoria OR 97103 (503) 325-5001	Disabled Adult Foster Home	Astoria			✓	✓				

Clatsop County
Existing Community Organizations

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Social Security Administration 115 W Bond St Astoria, OR 97103 (503) 325-8845 (503) 338-6262	Social Security	Clatsop County				✓				• Issue replacement Medicare cards • Maintain the accuracy of the earnings record for workers • Process applications for Medicare enrollment • Process applications for original and duplicate Social Security Numbers • Process applications for retirement, survivor & disability benefits including Supplemental Security Income claims
South County Food Bank 880 Avenue A Seaside OR 97138	Food Bank	Seaside							✓	Provides emergency food
St. Anne's AFH 1164 Irving Ave Astoria OR 97103 (503) 338-6922	Disabled Adult Foster Home	Astoria			✓	✓				

Clatsop County
Existing Community Organizations

Name and Contact Information	Description	Service Area	Populations Served							Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	English Second Language	Families	Low Income	
State of Oregon Dept of Human Services Self Sufficiency Programs 450 Marine Dr Astoria Suite 200 OR 97103 Phone: (503) 325-2021 or (503) 325-2984 (TTY) or (800) 643-4606 (Toll Free)	Self Sufficiency Programs	Clatsop County						✓	✓	• Food Stamp Program • Temporary Assistance for Needy Families (TANF) • Administers Oregon Health Plan (OHP) & Family Health Insurance Assistance Programs (FHIAP)
State of Oregon Dept of Human Services Child Welfare Programs 450 Marine Dr Astoria Suite 210 OR 97103 (503) 325-9179 or (503) 325-2984 (TTY) or (800) 643-4606 (Toll Free)	Child Welfare Programs	Clatsop County		✓				✓		• Adoption services • Foster care
Sumuer Place 155 SE 14th Place Warrenton OR 97146 (503) 861-0883	Disabled Adult Foster Home	Warrenton			✓	✓				
Tammy's Adult Foster Care 1030 N Roosevelt Seaside OR 97138 (503) 717-1514	Disabled Adult Foster Home	Seaside			✓	✓				
Teresa Nichols 37671 Timber Lane Astoria OR 97103 (503) 325-5634	Disabled Adult Foster Home	Astoria			✓	✓				

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The Biz Center Clatsop Community College 1455 N Roosevelt Seaside Oregon 97138 (503) 738-3346 www.clatsopcollege.com/DEPT/CE/BIZCENTER/index.html	Business Training Center	Clatsop County	✓							Supporting business creation, development & improvement through training, information & counseling.
Warrenton Food Bank 1365 SW Main Warrenton OR 97146 (503) 861-2689	Food Bank	Warrenton, Hammond & Sunset Beach residents							✓	Provides emergency food
Warrenton/Astoria Headstart 200 SW 3rd Warrenton OR 97146 (503) 861-9681	Child & Family Development Preschool program for those who meet income guidelines	Warrenton		✓				✓	✓	Child and Family Services
Winter Light 4777 Cedar St Astoria OR 97103 (503) 325-3177	Adult Foster Home	Astoria			✓	✓				Senior services