Eugene/Springfield

Multi-Jurisdictional Natural Hazards Mitigation Plan

Report for:

The Cities of Eugene and Springfield, Oregon

Prepared by:

Oregon Partnership for Disaster Resilience

1209 University of Oregon

Eugene, OR 97403

October 2009

COUNCIL RESOLUTION NO. 4992

A RESOLUTION ADOPTING THE EUGENE/SPRINGFIELD MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN AND REPLACING THE PLAN ADOPTED BY RESOLUTION NO. 4814.

PASSED: 8/0

REJECTED:

OPPOSED:

ABSENT:

CONSIDERED: November 23, 2009

RESOLUTION NO. 4992

A RESOLUTION ADOPTING THE EUGENE/SPRINGFIELD MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN AND REPLACING THE PLAN ADOPTED BY RESOLUTION NO. 4814.

The City Council of the City of Eugene finds that:

A. On November 8, 2004, Resolution No. 4814 was adopted approving the October 13, 2004 "Multi-Hazard Mitigation Plan for the Eugene-Springfield Metropolitan Area." The Federal Emergency Management Agency requires that Natural Hazard Mitigation Plans be updated every five years.

B. The City of Eugene recognizes the threat that natural hazards pose to people and property within our community.

C. Undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences.

D. An adopted Multi-Jurisdictional Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs.

E. The City of Eugene fully participated in the FEMA-prescribed mitigation planning process to prepare the Multi-Jurisdictional Natural Hazards Mitigation Plan attached as Exhibit A.

F. The Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the "Eugene/Springfield Multi-Jurisdictional Natural Hazard Mitigation Plan," dated October 2009, and have pre-approved it contingent upon this official adoption of the participating governments and entities.

NOW, THEREFORE,

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF EUGENE, a Municipal Corporation of the State of Oregon, as follows:

Section 1. The "Eugene/Springfield Multi-Jurisdictional Natural Hazards Mitigation Plan" attached as Exhibit A is adopted and replaces the Plan adopted by Resolution No. 4814.

Section 2. The City Manager, or the Manager's designee, is requested to submit a copy of this Resolution, including Exhibit A, to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to obtain formal approval of the Plan .

Section 3. This Resolution is effective immediately upon its passage by the City Council.

The foregoing Resolution adopted the 23rd day of November, 2009.

Elizabeth Tourt

Acting City Recorder

Special Thanks & Acknowledgements

This Natural Hazards Mitigation Plan was developed through a regional partnership funded by the Federal Emergency Management Agency's Pre-Disaster Mitigation Competitive Grant Program. The grant was awarded to support the update of natural hazard mitigation plans for the Eugene and Springfield. The planning process utilized a four-phased planning process, plan templates and plan development support provided by the Partnership for Disaster Resilience at the University of Oregon.

Regional partners include:

- Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center
- Oregon Emergency Management
- Federal Emergency Management Agency, Region X
- Department of Geology and Mineral Industries

Project Steering Committee:

- City of Eugene Fire and Emergency Medical Services
- City of Eugene Emergency Manager
- City of Eugene Public Works
- City of Eugene Building Permit Services
- City of Eugene Risk Services Division
- American Red Cross
- Eugene Water and Electrical Board (EWEB)
- Williams Northwest Pipeline
- Lane Council of Governments GIS
- US Army Corps of Engineers
- City of Springfield City Engineer
- City of Springfield Technical Services
- McKenzie-Willamette Medical Center
- Rainbow Water District
- Springfield Utility Board (SUB)
- City of Springfield Fire Department
- City of Springfield Police Department

Project Managers:

- Joe Rizzi, Emergency Manager, City of Eugene
- Mark Walker, Assistant Fire Chief, City of Springfield
- Josh Bruce, Oregon Partnership for Disaster Resilience
- Adam Crawford, Oregon Partnership for Disaster Resilience
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Eugene/Springfield Natural Hazards Mitigation Plan

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Section 1: Introduction

What is Natural Hazard Mitigation?

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

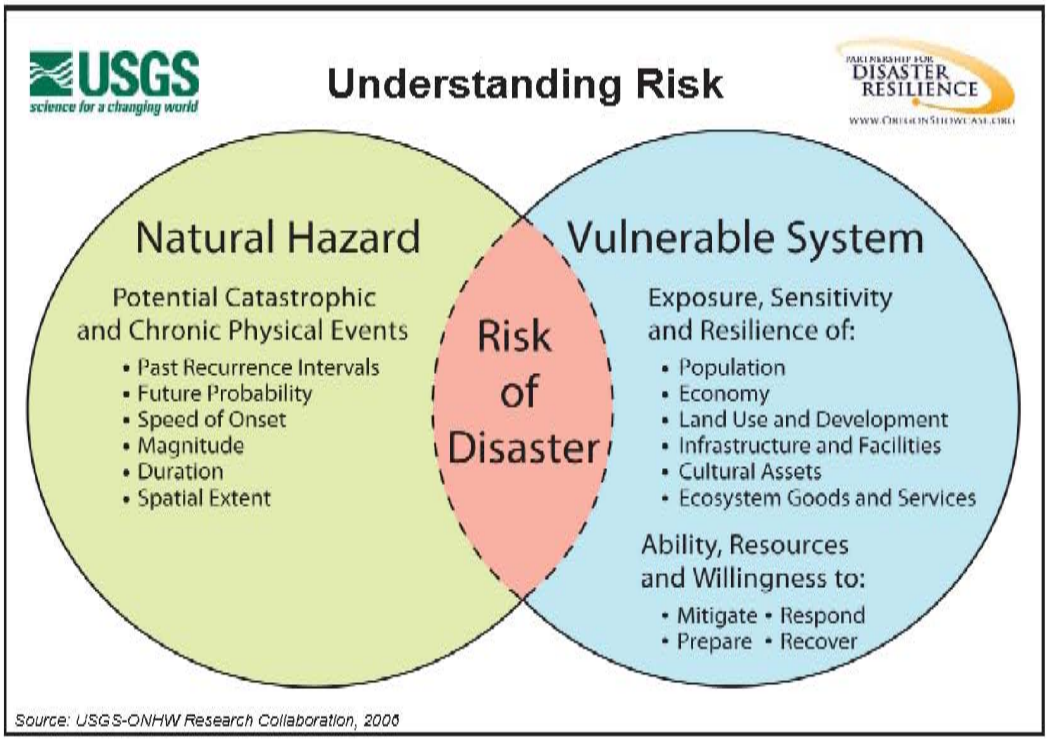
Engaging in mitigation activities provides jurisdictions with a number of benefits, including reduced loss of life, property, essential services, critical facilities and economic hardship; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within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

Why Develop a Mitigation Plan?

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

Figure 1.1 below is utilized throughout the plan to illustrate the concepts of risk reduction.

Figure 1.1 Understanding Risk



Source: Oregon Partnership for Disaster Resilience, 2006.

A natural hazard mitigation plan can assist the community in understanding what puts the community at risk. When a community can identify and understand the relationship between the natural hazards it faces, its vulnerable systems, and its existing capabilities, it becomes better equipped to identify and implement actions aimed at reducing the community's overall risk of disasters.

This plan focuses on the primary natural hazards that could affect Eugene and Springfield, Oregon, which include earthquakes, floods, landslides, severe weather, volcanoes, and wildland-urban interface fires. Also included are anthropogenic hazards like dam safety, hazardous materials, and terrorism. 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.[ii] This Natural Hazards Mitigation Plan is intended to assist Eugene and Springfield in reducing its risk from natural hazards by identifying resources, information, and strategies for risk reduction.

The plan is strategic and non-regulatory in nature, meaning that it does not set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the cities; (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 municipal plans and programs including Comprehensive Land Use Plans, Emergency Response and Recovery Plans, Capital Improvement Plans 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, and the implementation of preventative activities such as land use management programs. The actions described in the plan are intended to be implemented through existing plans and programs within Eugene and Springfield.

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 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 both the Eugene and Springfield *Metro Plan* (the comprehensive plan), and helps Eugene and Springfield 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 disasters before they occur. As such, this Act established the Pre-Disaster Mitigation (PDM) grant program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP). Section 322 of the Act specifically addresses mitigation planning at the state and local levels. State and local communities must have approved mitigation plans in place in order to

qualify to receive post-disaster HMGP funds. Mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to the individual and their capabilities.

How was the Plan Developed?

Development of the 2004 Eugene/Springfield Natural Hazards Mitigation Plan

Historical Mitigation Planning Efforts in Lane County

Mitigation planning efforts for the Eugene/Springfield metro area first occurred following the devastating flooding events of 1996 that impacted Lane County and both cities. After 1996, mitigation planning efforts began with the establishment of a Regional Emergency Management Coordinating Council (REMCC), which included representatives from Lane County and Eugene/Springfield, as well as Benton, Lincoln, and Linn Counties. Planning efforts continued through 2002, with numerous public meetings for local organizations and residents. This planning process resulted in a three volume Regional All-Hazard Mitigation Plan that was prepared and adopted by each of the counties, including Lane County.

Development of the 2004 Eugene/Springfield Mitigation Plan

The development of the 2004 Eugene/Springfield Natural Hazards Mitigation Plan built upon the previous mitigation planning efforts in Lane County. Beginning in December 2003, Ken Goettel from Goettel & Associates facilitated the planning efforts for the Eugene/Springfield Mitigation Plan. A Natural Hazards Mitigation Technical Advisory Committee was established to oversee development of the plan, and members were recruited through direct mailing of invitations and through personal contacts. The Technical Advisory Committee also made use of the Disaster Operations Task Team in Eugene and the Emergency Management Committee in Springfield which both have representatives from Police, Fire/EMS, Public Works and the Planning/Development Departments. Each of these committees met monthly, and updates and changes to the plan were provided to the committees on an ongoing basis.

In December of 2003, a public meeting was held to discuss natural hazard mitigation planning. Notification of this meeting was issued by invitation to a list of individual stakeholders, which included local utility companies, real estate and development interests, Army Corps of Engineers, American Red Cross, Williams Northwest Pipeline, Rainbow Water District, Lane Council of Governments, Eugene Water and Electric Board and staff from the Cities of Eugene and Springfield. The agenda for the meeting included the following:

1. An overview of hazard planning, presented by Kenneth Goettel of Goettel & Associates Inc.,

2. Identification of problems caused by natural hazards in the Eugene/Springfield metro area, and

3. Potential solutions to the identified problems.

The meeting was attended by 15 of the various representatives invited to the meeting. Information gathered from this meeting was used to develop the hazard chapters of the plan and draft mitigation actions.

Once a final draft of the plan was complete, the Technical Advisory Committee sought review and comments from city staff and Utility Boards. Two meetings were held--June 14, 2004 and July 14, 2004--with staff from the Cities of Eugene and Springfield. Also present was staff from Springfield Utility Board (SUB) and Eugene Water and Electric Board (EWEB). The focus of the meetings was to elicit comments and changes necessary for Chapter 4 "Plan Goals, Mitigation Strategies and Action Items". Those items were then incorporated into the final draft issued for public review and comment.

On September 13 and 16, 2004, a series of public meetings were held in Eugene and Springfield to review a final draft of the plan. Participants in this meeting included the same stakeholders from the December 2003 meeting plus the following:

1. City residents

2. Local businesses

3. Planning commissions

In addition, the draft plan was made available on the city of Eugene web site, and comments on the plan were incorporated into the final draft submitted to Oregon Emergency Management and FEMA for review.

The Eugene and Springfield city councils adopted the Eugene/Springfield Natural Hazards Mitigation Plan in November 2004.

Continued public involvement was maintained through posting information on the internet. Information and updates to the Mitigation Plan are available on the Eugene Emergency Management web page, in addition to other links to emergency information resources.

Development of the 2009 Eugene/Springfield Natural Hazards Mitigation Plan Update

Originally adopted in November 2004, the Eugene/Springfield Natural Hazards Mitigation Plan was due for an update by November of 2009 to remain eligible for federal mitigation funding. Beginning in fall 2008, 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 Eugene and Springfield to develop a Pre-Disaster Mitigation planning proposal to update the Eugene/Springfield Natural Hazards Mitigation Plan. Each city joined

OPDR by signing a Memorandum of Understanding to update the plan. In the summer of 2009, FEMA awarded a Pre-Disaster Mitigation grant to support the update of the natural hazard mitigation plan for the two cities, and local planning efforts began shortly thereafter. OPDR facilitated and documented the cities' plan update process.

Joe Rizzi, the Eugene Emergency Program Manager, and Mark Walker, Assistant Fire Chief of Springfield, served as the local community leads for Eugene and Springfield respectively. The project leads decided to have two separate steering committees to update their joint plan, and they were responsible for creating their respective jurisdictions' steering committees.

Participant organizations in the Eugene steering committee included:

- City of Eugene Fire and Emergency Medical Services
- City of Eugene Emergency Manager
- City of Eugene Public Works
- City of Eugene Building Permit Services
- City of Eugene Risk Services Division
- American Red Cross
- Eugene Water and Electrical Board (EWEB)
- Williams Northwest Pipeline
- Lane Council of Governments GIS
- US Army Corps of Engineers

Participant organizations in the Springfield steering committee included:

- City of Springfield City Engineer
- City of Springfield Technical Services
- McKenzie-Willamette Medical Center
- Rainbow Water District
- Springfield Utility Board (SUB)
- City of Springfield Fire Department
- City of Springfield Police Department

Although Eugene and Springfield had separate steering committees with different meeting times and places, steering committee members were encouraged to participate in the other city's meeting.

The planning process and associated resources used to update the Eugene/Springfield Natural Hazards Mitigation Plan were developed by OPDR. OPDR worked closely with steering committees from the city of Eugene and Springfield to review and update the plan's risk assessment, the mitigation actions, and the plan implementation and maintenance process. This planning process was designed to: (1) result in an updated

plan that is Disaster Mitigation Act 2000 compliant; (2) coordinate with the State's plan and activities of *the Partnership*; (3) build a network of local organizations that can play an active role in plan implementation; and (4) reflect any changes or new information that occurred since the plan's initial adoption in 2004. The following is a summary of major activities included in the planning process.

Plan Work Sessions

Plan Update Kickoff and Hazard Identification Work Session (August 2009)

OPDR held kickoff meetings on August 10 in Eugene and August 24 in Springfield with each city's steering committee. The purpose of the meetings was to (1) introduce committee members to the update planning process; (2) review and update previous occurrences of natural hazards; and (3) review and update the each city's probability and vulnerability estimates. Using information gathered from this meeting, OPDR updated the hazard chapters of the mitigation plan with new hazard and vulnerability information as well as probability and vulnerability estimates. Meeting materials and sign-in sheets from the August meetings can be found in Appendix C Public Process.

Goals and Action Item Work Session (September 2009)

OPDR held a goals and action item work session in Eugene on September 10 and in Springfield on September 15 with each city's steering committee. The purpose of the work sessions was to (1) review the goals of the Eugene/Springfield Natural Hazards Mitigation Plan; (2) review the status of original action items found in the plan; (3) develop and discuss new action items for the plan based on updated hazard and vulnerability information.

For each action item found in the 2004 plan, the city steering committees indicated whether it had been completed or not and why. The steering committees also indicated which actions should be continued or deleted for the 2009 update. Finally, both steering committees discussed new action items that would be included in the 2009 update. To ensure that the list of recommended actions from the city of Eugene corresponded with the list from the city of Springfield, OPDR facilitated a joint meeting with the city leads on September 23 which resulted in a finalized list of new action items for the 2009 update. The new list of action items for the 2009 update are located in Appendix A, while the list of actions from the 2004 plan, and their status, can be found in Appendix B. In addition, work session materials and sign-in sheets from the September meetings can be found in Appendix C Public Process.

Plan Implementation and Maintenance (October 2009)

OPDR held a plan implementation and maintenance work session in Eugene on October 6 and in Springfield on October 8 with each city's steering committee. The purpose of the work sessions was to (1) review the

FEMA requirements relating to plan implementation and maintenance; (2) identify potential funding sources for the implementation of action items; (3) discuss any final edits or changes the steering committees would like to make.

During the work sessions the steering committees also finalized conveners would be whomever holds the emergency management portfolios within Eugene and Springfield (currently Joe Rizzi and Mark Walker respectively) and identified that the Mitigation Sub-Committee of the Lane Preparedness Coalition as the coordinating body.

Public Involvement

Stakeholder Survey

As part of the regional public involvement effort, OPDR developed and distributed an online survey to a select group of stakeholders in Eugene and Springfield. These stakeholders were chosen by the community leads and represent local businesses, neighboring communities, and organizations that may be impacted by natural hazards in Eugene and Springfield. Representatives from the following organizations were contacted via email to participate in the survey:

- Eugene Public Works Maintenance
- Eugene Public Works, Engineering
- Rainbow Water District
- Central Lane (9-1-1) Communications/Eugene Police Department
- Springfield Fire and Life Safety
- City of Springfield Development Services Dept.
- Springfield Metropolitan Wastewater Management Commission (MWMC)
- Williams Northwest Pipeline
- Lane Council of Governments
- Eugene Fire and EMS
- Springfield Fire & Life Safety
- Oregon Department of Forestry
- Lane County of Governments: Government Services Division
- McKenzie Willamette Medical Center
- Oregon Department of Forestry - Eastern Lane
- Eugene Planning and Development

Results from the online survey were used to inform the mitigation plan's risk assessment and mitigation actions. Please see Appendix C Public Process, for a summary of the survey results.

Plan Review

The Eugene and Springfield steering committees served as the primary plan reviewers. Upon completion of a final draft, Eugene and Springfield posted a copy on their city websites, sent out a press release that described the update planning process, and requested feedback on plan content. A

notice was posted in the Eugene Register Guard on September 25, 2009 regarding the up-coming comment period on the draft natural hazard mitigation plan.

The Eugene and Springfield city websites posted the following information:

> ***For Immediate Release: The cities of Eugene and Springfield seek public input on update to Multi-Jurisdictional Natural Hazards Mitigation Plan***
> *(Eugene/Springfield, OR) – The cities of Eugene and Springfield are currently in the process of updating the existing multi-jurisdictional Natural Hazards Mitigation Plan for the two cities. This work is being performed in cooperation with the Oregon Partnership for Disaster Resilience and Oregon Emergency Management utilizing funds obtained from the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Grant Program. With re-adoption of the plan, the cities of Eugene and Springfield will maintain their eligibility to apply for federal funding towards natural hazard mitigation projects. This local planning process includes a wide range of representatives from city government, local utility providers, the Red Cross, LCOG and the Army Corps of Engineers, among others.*
>
> *A natural hazards mitigation plan provides communities with a set of goals, action items, and resources designed to reduce risk from future natural disaster events. 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. A draft version of the updated Eugene/Springfield Natural Hazard Mitigation Plan will be available for public comment between September 30 and October 13, 2009. Copies of the plan will be available on both the City of Eugene and City of Springfield websites and at www.oregonshowcase.org.*
>
> *If you have any questions regarding the Eugene/Springfield Natural Hazard Mitigation Plan or the update process in general, please call Josh Bruce, Project Director for the Oregon Partnership for Disaster Resilience at (541) 346-7326 or e-mail jdbruce@uoregon.edu.*

Additionally, fourteen of the stakeholders that participated in the stakeholder survey also volunteered to review plan drafts. The steering committees contacted those persons during the final review process.

Steering committee leads from the cities of Eugene and Springfield also spoke about the opportunity for public input at the Eugene and Springfield city council meetings.

All public outreach occurred between September 25 and October 9, 2009. The committee implemented public feedback / recommendations where appropriate.

The final adopted and approved plan will be posted on the University of Oregon Libraries' Scholar's Bank Digital Archive.

Development of the 2014 Eugene/Springfield Natural Hazards Mitigation Plan Update

To be completed in 2014.

How is the Plan Organized?

Each section of the mitigation plan provides specific information and resources to assist readers in understanding the hazard-specific issues facing Eugene and Springfield citizens, businesses, and the environment. Combined, the sections work in synergy to create a mitigation plan that furthers the community's mission to "Create disaster resilient and sustainable cities." This plan structure enables stakeholders to use the section(s) of interest to them.

Volume I: Natural Hazards Mitigation Plan

Section 1: Introduction

The Introduction briefly describes the Eugene/Springfield mitigation planning effort and the methodology used to develop the 2004 plan and the 2009 plan update.

Section 2: Community Overview

This section discusses the population, economy, housing, transportation, and land use characteristics of the Eugene/Springfield area. It also discusses the government structure of both communities, lists existing plans, policies, and programs that could be used to incorporate mitigation activities, lists community organizations, summarizes existing mitigation activities, and provides an overview of the hazards addressed in the plan. This section allows readers to gain an understanding of the community's sensitivities—those community assets and characteristics that may be impacted by natural hazards—and a community's resilience capabilities, which describe a community's ability to manage risk and adapt to hazard event impacts.

Section 3: Mission, Goals and Action Items

This section documents the plan, vision, mission, goals, and actions and also describes the components that guide implementation of the identified mitigation strategies. Actions are based on community sensitivity and

resilience factors, as well as the hazard assessments described in Volume I: Section 2 and Volume II: Hazard Annexes.

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 maintaining and updating the plan at semi-annual and 5-year review meetings.

Volume II

Hazard-Specific Annexes

The hazard-specific 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 hazards addressed within this plan include:

Earthquake;

Flood;

Landslide/Debris Flow;

Volcanic Event;

Wildfire;

Winter Storm.

Dam Safety

Terrorism

Hazardous Materials

Volume III

Resource Appendices

The resource appendices are designed to provide the users of the Eugene/Springfield 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: 2009 Action Item Forms

This appendix contains the current action items for the 2009 update. It is a compilation of actions continued from the 2004 version of this plan and new action items developed during the 2009 update process. For reference, the mitigation actions from the 2004 plan are included in Appendix B.

Appendix B: 2004 Action Items

This appendix contains the action items from the 2004 version of the plan. The action items have been put into action item forms and the status of each action, whether it has been completed or not, and whether it is continued in the 2009 update, is indicated in the action item status field.

Appendix C: Planning and Public Process

This appendix includes documentation of all the 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 D: Economic Analysis of Natural Hazards Mitigation Projects

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

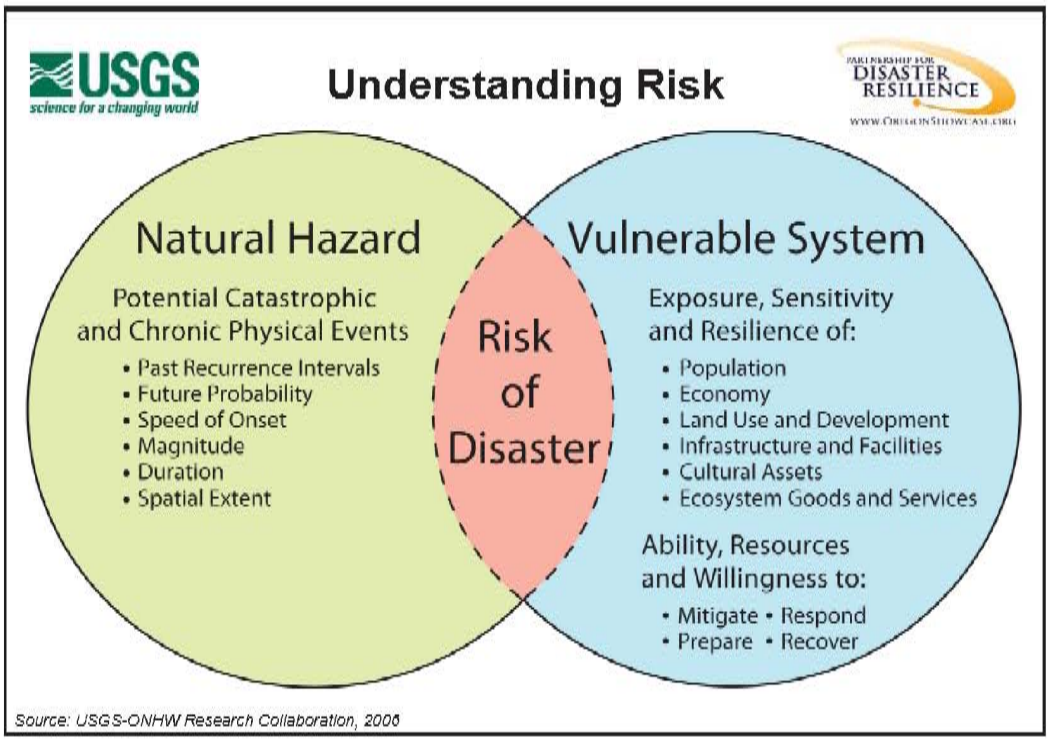
Appendix E: Grant Programs

This appendix lists state and federal resources and grant programs that can assist in action item implementation.

Section 2
Community Profile

The following section describes the cities of Eugene and Springfield from a number of perspectives in order to help define and understand the cities' 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 cities when the plan was developed. The information documented below, along with the risk assessments located below, should be used as the local level rationale for the risk reduction actions identified at the end of this plan in Appendix A. 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 2.1 Understanding Risk



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

Geography and Climate

The Eugene/Springfield area is located in the south end of the Willamette Valley, at the confluence of the Willamette and McKenzie Rivers, between the Coast Range and the Cascade Mountains. The Eugene/Springfield area contains a diversity of landscapes: wetlands, rivers, lakes, creeks, riparian vegetation, grasslands, buttes, and foothills.

In addition to the Willamette and McKenzie Rivers, there are numerous creeks and a canal system running through the area as well as several large lakes and reservoirs including Fern Ridge Reservoir.

The climate for the Eugene/Springfield area is moderate. The average range of high temperature in January is 46 degrees while the average low is 34 degrees. In August the average high is about 82 degrees with an average low of 51 degrees. The recorded annual range of daily annual temperatures is between 42 and 64 degrees. Each year the Eugene/Springfield area receives about 38 inches of precipitation.[iii]

Population and Demographics

The Eugene/Springfield area is the second largest metropolitan area in Oregon. In 2008, the estimated population for Lane County was 345,880. The 2008 population estimates for the cities of Eugene and Springfield were 154,620 and 58,005, respectively. The 2008 estimates are about 22.3% higher than the 2000 estimates for Eugene and 18.4% higher for Springfield (See Table 2.1 below).

Table 2.1 Population Change from 1990 to 2008

Year	Lane County	% Change	Eugene	% Change	Springfield	% Change
1990	282,912	-	112,733	-	44,664	-
2000	322,977	14.2%	137,893	22.3%	52,864	18.4%
2008	345,880	7.1%	154,620	12.1%	58,005	9.7%

Source: Portland State University; 2008 Oregon Population Report,

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. Children rely on parents or guardians for their well-being. Elderly individuals require special consideration due to their sensitivities to heat and cold, their reliance upon public transportation for medications, and their comparative difficulty in making home modifications that reduce risk to hazards. Persons that don't speak English or only speak it as a second language may have difficulty communicating their needs to authorities. Conversely, authorities might have difficulty communicating and reaching out to that population. Portions of the Eugene/Springfield residents fall into these special needs populations.

As shown in Table 2.2 below, the Eugene/Springfield area has a substantial population of children and elderly adults. In Eugene and Springfield, the population of residents less than 18 years old is estimated to be 18% and 25%, respectively. Additionally, the population of residents 65 years and over is 13% and 11%.

Table 2.2 Population by Age 2007

Age	Lane County	Eugene	Springfield
Under 5 Years	5.3%	4.5%	8.0%
Under 18 Years	20.5%	18.0%	24.8%
18 years and over	79.5%	82.0%	75.2%
18 years to 65 years	65.6%	68.6%	64.6%
65 years and over	13.9%	13.4%	10.5%

Source: US Census Bureau, 2005-2007 American Community Survey 3-Year Estimates "Age and Sex"

Table 2.3 outlines median household and median family income, percentage of families that live below the poverty line and families that live below the poverty line and have children who are aged less than 18 years old. For example in the table below, even though only 10.1%of the total families in Eugene live below the poverty level, 15.1% of families with children under 18 do so as well. Persons with lower income have less opportunity to make their homes more hazard-resilient.

Table 2.3 Selected Economic Data

Incomes and poverty levels	Lane County	Eugene	Springfield
Median household income	$42,079	$40,207	$37,395
Median family income	$54,100	$56,555	$44,083
All families below poverty level	9.6%	10.1%	14.9%
Families with children under 18 below poverty level	15.8%	15.1%	23.1%

Source: US Census, 2005-2007 American Community Survey 3-Year Estimates "Fact Sheet" and "Poverty Status in the Past 12 Months of Families"

Table 2.4 describes the percentage of the population in the Eugene/Springfield area, divided by age, that is disabled. The disabled are a high needs population that must be considered when planning for emergencies. Almost 42% of Eugene's elderly population is classified as disabled while roughly 45% of Springfield's elderly population is considered disabled.

Table 2.4 Percentage of Disabled Populations 2007

Disability	Lane County	Eugene	Springfield
5 to 15 years	7.7%	7.9%	9.1%
16 to 64 years	15.2%	12.4%	19.1%
65 years and over	39.8%	41.8%	45.1%
Total population 5 years and over	**17.6%**	**15.3%**	**20.4%**

Source: US Census Bureau 2005-2007, American Community Survey 3-Year Estimates "Disability Status"

A final population that must be considered in emergency planning is non-English speakers and English as a second langue. Table 2.5 lists the race and language spoken at home populations in the Eugene/Springfield area. As shown in Table 5 below, the cities of Eugene and Springfield have between 15% and 17% of the population whose primary language spoken at home is not English.

Table 2.5 Population by Race and Language Spoken at Home 2007

Language Spoken at Home	Lane County	Eugene	Springfield
Only English	84.8%	82.9%	n/a
Spanish or Spanish Creole	5.4%	5.8%	n/a
Other language	9.9%	12.6%	n/a

Source: US Census Bureau, 2005-2007 American Community Survey 3-Year Estimates "Age and Sex" and "Characteristics of People by Language Spoken at Home"

Employment and Economics

When Eugene and Springfield were first founded, the economy was largely agrarian; wheat was the first commercial crop. Industrialization began in the 1850s with the construction of millraces to provide water power for flour mills, lumber mills, and later for woolen mills. The Willamette River was the major transportation artery for the region. In the 1870s, development accelerated when the railroad from California reached Eugene. Through the mid-20th century, the lumber industry was a very important segment of the local economy. However, by the 1990s, the lumber industry had declined in importance, with economic growth in new sectors, including the medical and high-tech sector. Currently, the major employment categories in the Eugene/Springfield area are medical, wood products, and the high-tech sector.

Education has been a major segment of the regional economy since the founding of the University of Oregon in 1872. The creation of several private colleges and Lane Community College has added to the importance of the education sector. Table 2.6 below indicates the major industries in the Eugene/Springfield area.

Table 2.6 Employment by Industry

Industry	Number	Percent
Educational, health and social sciences	34,283	22.1%
Manufacturing	22,170	14.3%
Retail Trade	21,223	13.7%
Professional, scientific, management, administrative, and waste management services	13,468	8.7%
Arts, entertainment, recreation, accommodation and food services	12,450	8.0%
Construction	10,112	6.5%
Other services (except public administration)	8,555	5.5%
Finance, insurance, real estate, and rental and leasing	8,158	5.2%
Transportation and warehousing, and utilities	6,585	4.2%
Wholesale trade	5,725	3.7%
Public administration	5,132	3.3%
Information	3,947	2.5%
Agriculture, forestry, fishing and hunting, and mining	3,652	2.3%
Total	**155,460**	**100.0%**

Source: US Census, "Profile of Selected Economic Characteristics: 2000"

Transportation

Transportation is an important consideration when planning for emergency service provisions. Growth within the cities will put pressure on the major and minor roads, the airport, rail systems, and the rivers. Eugene/Springfield's location in central Lane County between the Coast Range and Cascades and on the convergence of the Willamette and McKenzie Rivers has made the area a longstanding choice for transportation interchanges to occur.

Interstate 5, the major road that connects Oregon to Washington and California, runs between the cities of Eugene and Springfield. State Highway 99 also runs north-south through the city of Eugene, connecting the area to Junction City to the north and Goshen to the south. State Highway 126 runs east-west through both Eugene and Springfield connecting the cities to nearby communities such as Walterville to the east and Veneta to the west.

Union Pacific owns and operates rail that runs north-southeast through Eugene. Additionally, there is a smaller cargo rail connecting the Eugene/Springfield area to the coast. Amtrak also runs passenger trains daily through the Eugene/Springfield area.

The Eugene/Springfield area is also home to the Eugene Airport, which is the second largest airport in Oregon and fifth largest airport in the Pacific Northwest. The Eugene Airport serves a six county region and connects the Eugene/Springfield area to large and small western cities such as Portland, Seattle, Medford, and Salt Lake City. The airport is owned and operated by the city of Eugene.[iv]

Please see transportation maps for Eugene and Springfield on Figures 2.2 and 2.3 respectively.

Figure 2.2 Eugene Transportation Map

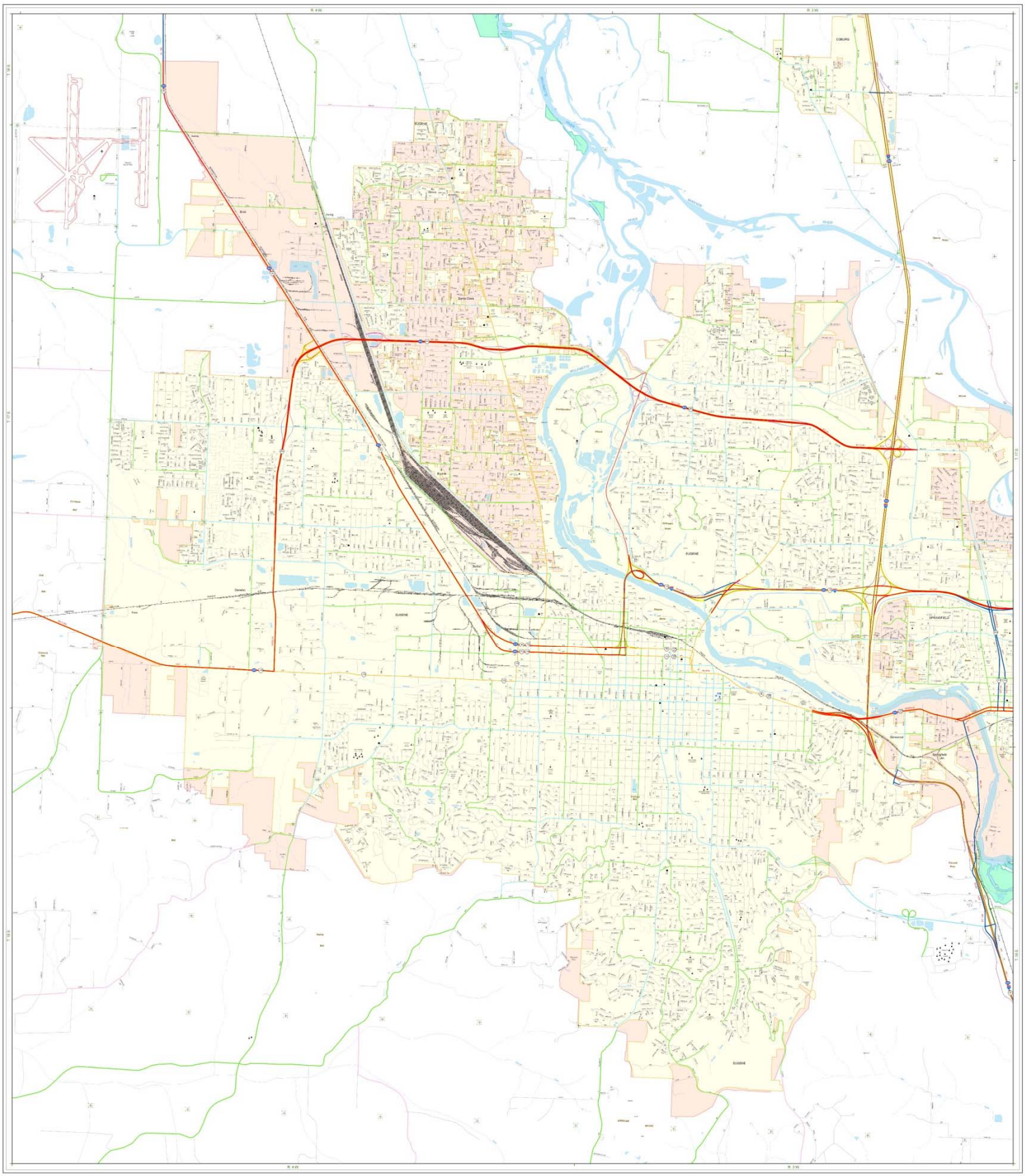
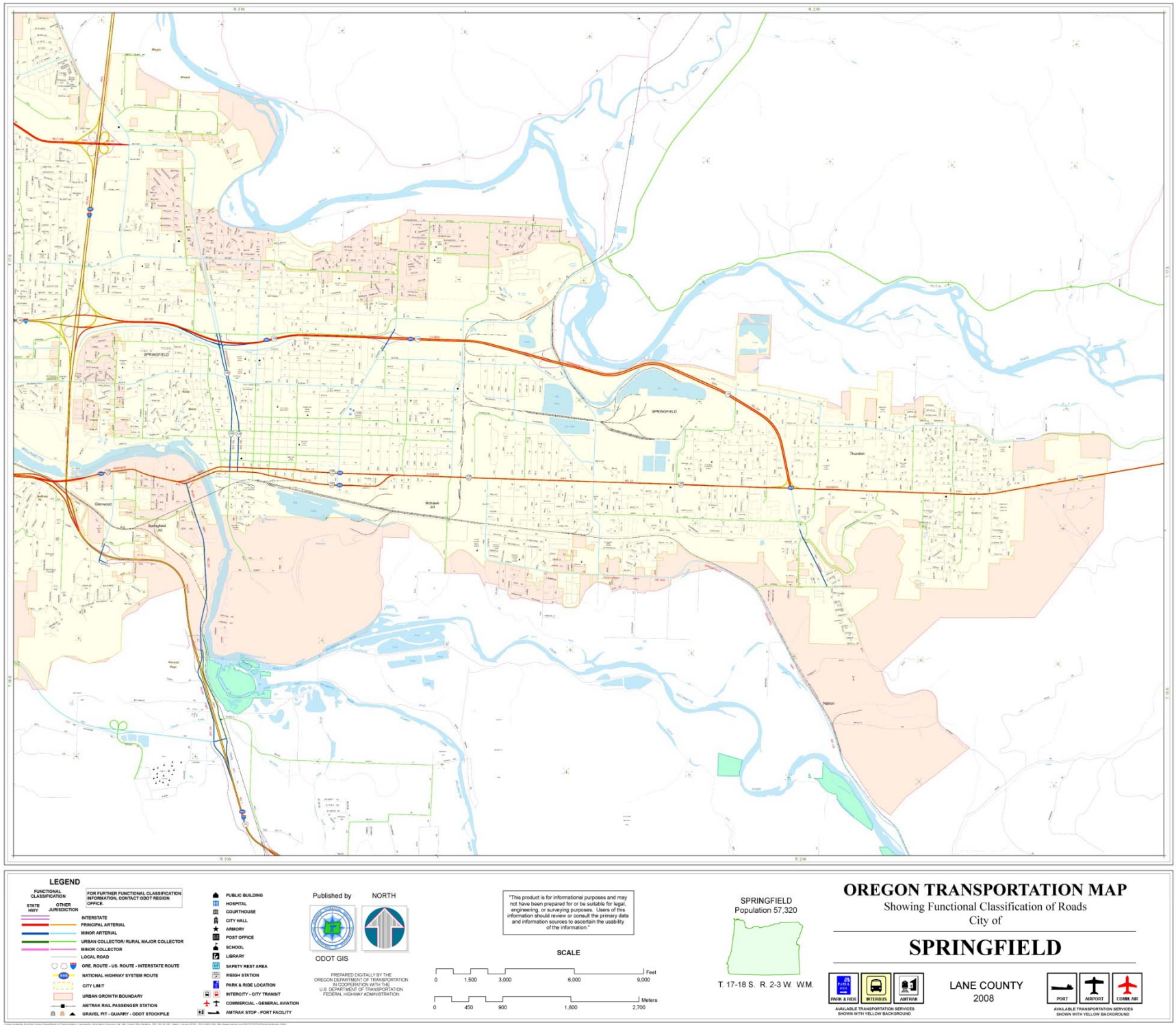


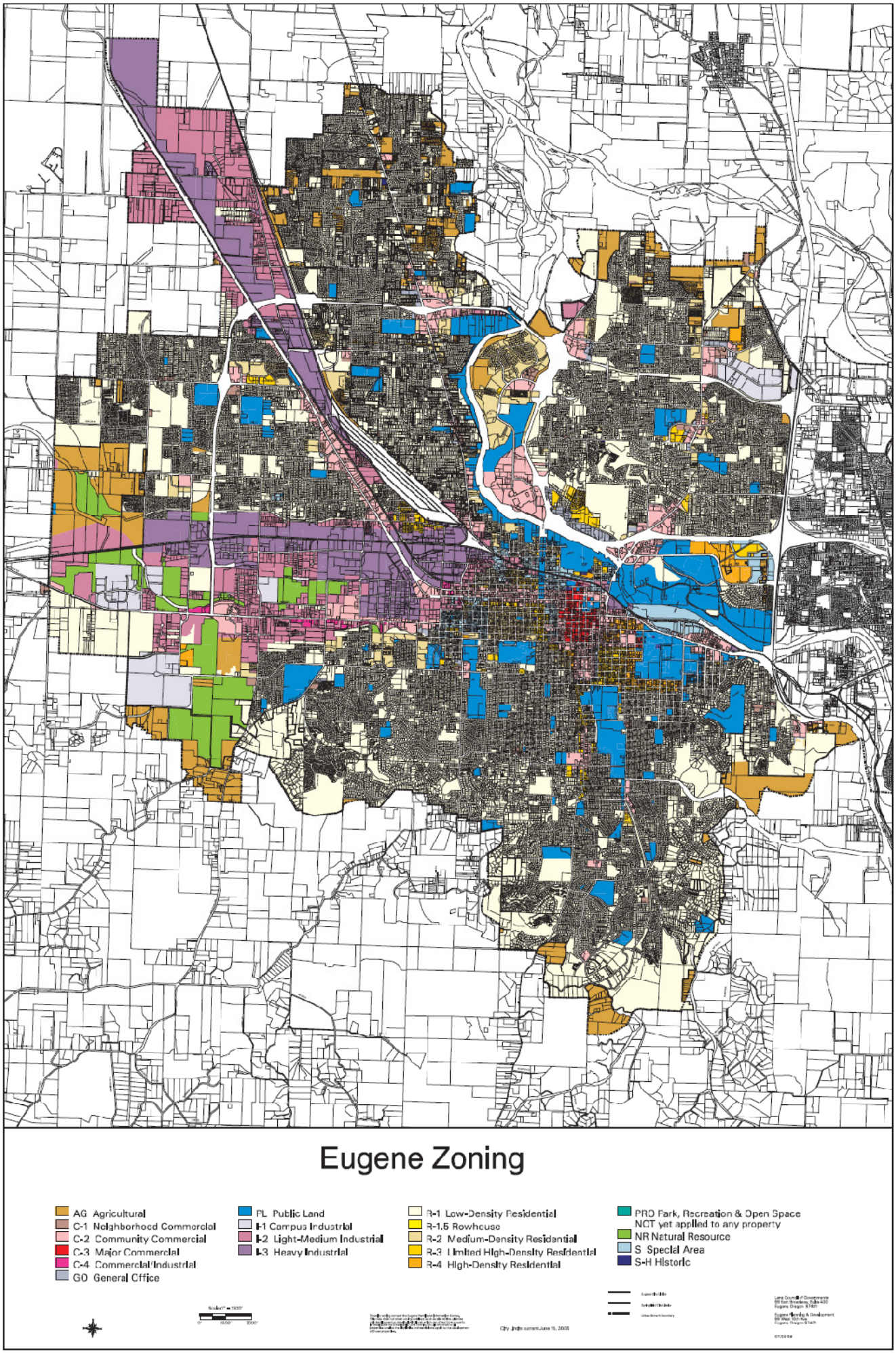
Figure 2.3 Springfield Transportation Map



Land Use

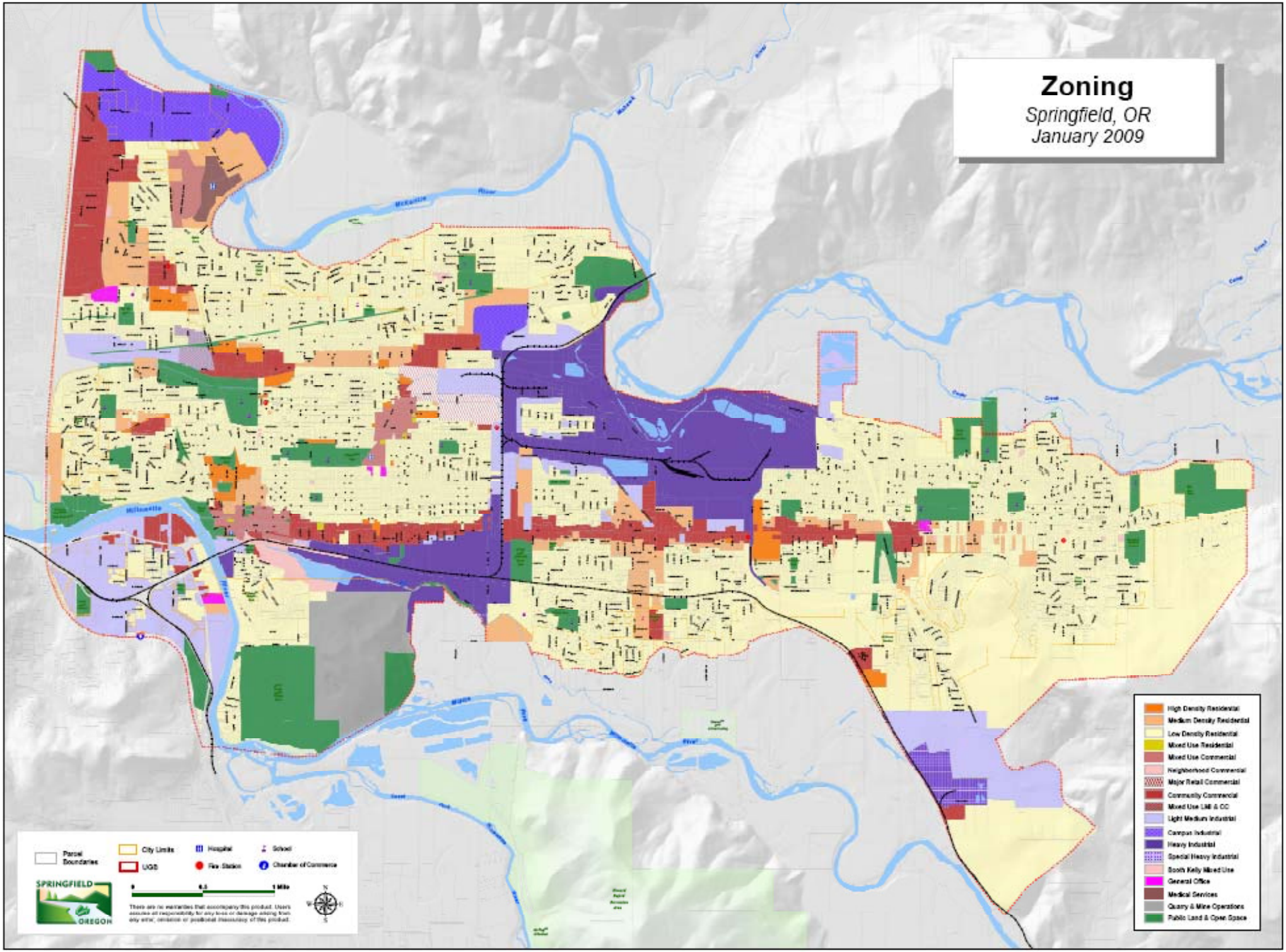
Eugene contains twenty different land use designations. Public land is scattered throughout the entire city limits. Industrial (heavy and light) is centered around Highway 99 and the Pacific Union rail yard as well as along Highway 126 heading west. The majority of the city is zoned Low-Density Residential. Please see Figure 2.4 below for the Eugene zoning map.

Figure 2.4 Eugene Zoning Map



Springfield has designated eighteen zones for land use purposes. The majority of Heavy Industrial Zoning is located in the central part of the city and in the northwest corner. Areas zoned for Public Lands & Open Space are spread throughout the city. Additionally, most of the city is zoned Low-Density Residential (See Springfield's Zoning Map below in Figure 2.5).

Figure 2.5 Springfield Zoning Map



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 wooden frame homes. Generally the older the home is, the greater the risk of damage from natural disasters. This is because building codes improved with a better understanding of 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 2007, Eugene had 66,769 housing units. Of those 48% (32,391) were owner-occupied while 45% (30,095) were renter-occupied. That same year, Springfield had a total of 23,451 housing units of which 53% were owner-occupied and 43% were renter-occupied. This is important for hazard mitigation because renters often have less incentive to mitigate natural hazard damage to their property.

Table 2.8 Housing Data

Housing Units	Lane County	Eugene	Springfield
Total housing units	**147,771**	**66,796**	**23,451**
Occupied Units	137,630	62,486	22,353
Vacant units	10,141	4,310	1,098
Vacancy percentage	6.9%	6.5%	4.7%
Owner-occupied units	85,855	32,391	12,263
Renter-occupied units	51,775	30,095	10,090

Source: US Census Bureau 2005-2007 American Community Survey 3-Year Estimates "Occupancy Characteristics"

Additionally, a number of homes in Eugene and Springfield are mobile homes which are typically more vulnerable to natural hazards. About 5% or 3,094 homes in Eugene are mobile homes while about 8% or 1,777 are mobile homes in Springfield.

Table 2.9 Housing Type

Housing Units by Type	Lane County	Eugene	Springfield
Single-family detached	91,115	35,901	12,841
Multi-family	32,627	10,961	3,574
Manufactured homes in parks	14,466	3,094	1,777

Source: US Census Bureau 2005-2007 American Community Survey 3-Year Estimates "Units in Structure"

The Eugene/Springfield Area also has a large number of older housing structures that may be vulnerable to earthquakes. Roughly 58% of all

housing units were built before 1980 when more stringent seismic codes were put into place (see Table 2.10 below).

Table 2.10 Age of Housing Structures

Year structure built	Lane County	Eugene	Springfield
1990 to March 2000	19.7%	21.6%	19.5%
1980 to 1989	9.6%	8.3%	8.9%
1970 to 1979	25.4%	24.2%	29.9%
1960 to 1969	16.0%	15.4%	10.6%
1950 to 1959	12.6%	15.0%	12.5%
1940 to 1949	8.7%	8.1%	13.0%
1939 and earlier	8.0%	7.4%	5.6%
Median	**1972**	**1972**	**1973**

Source: US Census Bureau, "Year Structure Built and Year Householder Moved Into Unit: 2000"

Historic and 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.

Eugene has 63 sites on the National Register of Historic Places and Springfield has 7. Table 2.11 summarizes the historic sites in Eugene and Springfield that were built before 1900. Eugene has sixteen pre-1900 sites on the National Historic Registry while Springfield has five.[v]

Table 2.11 Pre-1900 Historic Sites

City	Site	Estimated Year Built
Eugene	Flanagan Site	Prehistoric
Eugene	Frank L. & Ida Chambers House	1891
Eugene	Chase Gardens Residential Grouping	1889
Eugene	Danie & Catherine Christian House	1885
Eugene	Christian-Patterson Rental Property	1890
Eugene	Deady Hall	1873
Eugene	Blair Boulevard Historic Commercial Area	1875
Eugene	Pioneer Cemetery	1872
Eugene	Masonic Cemetery and Hope Abbey Mausoleum	1859
Eugene	A.V. Peters House	1869
Eugene	Shelton-McMurphy House and Grounds	1888
Eugene	Smeede Hotel	1884
Eugene	Villard Hall	1885
Eugene	Benjamin Franklin Dorris House	1850-1874
Eugene	East Skinner Butte Historic District	1850-1874
Eugene	Lane County Clerk's Building	1853
Springfield	Brattain-Hadley House	1893
Springfield	Robert E. Campbell House	1870
Springfield	Dorris Ranch	1899
Springfield	Southern Pacific Railroad Passenger Station and Freight	1891
Springfield	Larimer House	1885

Source: National Register of Historic Places National Register Information System, 2009.

Additionally, the National Registry of Historic Places has listed Springfield's Washburne Historic District as worthy of preservation. The Washburn Historic District, established in 1985, has fifteen buildings built between 1885 and 1924. The Larimer House listed above is included in the Washburne Historic District.[vi] Although not listed on the National Register of Historic Places, the Gray/Jaqua house on Highway 126 east of Springfield is considered one of the oldest existing buildings in the city of Springfield and is currently being developed into a city park.

Throughout the year, the cities of Eugene and Springfield have many community events and annual traditions. A few examples include: Eugene Celebration; Eugene Marathon; track and field events at University of Oregon's Hayward Field and the weekend markets in both Eugene and Springfield.

Critical Facilities

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.

The city of Eugene owns and manages the following facilities: City Hall; eleven fire stations and a training center; three police stations; a wastewater treatment plant; Eugene Water and Electric Board. As the Lane County seat, Eugene also contains several many county government facilities including the Lane County Sheriff's Office and Lane County Jail.

The city of Springfield owns and manages the following facilities: City Hall; five fire stations; the Springfield Justice Center Facility containing the police department, jail and courts; and the Maintenance Division facility. In addition, the Eugene Water and Electric Board (EWEB), Springfield Utility Board (SUB) and the Rainbow Water District have water treatment facilities in Springfield and wastewater pump stations.

Eugene and Springfield also contain a number of significant federal facilities. In Springfield, the National Guard Resource Center houses the National Guard, Federal Reserve forces, and the dispatch center for the Forest Service's fire fighting forces. Eugene houses the Federal Courthouse.

The Eugene/Springfield area is home to the following hospitals: Sacred Heart Medical Center University District (104); Sacred Heart Medical Center at RiverBend (386); and, McKenzie-Willamette Medical Center (114) which contains a total of 604 traditional hospital beds in the Eugene/Springfield metro area.

Government Structure

Eugene and Springfield both operate under a council-manager framework with the councils enacting policy and the city manager responsible for operations.

In Eugene, the city council consists of a mayor and eight city councilors. The city of Eugene contains the following city departments:

- *Central Services:* Provides centralized support for other city departments. Includes the city manager's office, municipal court, city prosecutor's office, human resources, risk services, finance; and facilities management and information services.
- *Fire and EMS:* Protecting and preserving life, property, and the environment through prevention, education, medical, rescue, and fire suppression services.
- *Library/Recreation/Cultural Services:* Supports an informed society, offers opportunities for lifelong learning and health, and provides cultural experiences.
- *Planning and Development:* Enforces zoning ordinances, works with general public to plan and monitor development activities.

- *Police:* Protecting, training, and enhancing the lives of the citizens.
- *Public Works:* Provides a wide range of services and programs related to parks and open space, transportation, stormwater and wastewater infrastructure and natural resource stewardship.

The Springfield city council consists of the mayor and 6 city councilors that are elected for four year terms. The mayor and council are responsible for the appointment of the city manager, city attorney, municipal court judges, and advisory committees. Springfield City Hall and the separate Justice Center contain the offices of the following city departments:

- *Development Services:* Enforces zoning ordinances, works with general public to plan and monitor development activities.
- *Finance:* Manages the finances of the city and Metropolitan Wastewater Management Commission, and operates Municipal Court.
- *Fire and Life Safety:* Protect life, property, and environment through prevention, education, emergency/medical, rescue, and fire suppression services.
- *Human Resources:* Supports and develops staff.
- *Information Technology:* Ensures the city's computer and communication systems are efficient, and up to date.
- *Library:* Gives the community access to reading and learning through books, computers, technology and children's cultural events.
- *Municipal Courts:* Enforces the municipal code and prosecutes traffic violations.
- *Police and Jail:* Protects lives and property by enforcing laws and preventing crimes.
- *Public Works:* Designs, constructs, operates, and manages public infrastructure including streets, sanitary sewers, stormwater management facilities, public buildings and other facilities.

The Willamalane Parks and Recreation District is responsible for parks within Springfield.

Existing Plans and 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 to changing conditions and needs. [vii]

The Eugene/Springfield Natural Hazards Mitigation Plan includes a range of recommended action items that, when implemented, will reduce the area's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the area'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 plan's action items through existing plans and policies increases their likelihood of being supported and getting updated, and maximizes the area's resources.

The following list documents the plans and policies already in place in the Eugene/Springfield area:

Plan: Eugene-Springfield Metropolitan Area General Plan
Date of Last Revision: updated 2004, text amendments October 2008
Author/Owner: City of Eugene, city of Springfield, Lane County
Description: The Eugene-Springfield Metropolitan Area General Plan (also known as the Metro Plan) is Eugene and Springfield's comprehensive plan. Its purpose is to promote sustainability and sustainable development, contain urban development, promote redevelopment, protect natural resources, foster economic vitality, provide efficient and cost-effective services, and ensure a sense of history and place.
Relation to Natural Hazard Mitigation: Provides policy guidelines for future development and land use in the metro area.

Plan: Public Facilities and Services Plan
Date of Last Revision: December 2001
Author/Owner: City of Eugene, city of Springfield, Lane County
Description: An appendix to the Metro Plan described above, but it bears mentioning on its own. Describes the water, sewer and transportation facilities which are to support the land uses designated in the Comprehensive Plan.
Relation to Natural Hazard Mitigation: Mitigation actions relating to water and wastewater treatment facilities should be linked to goals and policies outlined in the Public Facilities and Service Plans.

Plan: Regional Transportation Plan
Date of Last Revision: November 2007
Author/Owner: Lane County, city of Eugene, city of Springfield, city of Coburg, Oregon Department of Transportation, Lane Transit District
Description: Guides the management and development of appropriate transportation facilities in Lane County, incorporating the community's vision, while remaining consistent with state, regional, and local plans including the metro area's comprehensive plan.

Relation to Natural Hazard Mitigation: Mitigation actions relating to improving transportation facilities should be linked with goals and policies expressed in the transportation system plan.

Plan: Development Code
Date of Last Revision: December 2005
Author/Owner: City of Eugene
Description: Interprets land use code. Outlines decision making processes, code enforcement, penalties, and non-conforming situations. It is the primary implementation tool of the Metro Plan (comprehensive plan).
Relation to Natural Hazard Mitigation: Should reflect needs and issues related to development in hazardous areas. Contains regulations for development on steep slopes

Plan: Development Code
Date of Last Revision: September 2007
Author/Owner: City of Springfield
Description: Interprets land use code. Outlines decision making processes, code enforcement, penalties, and non-conforming situations. It is the primary implementation tool of the Metro Plan (comprehensive plan).
Relation to Natural Hazard Mitigation: Should reflect needs and issues related to development in hazardous areas.

Plan: All Hazards Emergency Management Plan
Date of Last Revision: 2007 (updated periodically)
Author/Owner: City of Eugene
Description: Outlines plans and policies for potential emergencies in all aspects of city life.
Relation to Natural Hazard Mitigation: This document is primarily response-based, but contains elements that are pertinent to mitigation

Plan: All Hazards Emergency Management Plan
Date of Last Revision: 2007 (updated periodically)
Author/Owner: City of Springfield
Description: Outlines plans and policies for potential emergencies in all aspects of city life.
Relation to Natural Hazard Mitigation: This document is primarily response-based, but contains elements that are pertinent to mitigation. Mitigation plans and response plans are closely linked because the more a community mitigates a natural hazard, the less it will have to respond in the future.

Plan: Capital Improvement Program, 2004-2009
Date of Last Revision: March 2007
Author/Owner: City of Eugene
Description: Provides a list of public facilities that are programmed for funding for construction in the next five years. These improvements are aimed at improving neighborhoods, providing economic growth, improving traffic safety, complying with environmental standards, and maintaining the existing infrastructure.

Relation to Natural Hazard Mitigation: Mitigation actions addressing capital improvements can be incorporated into capital improvement plans and funded appropriately.

Plan: Capital Improvement Program
Date of Last Revision: March 2009 (updated annually)
Author/Owner: City of Springfield
Description: Provides a list of public facilities that are programmed for funding for construction in the next five years. These improvements are aimed at improving neighborhoods, providing economic growth, improving traffic safety, complying with environmental standards, and maintaining the existing infrastructure.
Relation to Natural Hazard Mitigation: Mitigation items linked with capital improvements should be linked with goals and policies of the capital improvement plan.

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 cities of Eugene and Springfield 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.

Table 2.12 below highlights organizations that are active within the community and may be potential partners for implementing mitigation actions. The table includes information on each organization or program's service area, types of services offered, populations served, and how the organization or program could be involved in natural hazard mitigation. The three involvement methods 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.

Table 2.12 Eugene/Springfield Community Organizations

Name and Contact Information	Description	Service Area	Population Served						Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	Families	Low-Income	
Eugene Chamber of Commerce 1401 Willamette St Eugene, OR 97401-4099 (541) 484-1314	Represents the local businesses and disseminates information to businesses and visitors.	Eugene	✓						Education and outreach Information dissemination
Springfield Chamber of Commerce 101 South A Street Springfield, OR 97477 (541) 746-1651	Represents the local businesses and disseminates information to businesses and visitors.	Springfield	✓						Education and outreach Information dissemination
Sacred Heart Medical Center 1255 Hilyard St, Eugene, OR (541) 686-7300	Provides healthcare to the area	Eugene, Springfield and the surrounding area		✓	✓	✓	✓	✓	Education and outreach Information dissemination
Sacred Heart Medical Center-Riverbend 3333 Riverbend Dr, Springfield, OR (541) 222-7300	Provides healthcare to the area	Eugene, Springfield and the surrounding area		✓	✓	✓	✓	✓	Education and outreach Information dissemination
McKenzie-Willamette Medical Center 460 G St, Springfield, OR - (541) 726-4400	Provides healthcare to the area	Eugene, Springfield and the surrounding area		✓	✓	✓	✓	✓	Education and outreach Information dissemination
Lions Club International 1075 Washington St # 212, Eugene, OR (541) 484-0452	Community organization	Eugene, Springfield and the surrounding area	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Rotary Club of Eugene Eugene Hilton and Conference Center (541) 485-5983	Community organization	Eugene	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination

Name and Contact Information	Description	Service Area	Population Served						Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	Families	Low-Income	
Eugene Airport Rotary Club Wings Restaurant, Eugene Airport (541) 688-1406	Community Organization	Eugene	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Eugene Emerald Rotary Club Valley River Inn (541) 510-3042	Community Organization	Eugene	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Eugene Metropolitan Rotary Club Downtown Athletic Club (541) 345-3733	Community Organization	Eugene	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Eugene Mid-Valley Rotary Club Oregon Electric Station (541) 484-6717	Community Organization	Eugene	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Eugene Southtowne Rotary Club Vet's Club (541) 689-6872	Community Organization	Eugene	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Eugene Delta Rotary Club The Boulevard (541) 914-1365	Community Organization	Eugene	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Springfield-Twin Rivers Rotary Club Royal Caribbean Cruise 1000 Royal Caribbean Way, Springfield, OR (541) 968-3277	Community organization	Springfield	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Springfield Rotary Club Holiday Inn Springfield, OR (541) 689-2984	Community Organization	Springfield	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Eugene Elks Club 2470 W 11th Ave, Eugene, OR (541) 338-7848	Community organization	Eugene	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination

Name and Contact Information	Description	Service Area	Population Served						Involvement with Natural Hazard Mitigation
			Businesses	Children	Disabled	Elders	Families	Low-Income	
Springfield Elks Club 1701 Centennial Blvd, Springfield, OR (541) 747-2145	Community organization	Springfield	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Lane County Historical Society 740 W. 13th Ave. Eugene, OR (541) 682-4242	Community Historical Society	Lane County, including Eugene and Springfield	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
Eugene Public Library 100 West 10th Ave. Eugene, Oregon 97401 (541) 682-5450	Public Library	Eugene		✓	✓	✓	✓	✓	Education and outreach Information Dissemination
Springfield Public Library 225 Fifth Street Springfield, Oregon, 97477 (541) 726-3766	Public Library	Springfield		✓	✓	✓	✓	✓	Education and outreach Information Dissemination
Eugene Airport 28855 Lockheed Drive Eugene, Oregon 97402 (541) 682-5430	Regional Airport	Eugene and Springfield	✓				✓		Education and outreach Information dissemination
University of Oregon Eugene, OR 97403 (541) 346-1000	State university	Eugene	✓				✓		Education and outreach Information dissemination
Lane Community College 4000 East 30th Ave. Eugene, OR 97405 (541) 463-3000	Local community college	Eugene and Springfield	✓	✓			✓	✓	Education and outreach Information dissemination
Lane Transit District P.O. Box 7070 Eugene, OR 97401-0470 (541) 682-6100	Local public transit system	Lane County and cities	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination
United Way Lane 3171 Gateway Loop Springfield, OR 97477 (541) 741-6000	Community Organization	Lane County and cities	✓	✓			✓	✓	Education and outreach Information dissemination
American Red Cross Oregon Pacific Chapter 862 Bethel Drive Eugene, OR 97401 (541) 344-5244	Regional Red Cross Headquarters	Benton, Coos, Curry, Douglas, Lane, Lincoln and Linn counties	✓	✓	✓	✓	✓	✓	Education and outreach Information dissemination

Hazard Summary

The following is a brief overview of the hazards that can impact the Eugene/Springfield area. Each of the hazards is described in more detail in the Hazard Annexes of the plan.

Earthquake: The Eugene/Springfield area has not experienced any major earthquake events in recent history. Seismic events do, however, pose a threat. In particular, a Cascadia Subduction Zone (CSZ) event could produce devastating damage and loss of life.

Flood: Flooding is frequent in the Eugene/Springfield area. Riverine flooding, in particular, is the leading cause of flooding events, and occurs when warm winter rain melts mountain snow.

Landslide: The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller, and earthquake induced landslides may be very large. Even small slides can cause property damage, result in injuries, or take lives. [viii]

Volcano: The Cascade Range of the Pacific Northwest has more than a dozen active volcanoes. Volcano-related hazards that could most likely affect the Eugene/Springfield area are volcanic ash (tephra) and flooding from lahars.

Wildfire: Fire is an essential part of Oregon's ecosystem, but it is also a serious threat to life and property. The size of the Eugene/Springfield wildland-urban interface makes wildfire a hazard worth addressing.

Winter Storm: Destructive winter storms that produce heavy snow, ice, rain, freezing rain, and high winds typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March. The recurrence interval for severe winter storms throughout Oregon is about every 13 years; however, there can be many localized storms between these periods.

Dam Safety: While not a natural hazard, dam safety is of concern to the residents of Eugene and Springfield because of their proximity to earthquake and landslide hazards in the region.

Hazardous Materials: While hazardous materials are a manmade hazard, they are being addressed in the Eugene/Springfield Natural Hazards Mitigation Plan. Hazardous materials can be found throughout Eugene and Springfield, and if released into the environment, can be dangerous to community residents and the surrounding environment.

Terrorism: The Eugene/Springfield area has a history of environmental activism that has occasionally manifested itself in violent acts. In addition, the large sporting events that are hosted in Eugene/Springfield, such as national and international track events, are vulnerable terrorist attacks.

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 Eugene/Springfield intends to incorporate the mitigation strategies outlined in the plan into existing planning mechanisms and programs such as the city comprehensive land use planning process, capital improvement planning process, and building codes enforcement and implementation.

- 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 Eugene/Springfield 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 city effort is directed. Goals identify how Eugene and Springfield intend to work toward mitigating risk from natural hazards. The goals are guiding principles for the specific recommendations that are outlined in the action items.

- Action Items— The action items are detailed recommendations for activities that local departments, citizens and others could engage in to reduce risk.

Mitigation Plan Mission

The mission statement for the Eugene/Springfield Natural Hazards Mitigation Plan is intended to be adaptable to any future changes made to the plan. The Oregon Partnership for Disaster Resilience (OPDR), together with the Eugene and Springfield steering committee members, developed the following mission statement for the plan:

To create disaster-resilient and sustainable cities.

Steering committee members agreed at the September 10, 2009 meeting in Eugene and the September 15 meeting in Springfield that this was an

appropriate statement for the 2009 update to the Eugene/Springfield Natural Hazards Mitigation Plan and that it adequately defines why Eugene and Springfield have developed their plan. While a mission was not included in the 2004 version of the plan, it was added during the 2009 update process to provide direction for implementing mitigation plan goals and efforts.

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. The goals for the Eugene/Springfield Natural Hazards Mitigation Plan include the following:

1. Save lives and reduce injuries
2. Minimize damage to buildings and infrastructure, especially to critical facilities,
3. Minimize economic losses,
4. Decrease disruption of public services, businesses, schools, and families,
5. Protect the environment,
6. Foster public/private partnerships, and
7. Strengthen the social fabric and economic well-being of the Eugene/Springfield metro area.

These goals were originally developed as part of the 2004 Eugene/Springfield Natural Hazards Mitigation Plan and are still relevant for the 2009 update. Steering committee members agreed at the September 10, 2009 meeting in Eugene and the September 15, 2009 meeting in Springfield that these goals still adequately guide the direction of the Eugene/Springfield Natural Hazards Mitigation Plan.

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.

The Eugene and Springfield steering committees, together with OPDR, developed the action items presented in this plan. The action items are a combination of revised action items from the 2004 mitigation plan and new action items that address hazards and vulnerabilities identified during the 2009 Eugene/Springfield mitigation plan update process. During the update process, the Eugene and Springfield steering committees identified which actions from the 2004 plan had been completed or not completed, and whether or not these actions would be continued. The 2004 actions

and their status can be found in Appendix B, while the actions for the 2009 update are located in Appendix A.

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: 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.

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 Eugene/Springfield Natural Hazards Mitigation Plan includes a range of action items that, when implemented, will reduce loss from hazard events in the County. Within the plan, FEMA requires the identification of existing programs that might be used to implement these action items. Eugene and Springfield currently address statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, Eugene and Springfield will work to incorporate the recommended mitigation action items into existing programs and procedures.

Many of the Eugene/Springfield Natural Hazards Mitigation Plan's recommendations are consistent with the goals and objectives of each city's existing plans and policies. Where possible, the cities of Eugene and Springfield will implement the Natural Hazards 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.[ix] Implementing the Natural Hazards 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 cities or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

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

Plan Goals Addressed:

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

Timeline:

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

Section 4: Plan Implementation and Maintenance

This section details the formal process that will ensure that the Eugene/Springfield 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 Eugene and Springfield will integrate public participation throughout the plan maintenance and implementation process.

Implementing the Plan

After the plan is locally reviewed and deemed complete, the Emergency Managers submit 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 city councils of Eugene and Springfield will adopt the plan via resolution. At that point Eugene and Springfield will gain eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds.

Convener

The emergency managers for the cities of Eugene and Springfield will be the joint conveners for the Eugene/Springfield Natural Hazards Mitigation Plan. Their responsibilities include:

- Coordinating steering committee meeting dates, times, locations, agendas, and member notification;
- Documenting outcomes of Committee meetings;
- Serving as a communication conduit between the steering committee and key plan stakeholders;
- Incorporating, maintaining, and updating the jurisdiction's natural hazard risk GIS data elements; and
- Submitting future plan updates to Oregon Emergency Management for review; and

- Utilizing the Risk Assessment as a tool for prioritizing proposed natural hazard risk reduction projects.

Coordinating Body

The cities of Eugene and Springfield have identified the Mitigation Subcommittee of the Lane Preparedness Coalition as the coordinating body for the mitigation plan. Their responsibilities include:

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

Members of the Lane Preparedness Coalition include the following organizations:

- American Red Cross
- Cascade Manor Senior Community
- City of Cottage Grove
- City of Eugene
- City of Florence
- City of Springfield
- Lane Council of Governments
- Lane County Health & Human Services
- Lane County Medical Society
- Lane County Sheriff's Office
- Lane Education Service District
- Lane Transit District
- Pacific Continental Bank
- Royal Caribbean Cruise Lines
- Springfield Public Schools

- United Way of Lane County
- University of Oregon

To make the coordination and review of Eugene/Springfield Natural Hazards Mitigation Plan as broad and useful as possible, the Coordinating Body will engage additional stakeholders and other relevant hazard mitigation organizations and agencies to implement the identified action items. Specific organizations have been identified as either internal or external partners on the individual action item forms found in Appendix A.

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 two cities' 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 Coordinating Body 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 Coordinating Body will meet at least on a semi-annual basis to complete the following tasks. During the first meeting the Coordinating Body will:

- 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
- Review existing action items to determine appropriateness for funding;
- Prioritize potential mitigation projects using the methodology described below.

During the second meeting of the year the Coordinating Body will:

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

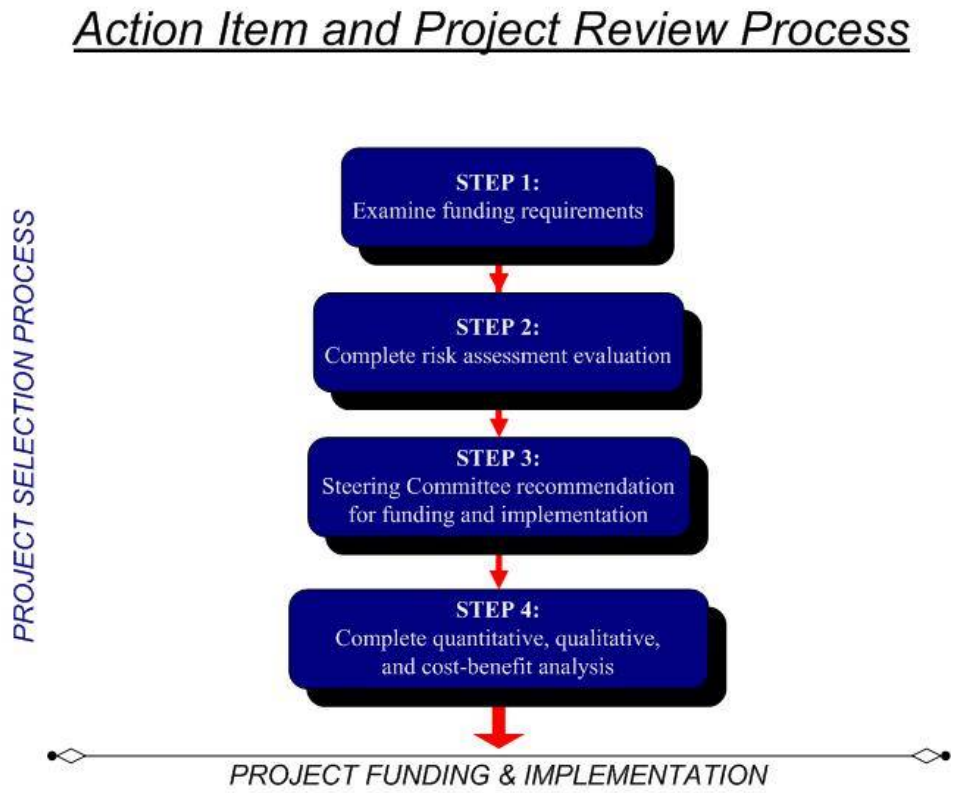
The convener will be responsible for documenting the outcome of the semi-annual meetings in Appendix B. The process the Coordinating Body will use to prioritize mitigation projects is detailed in the section below. The plan's format allows the participating jurisdictions to review and update sections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

incorporated, resulting in a natural hazards mitigation plan that remains current and relevant to Eugene and Springfield.

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. Figure 4.1 illustrates the project development and prioritization process.

Figure 4.1: Project Prioritization Process



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

Step 1: Examine funding requirements

The 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.

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.

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: Committee Recommendation

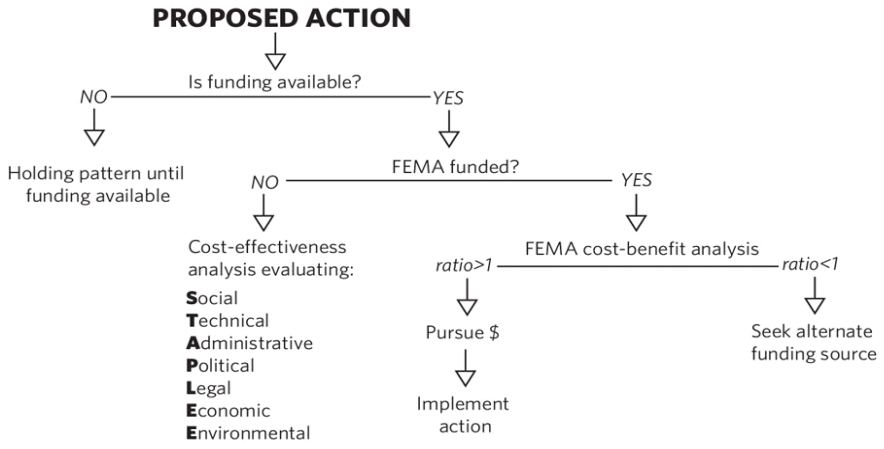
Based on the steps above, the committee will recommend whether or not the mitigation activity should be moved forward. If the committee decides to move forward with the action, the coordinating organization designated on the action item form will be responsible for taking further action and, if applicable,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

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

Step 4: Complete quantitative and qualitative assessment, and economic analysis

The fourth 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 appropriate method of analysis.

Figure 4.2: Benefit Cost Decision Criteria



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

Continued Public Involvement & Participation

The participating jurisdictions are dedicated to involving the public directly in the continual reshaping and updating of the Eugene/Springfield Natural Hazards Mitigation Plan. Although members of the Coordinating Body 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 city of Eugene will:

- Conduct presentations to specialty groups involving the plan,

- Conduct CERT classes where the plan will be highlighted,
- Have the plan at the annual Prevention Convention, a local safety fair,
- Post the plan on their Emergency Management Website and allow comments,
- Put out an article annually in neighborhood newsletters highlighting emergency management issues and alert the public to the plan,
- Ensure the meetings of the Coordinating Body (the Lane Preparedness Council's Sub-Committee on Mitigation) will be open to the public, and
- Hold a copy of the plan at the Eugene Public Library

The city of Springfield will:

- Discuss hazard mitigation with Team Springfield, which will involve the schools and Willamalane
- Discuss hazard mitigation during regular SUB meetings
- Announce changes/updates in the Springfield Times
- Seek feedback on mitigation during Public Works Week
- Fire Prevention week an opportunity to discuss wildfire mitigation actions
- Post plan on the city's website
- Include a copy of the plan at the Springfield Public Library

In addition to the involvement activities listed above, the Eugene/Springfield Natural Hazards Mitigation Plan has been archived and posted on the Partnership website via the University of Oregon Libraries' Scholar's Bank Digital Archive.

Five-Year Review of Plan

This plan will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. The following 'toolkit' can assist the convener in determining which plan update activities can be discussed during regularly-schedule plan maintenance meetings, and which activities require additional meeting time and/or the formation of sub-committees.

Mitigation Plan Update Toolkit			
Question	*Yes*	*No*	*Plan Update Action*
Is the planning process description still relevant?			Modify this section to include a description of the plan update process. Document how the planning team reviewed and analyzed each section of the plan, and whether each section was revised as part of the update process. (This toolkit will help you do that).
Do you have a public involvement strategy for the plan update process?			Decide how the public will be involved in the plan update process. Allow the public an opportunity to comment on the plan process and prior to plan approval.
Have public involvement activities taken place since the plan was adopted?			Document activities in the "planning process" section of the plan update
Are there new hazards that should be addressed?			Add new hazards to the risk assessment section
Have there been hazard events in the community since the plan was adopted?			Document hazard history in the risk assessment section
Have new studies or previous events identified changes in any hazard's location or extent?			Document changes in location and extent in the risk assessment section
Has vulnerability to any hazard changed?			Document changes in vulnerability in the risk assessment section
Have development patterns changed? Is there more development in hazard prone areas?			
Do future annexations include hazard prone areas?			
Are there new high risk populations?			
Are there completed mitigation actions that have decreased overall vulnerability?			

Mitigation Plan Update Toolkit			
Question	*Yes*	*No*	*Plan Update Action*
Did the plan document and/or address National Flood Insurance Program repetitive flood loss properties?			Document any changes to flood loss property status
Did the plan identify the number and type of existing and future buildings, infrastructure, and critical facilities in hazards areas?			1) Update existing data in risk assessment section or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Did the plan identify data limitations?			If yes, the plan update must address them: either state how deficiencies were overcome or why they couldn't be addressed
Did the plan identify potential dollar losses for vulnerable structures?			1) Update existing data in risk assessment section or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Are the plan goals still relevant?			Document any updates in the plan goal section
What is the status of each mitigation action?			Document whether each action is completed or pending. For those that remain pending explain why. For completed actions, provide a 'success' story.
Are there new actions that should be added?			Add new actions to the plan. Make sure that the mitigation plan includes actions that reduce the effects of hazards on both new and existing buildings.
Is there an action dealing with continued compliance with the National Flood Insurance Program?			If not, add this action to meet minimum NFIP planning requirements
Are changes to the action item prioritization, implementation, and/or administration processes needed?			Document these changes in the plan implementation and maintenance section
Do you need to make any changes to the plan maintenance schedule?			Document these changes in the plan implementation and maintenance section
Is mitigation being implemented through existing planning mechanisms (such as comprehensive plans, or capital improvement plans)?			If the community has not made progress on process of implementing mitigation into existing mechanisms, further refine the process and document in the plan.

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

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

[iii] Western Regional Climate Center, www.wrcc.dri.edu, Eugene, Oregon (352706), accessed July 24, 2009.

[iv] City of Eugene, Accessed July 24, 2009. http://www.eugene-or.gov/portal/server.pt?space=CommunityPage&cached=true&parentname=CommunityPage&parentid=1&in_hi_userid=2&control=SetCommunity&CommunityID=462&PageID=0

[v] National Register of Historic Places, Accessed July 27, 2009. http://www.nps.gov/nr.

[vi] Springfield Historic Commission, Accessed July 27, 2009. http://www.ci.springfield.or.us/dsd/Planning/hcommission/washburne.htm

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

[viii] State of Oregon Natural Hazard Mitigation Plan. Part 3: Hazard Chapters. "Landslides – Debris Flows," p. LS-2. March, 2006.

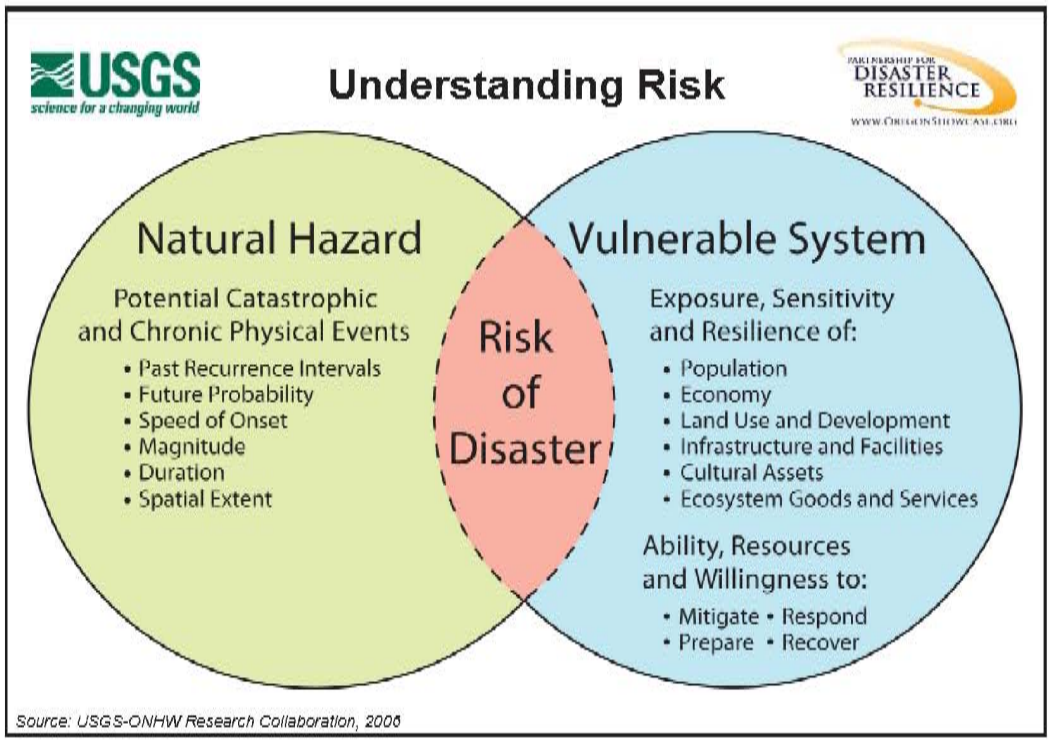
[ix] Burby, Raymond J., ed. 1998. *Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities.*

Volume II: Hazard Annex Introduction

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

This section identifies and profiles the location, extent, previous occurrences, and future probability of natural hazards that can impact the participating jurisdictions, as highlighted in Figure HA.1 below. The information in this section was paired with the information in Section 2 – Community Overview during the planning process in order to identify issues and develop actions aimed at reducing overall risk, or the area of overlap in the figure below.

Figure HA.1 Understanding Risk



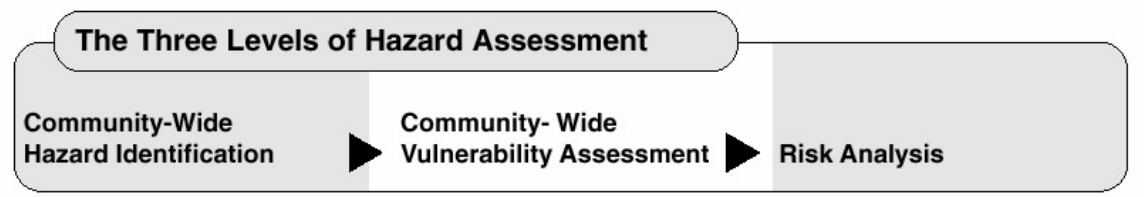
Source: USGS – The Partnership for Disaster Resilience Research Collaborative, 2006

This section drills down to local level information and results in an understanding of the risks the communities face. In addition to local data, the information here relies upon the Region 3 (Willamette Valley) Regional Risk Assessment in the State Natural Hazards Mitigation Plan.

What is a Risk Assessment?

A risk assessment consists of three phases: hazard identification, vulnerability assessment, and risk analysis, as illustrated in the following graphic.

Figure HA.2 The Three Phases of a Risk Assessment



Source: Planning for Natural Hazards: Oregon Technical Resource Guide, 1998

The first phase, hazard identification, involves the identification of the geographic extent of a hazard, its intensity, and its probability of occurrence. This level of assessment typically involves producing a map. The outputs from this phase can also be used for land use planning, management, and regulation; public awareness; defining areas for further study; and identifying properties or structures appropriate for acquisition or relocation.[1]

The second phase, vulnerability assessment, combines the information from the hazard identification with an inventory of the existing (or planned) property and population exposed to a hazard, and attempts to predict how different types of property and population groups will be affected by the hazard. This step can also assist in justifying changes to building codes or development regulations, property acquisition programs, policies concerning critical and public facilities, taxation strategies for mitigating risk, and informational programs for members of the public who are at risk.[2]

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

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

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

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

Probability and Vulnerability Assessments

The hazard annexes in Volume II describe each hazard's probability of future occurrence within Eugene/Springfield, as well as the city's overall vulnerability to each hazard. To facilitate connections with the State of Oregon's probability and vulnerability rating systems, Eugene/Springfield used the same rating scales as provided within Oregon Emergency Management's Hazard Analysis Methodology template, and are listed below. Probability estimates are based on the frequency of previous events, and vulnerability estimates are based on potential impacts of the hazard to the cities of Eugene and Springfield.

Probability scores address the likelihood of a future major emergency or disaster within a specific period of time as follows:

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

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

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 intraplate 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. Within Oregon, a major Cascadia Subduction Zone (CSZ) event could generate an earthquake with a magnitude of 9.0 or greater resulting in devastating damage and loss of life. While that magnitude would likely be lessened by the time it reached the Eugene/Springfield area, it would certainly be felt and cause damage.

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.

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 Hazard in Eugene/Springfield

Pre-historic earthquakes have occurred in Oregon as offshore Cascadia Subduction Zone earthquakes of approximately 8-9 magnitude. Approximate years for the earthquakes are the following:

- 1400 BCE
- 1050 BCE
- 600 BCE
- 400 CE
- 750 CE
- 900 CE

Oral records from Native Americans and geologic evidence have shown that the most recent Cascadia subduction zone earthquake occurred in January 1700 with an approximate magnitude of 9.0. The earthquake generated a tsunami that struck Oregon, Washington and Japan and destroyed Native American villages along the Oregon coast.

Although the Eugene/Springfield area has not been the center point of any recorded earthquakes, Figure 1.1 shows the locations of past earthquakes in the Eugene/Springfield area from 1841-2002. No significant earthquake events have occurred since 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?

The earthquake hazard and its effects, especially for a subduction zone earthquake, are prevalent over the entire Eugene/Springfield area.

Earthquake associated hazards include severe ground shaking, liquefaction of fine-grained soils, and earthquake-induced landslides. The extent of the

earthquake hazard depends 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. As seismic waves travel through bedrock, some energy propagates through surface soils to the ground surface. It is during this propagation through these surface soils that the shaking can be greatly influenced. Soil deposits can either deamplify (weaken) or amplify the shaking based on the characteristics of the deposit. This phenomenon is generally referred to as ground shaking amplification (GSA). Figures 1.2 and 1.3 show the amplification of the earthquake hazard in the Eugene/Springfield area.

Figure EQ.2. Amplification Earthquake Hazard in Eugene

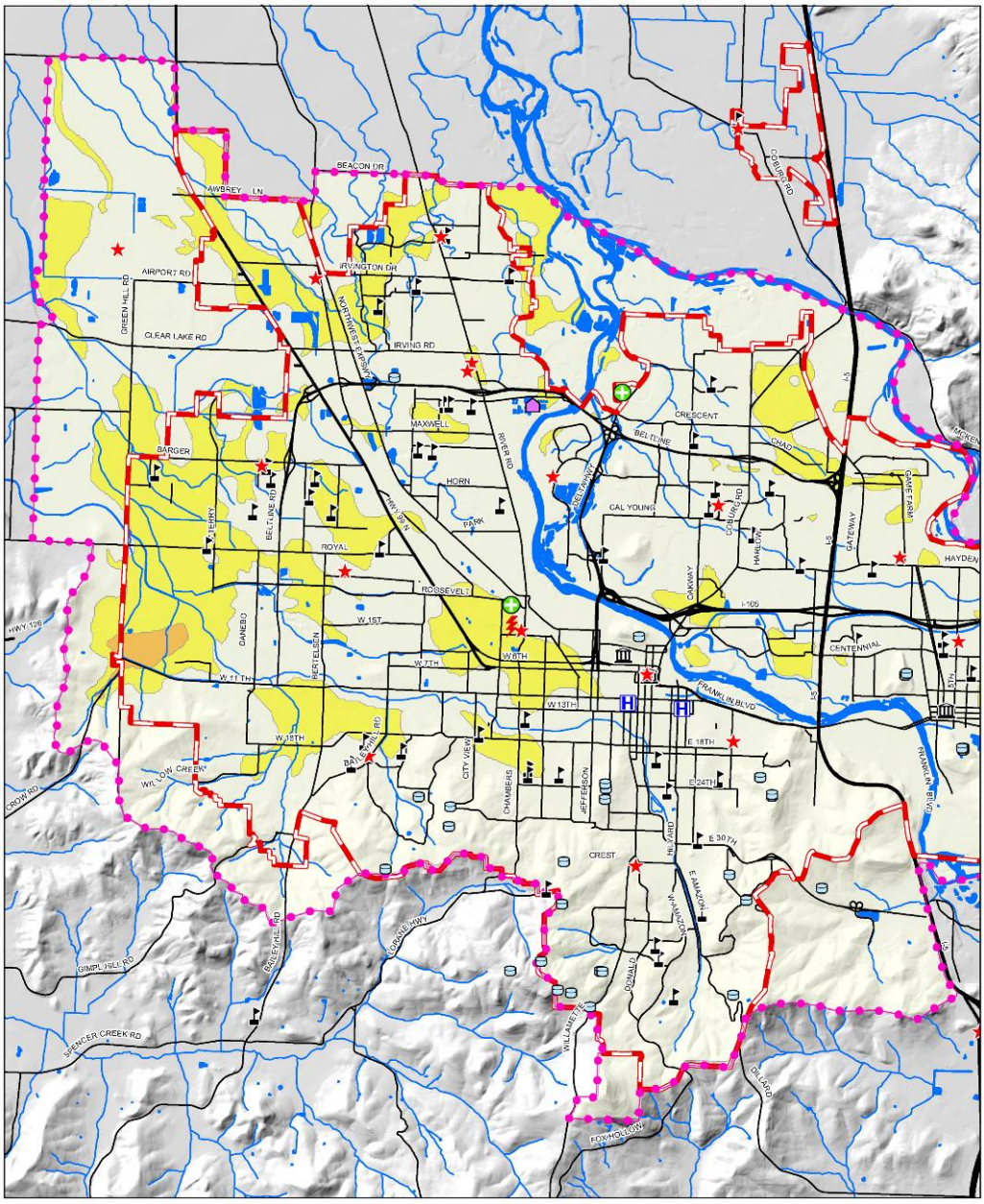
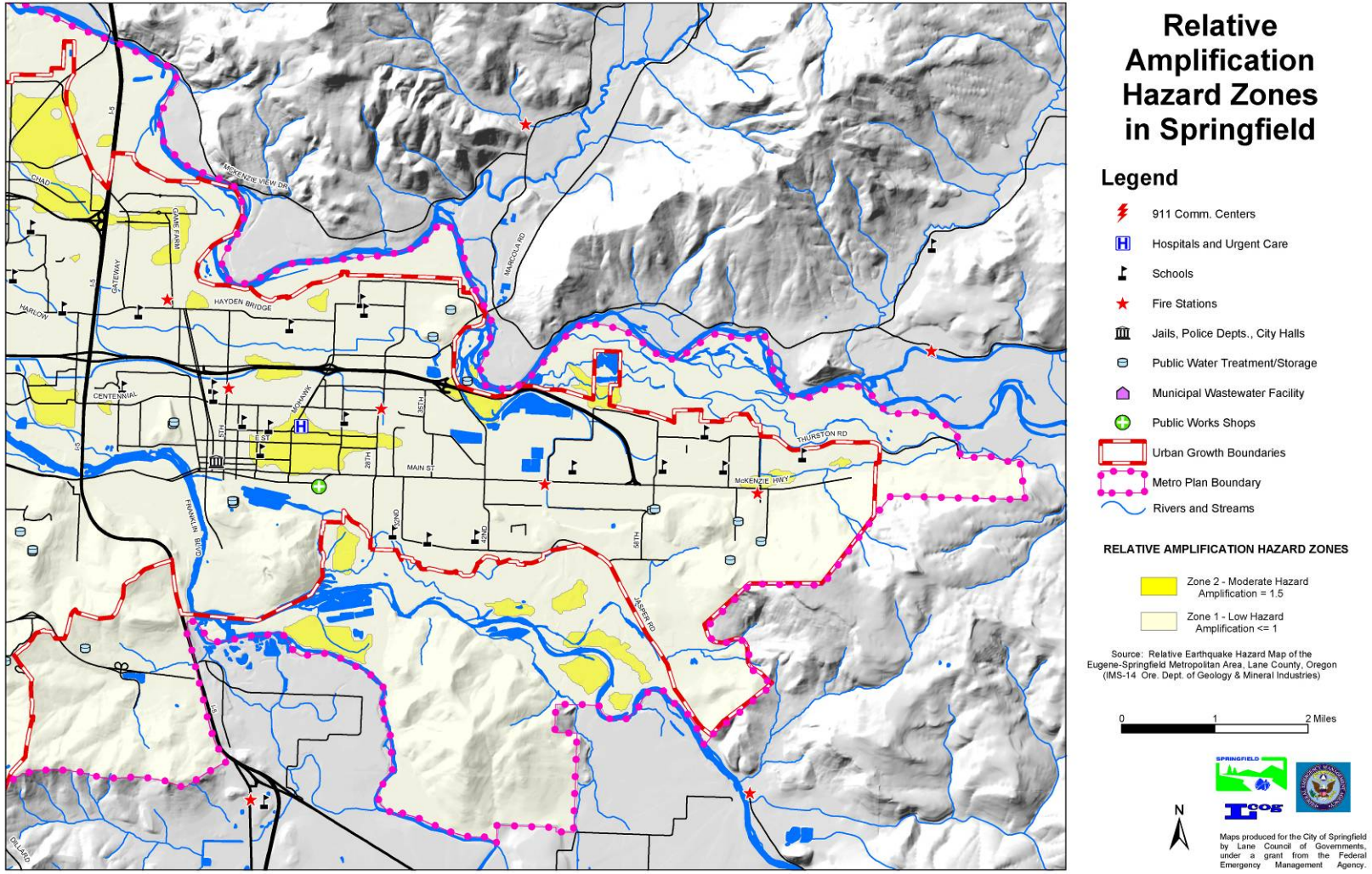


Figure EQ.3. Earthquake Amplification Hazard Springfield



Probability of Future Occurrence

Scientists estimate the chance in the next 50 years of a great subduction zone earthquake is between 10 and 20 percent, assuming that the recurrence is on the order of 400 +/- 200 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.[3]

Establishing a probability for crustal earthquakes is more difficult. Oregon's seismic record is short and the number of large magnitude earthquakes that have occurred throughout the Eugene/Springfield area is small. Therefore, any kind of prediction would be questionable. Earthquakes generated by volcanic activity in Oregon's Cascade Range are possible, but likewise unpredictable.

The Eugene and Springfield Steering Committees felt there was value in separating earthquake events into three categories: crustal, intraplate and subduction. These committees gave probability and vulnerability estimates for each.

Based on this information, the Eugene/Springfield area estimates a 'moderate' probability that a CSZ earthquake will occur in the future, or once every 35-75 years. Given the relatively low frequency of both crustal and intraplate earthquakes at the south end of the Willamette Valley, Eugene and Springfield estimate that the probability for either kind of earthquake occurring would be 'low', or roughly once every 75-100 years.

Vulnerability Assessment

In 2007, DOGAMI completed a rapid visual screening (RVS) of educational and emergency facilities in communities across Oregon, as directed by the Oregon Legislature in Senate Bill 2 (2005). RVS is a technique used by the Federal Emergency Management Agency (FEMA), known as FEMA 154, to identify, inventory, and rank buildings that are potentially vulnerable to seismic events. DOGAMI surveyed a total of 3,349 buildings, giving each a 'low,' 'moderate,' 'high,' or 'very high' rating for collapse potential in the event of a high magnitude earthquake. The RVS assessed a total of 174 buildings in the Eugene/Springfield area. The full data set can be found on DOGAMI's website: http://www.oregongeology.com/sub/projects/rvs/SSNA-abridgeddata.pdf

It is important to note that these rankings represent a probability of collapse based on limited observed and analytical data and are therefore

[3] *Oregon Geology*, 2002.

approximate rankings.[4] To fully assess a building's collapse potential, a more detailed engineering study completed by a qualified professional is required, but the RVS study can help to prioritize which buildings to survey.

Table EQ.1 below shows the number of buildings surveyed in Eugene and Springfield with their respective rankings.

Table EQ.1 Building Level of Collapse Potential for Eugene and Springfield

City	Level of Collapse Potential			
	Low (< 1%)	Moderate (>1%)	High (>10%)	Very High (100 %)
Eugene	56	52	29	0
Springfield	28	4	3	2

Source: DOGAMI 2007. Open File Report 07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment.

The potential impacts of major earthquakes on the Eugene/Springfield area are summarized below in Table EQ.5.

Table EQ.2. Potential Impacts of Earthquakes on the Eugene/Springfield area

Inventory	Probable Impacts
Portion of Eugene/Springfield Metro Area affected	Entire City and surrounding region
Buildings	Many buildings will have no damage or light to moderate damage, with heavy damage concentrated in vulnerable buildings (wood frame buildings with cripple walls, unreinforced masonry, etc.). Total building damage estimated to be about $1,000,000,000.
Streets within Metro Area	Minor damage possible in areas of soft soils. Some bridges will have moderate to extensive damage.
Roads to/from Metro Area	Minor damage possible in areas of soft soils. Some bridges will have moderate to extensive damage.
Electric power	Short outage of electric power is likely, with duration ranging from a few hours to 1 day.
Other Utilities	Generally moderate damage to water, wastewater and natural gas systems, including pipe breaks. Probable damage to water and wastewater treatment plants.
Casualties	Up to 30 deaths and about 1,600 injuries. Casualties will be higher for daytime earthquake than nighttime earthquake, because mostly wood frame residential buildings have lower life safety risk.

The above summary of potential impacts is for major earthquakes on the Cascadia Subduction Zone. Smaller earthquakes would generally have substantially smaller impacts than shown above.

In addition, there is a small chance that a major earthquake could result in substantial damage or failure of dams upstream of the Eugene/Springfield

[4] State of Oregon Department of Geologic and Mineral Industries, *Implementation of 2005 Senate Bill 2 Relating to Public Safety, Seismic Safety and Seismic Rehabilitation of Public Building,* May 22, 2007, iv.

area. If dam failure were to occur, however, the impact on the Eugene/Springfield area could be very large with very high damage levels in inundation areas and potentially high casualties (depending on the extent of dam damage, the amount of warning time of dam failure, and the effectiveness of evacuations).

The Eugene and Springfield Steering Committees ranked their vulnerabilities to crustal, intraplate and subduction earthquake events to the 'high'. This would indicate more than 10% of the population would be impacted in the event of an earthquake.

Risk Analysis

Hazus

The Oregon Department of Geology and Mineral Industries (DOGAMI) has developed two earthquake loss models for Oregon based on the two most likely sources of seismic scenarios: (1) the Cascadia Subduction Zone (CSZ), and (2) M6.5 arbitrary crustal earthquake. Both models are based on HAZUS-MH software 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 9.0 earthquake generated off the Oregon coast. The model does not take into account a tsunami, which probably would develop from the event. The M6.9 arbitrary crustal earthquake scenario does not look at a single earthquake (as in the CSZ model); it encompasses many faults, each with a 2% 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.

DOGAMI investigators caution that the models contain a high degree of uncertainty and should be used only for general planning purposes. Also, individual cities were not modeled. Despite their limitations, the models do provide some approximate estimates of damage. Results for Lane County are found in Tables EQ.3-EQ.5.

Table EQ.3. Estimated Losses from M9 CSZ and Local Crustal Event

REGION 3 COUNTIES	BUILDING VALUE (BILLIONS)	TOTAL BUILDING-RELATED LOSSES FROM A 9.0 CSZ EVENT (BILLIONS)	TOTAL BUILDING-RELATED LOSSES FROM A CRUSTAL EARTHQUAKE (BILLIONS)
Lane	$21.055	$5.0	$3.4

Table EQ.4. Estimated Losses Associated with a Magnitude 8.5-9.0 Subduction Event

Categories	Lane
Injuries (5 pm time period)	3,945
Deaths (5 pm time period)	264
Displaced Households	7,633
Economic Losses For Buildings	$4,652 million
OPERATIONAL AFTER DAY 1 Fire station Police Station Schools Bridges	 100% 100% 100% 84%
Economic Loss to Infrastructure Highways Airports Communications	 $211 million $13.3 million $0.33 million
Debris Generated (thousands of tons)	2,000

Source: DOGAMI, 2008, *Geologic Hazards, Earthquake and Landslide Hazard Maps, and Future Earthquake Damage Estimates.*

Table EQ.5 Estimated Losses Associated with an Arbitrary M 6.5-6.9 Crustal Event

Categories	Lane
INJURIES (5 pm time period)	1821
DEATHS (5 pm time period)	96
DISPLACED HOUSEHOLDS	7,716
ECONOMIC LOSSES FOR BUILDINGS	$3,351.03 million
OPERATIONAL THE DAY AFTER THE EVENT Fire station Police Station Schools Bridges	 100% 91% 99% 97%
ECONOMIC LOSSES TO INFRASTRUCTURE Highways Airports Communications	 $106 million $16 million $0.63 million
DEBRIS GENERATED (in thousands of tons)	1,000

Source: DOGAMI, 2008, *Geologic Hazards, Earthquake and Landslide Hazard Maps, and Future Earthquake Damage Estimates.*

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.

Steering Committee members noted that due to the relatively new information regarding earthquake hazards in the Pacific Northwest, only recently created infrastructure was built to a high seismic standard. The I-5 bridge that crosses the Willamette River is seismically sound and there have been some seismic retrofits done to the Glenwood bridge, but of greater concern are water, wastewater and gas lines.

Existing Hazard Mitigation Activities

Eugene and Springfield have taken steps to mitigate earthquake risks. Efforts include:

- Enforcement of the International Building Codes and Oregon State Structural Specialty Code that address earthquake mitigation measures for new construction.
- Creating a team which includes Oregon Department of Transportation, Lane County, Eugene and Springfield which would be responsible for checking bridges after the event of an earthquake.

This team has held table top and field exercises within the past year and hopes to do so every other year.

Volume II: Hazard Annex
Flood

Causes and Characteristics of the Hazard

The Eugene and Springfield Steering Committees decided to view this hazard as having two major components; riverine and urban flooding. Riverine flooding occurs when water overtops the banks of a naturally occurring waterway, while urban flooding is most often caused by inadequate stormwater drainage.

The Eugene/Springfield area is subject to flooding from several sources, including:

1) riverine flooding from the Middle Fork of the Willamette River, the Willamette River, and the McKenzie River,

2) riverine flooding from numerous smaller creeks and sloughs,

3) local stormwater drainage flooding.

Most of the serious flooding in Eugene and Springfield occurs in December and January. Events are usually associated with La Niña conditions, which result in prolonged rain and rapid snowmelt on saturated or frozen ground. This sudden influx of water causes rivers to swell, forcing tributary streams to back up and flood communities.

Spring snowmelt sometimes causes problematic flooding, but development has contributed to the severity of normal stream cycles. Water flows more quickly over logged forestland and into streams and rivers occasionally leading them to overtop their banks. Urbanization and stormwater runoff have had a significant impact on Willamette Valley flooding through increased impermeable surfaces and development. Undersized culverts, bridge clearance, substandard dikes/levees, and debris dams are also problematic.

History of the Hazard in Eugene/Springfield

Flooding has occurred in the Eugene/Springfield area throughout the recorded history of the area, ever since the first European settlers arrived in the area in the mid-1800s.

The FEMA Flood Insurance Study for Lane County (June 2, 1999) has a brief history of major historical floods in the Eugene/Springfield area. Major floods occurred in 1861, 1890, 1945, 1956, and 1964 and 1996. The 1964 flood was the largest flood event recorded in Lane County.

In considering these past major floods in Eugene/Springfield and in Lane County it is important to recognize that construction of major dams in the 1940s to the 1960s has substantially reduced the potential for major floods on the major rivers. These dams have reduced the expected 100-year stream discharges (volume of water flowing in the rivers). Accordingly, expected flood elevations and overall flood potential for major flood events along the rivers have been substantially reduced. The flood hazard areas shown on the current Flood Insurance Rate Maps (FIRM) for Eugene/Springfield assume that the dams are operating properly. Dam failure hazards are not addressed by the FIS or the FIRM.

Despite the reduction in flood potential from construction of the dams, the Eugene/ Springfield area continues to have flood risk from major rivers as well as from the numerous creeks and sloughs running through the Eugene/Springfield area. Flood risk on these smaller streams has not been reduced by the dams on the larger rivers.

The most recent major flood event occurred in February 1996. Unusually heavy rains over the four-day period from February 5th to February 8th resulted in significant flooding on numerous rivers and streams throughout western Oregon. The 1996 flood may have been about a 25-year event.

During this flood event, rising waters in the McKenzie River forced the evacuation of about 1,200 to 1,500 people in low lying areas of Springfield. In the Springfield/Thurston area along the McKenzie River about 35-40 homes were damaged, along with about 20 private roads and bridges and about 20 vehicles.

Widespread flooding was also experienced in the Mohawk Valley from Marcola to Springfield, with flooded homes on Sunderman Road and on Goat Road. The Springfield Golf Course suffered substantial damage with about 6 inches of silt and debris deposited on the greens and fairways. There were widespread road closures in Lane County and even Interstate 5 had water flowing across it just north of Eugene near the Boston Mill Road overpass.

The most recent major flood event occurred in December of 2005. Days of heavy rains led to flooding on the Mohawk River near Springfield. The flood stage of the Mohawk is 15 feet. On December 31st, the river was at 18 feet.

Risk Assessment

How are Hazard Areas Identified?

FEMA Flood Insurance Rate Maps (FIRMs) are the most comprehensive resource for identifying hazards in the Eugene/Springfield area. FIRMs depict flood conditions; however, many old maps are inaccurate. The Eugene/Springfield area's most recent FIRM was developed on June 6, 1999.

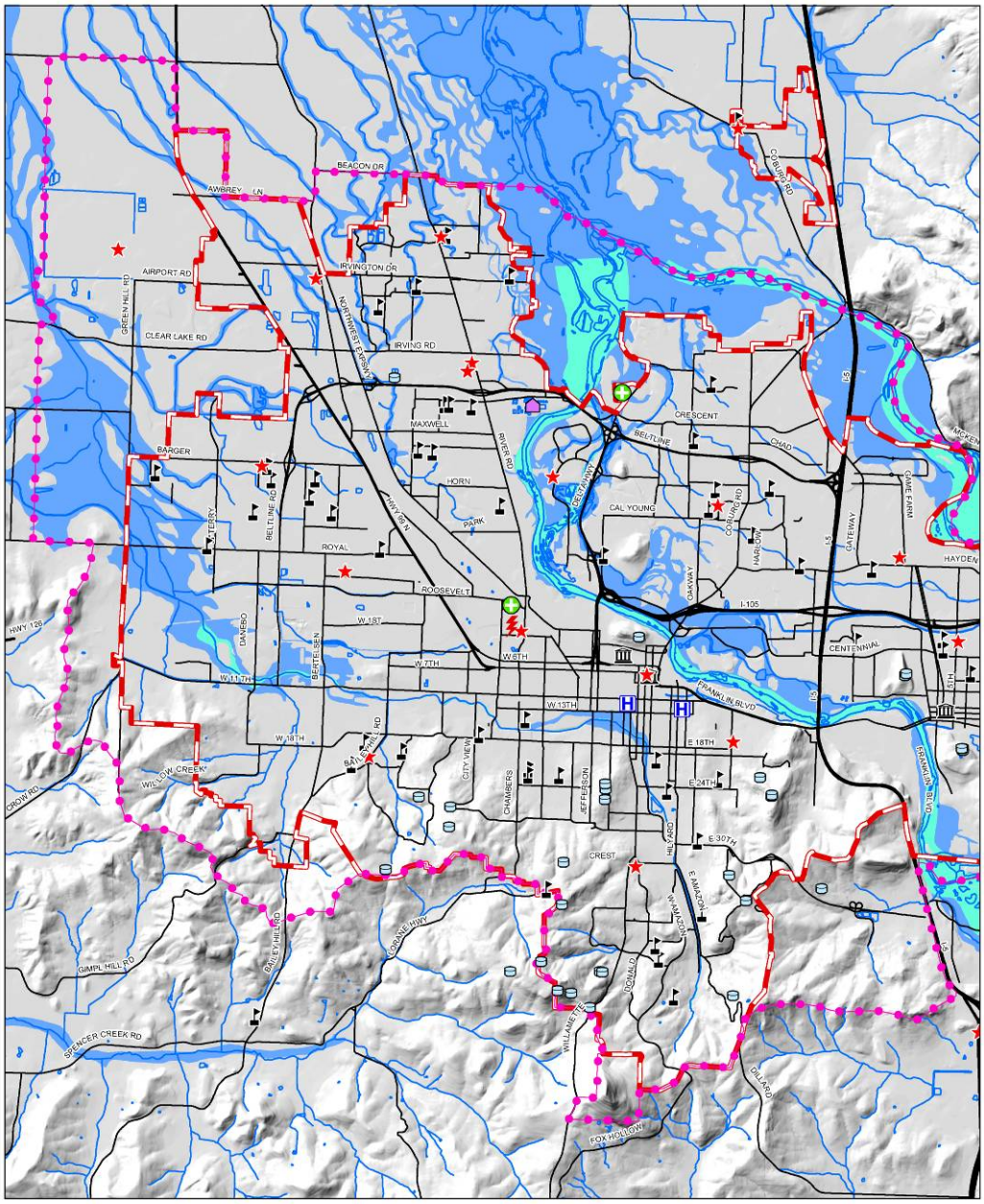
Some areas within Springfield are presently being re-mapped. These include the Willamette River through Glenwood, the McKenzie from Hayden Bridge Road to Hendricks Park Road and the area around the newly-constructed RiverBend Hospital.

Flood prone areas of the Eugene/Springfield area include the FEMA mapped floodplains for the major rivers, including the Mohawk, McKenzie and Willamette (including the Middle Fork and the Coast Fork). FEMA mapped floodplains also include areas along Amazon Creek, the Mill Race and several smaller creeks (mostly in the western portion of Eugene).

Historical experience and hydrologic/hydraulic modeling suggests that the most problematic areas for stormwater drainage in Eugene are the Amazon Creek, Willow Creek and Laurel Hill basins in the South Hills. Drainage problems in these areas are exacerbated by relatively thin, impermeable soils.

Figures FL.1 and FL.2 show the location of the flood hazard in the Eugene/Springfield area.

Figure FL.1 100-Year Flood Hazard in Eugene



Legend

- 911 Comm. Centers
- Hospitals and Urgent Care
- Schools
- Fire Stations
- Jails, Police Depts., City Halls
- Public Water Treatment/Storage
- Municipal Wastewater Facility
- Public Works Shops
- Urban Growth Boundaries
- Metro Plan Boundary
- Rivers and Streams

FLOOD HAZARD ZONES

- Floodway (where mapped)
- 100-Year Flood Zone

Source:
Flood Hazard Zones are from FEMA DFIRM data.

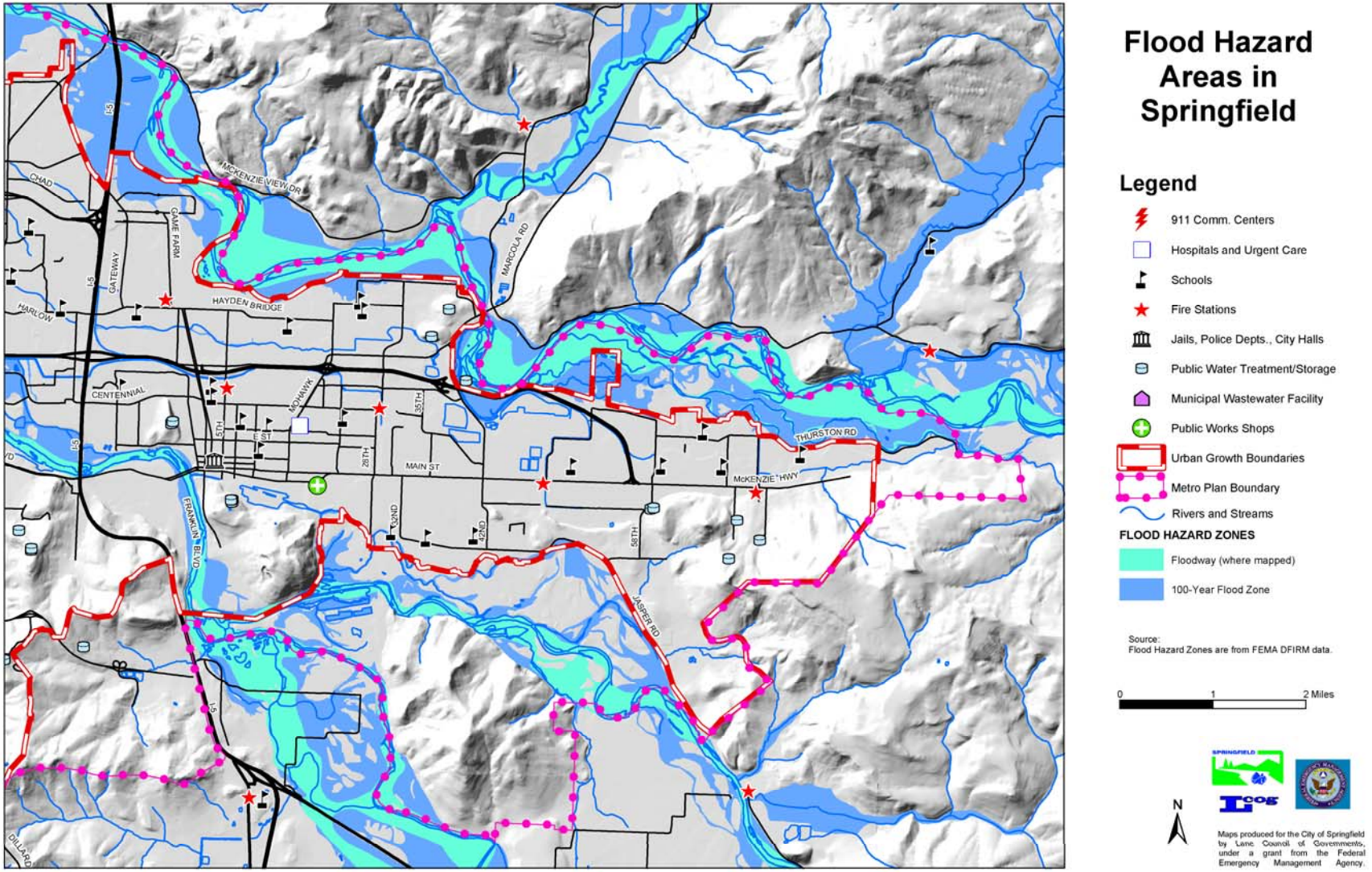
Flood Hazard Areas in Eugene

0 1 2 Miles

N

Maps produced for the City of Eugene, by Lane Council of Governments, under a grant from the Federal Emergency Management Agency.

Figure FL.2 100-Year Floodplain Springfield



Probability of Future Occurrence

The Eugene and Springfield Steering Committees estimated their probability for riverine flooding as 'moderate' and for stormwater flooding as 'high'. A 'moderate' probability indicates that one riverine flooding event is likely in the next 35 to 75 years. A 'high' probability indicates one stormwater flooding event is likely within the next 10 to 35 years.

Vulnerability Assessment

The level of flood hazard (frequency and severity of flooding) is not determined simply by whether the footprint of a given structure is or is not within the 100-year floodplain. A common error is to assume that structures within the 100-year floodplain are at risk of flooding while structures outside of the 100-year floodplain are not. Some important guidance for interpreting flood hazard is given below.

A. Being in the 100-year floodplain does not mean that floods happen once every 100 years. Rather, a 100-year flood simply means that the probability of a flood to the 100-year level or greater has a 1% chance of happening each year.

B. Much flooding happens outside of the mapped 100-year floodplain. First, the 100-year flood is by no means the worst possible flood. For flooding along the Willamette River, the 500-year flood is 4 feet higher than the 100-year flood. Second, many flood prone areas flood because of local stormwater drainage conditions. Such flood prone areas have nothing to do with the 100-year floodplain boundaries.

C. The key determinant of flood hazard for a structure is the relationship of the elevation of the structure or facility to the flood elevations for various flood events. Thus, homes with first floor elevations below or near the 10-year flood elevation have drastically higher levels of flood hazard than other structures with first floor elevations near the 50-year or 100-year flood elevation.

The importance of first floor elevations in determining flood hazard levels is illustrated in the data shown below in Figure FL.3. The data show the statistical return period for flooding reaching the first floor for structures with various first floor elevations near the Willamette River at State Highway 126 in Springfield.

In the Eugene/Springfield area, homes with first floor elevations at 434 or 435 feet above sea level have return periods for flooding of less than 10 years. As floor elevations increase, the return period for flooding increases markedly, with homes at 440 feet expected to flood only once about every 117 years and homes at 443 feet expected to flood only about once every 376 years, on average. Thus, even in the same neighborhood or the same

block, the level of flood hazard for homes varies markedly depending on the specific elevations of each home.

For mapped floodplain areas, the flood hazard data included in the Flood Insurance Study (FIS) allow quantitative calculation of the frequency and severity of flooding for any property within the floodplain. Such calculations are very important for mitigation planning, because they allow the level of flood risk for any structure to be evaluated quantitatively. For example, for Willamette River at State Highway 126 in Springfield, the FEMA FIS includes the following data:

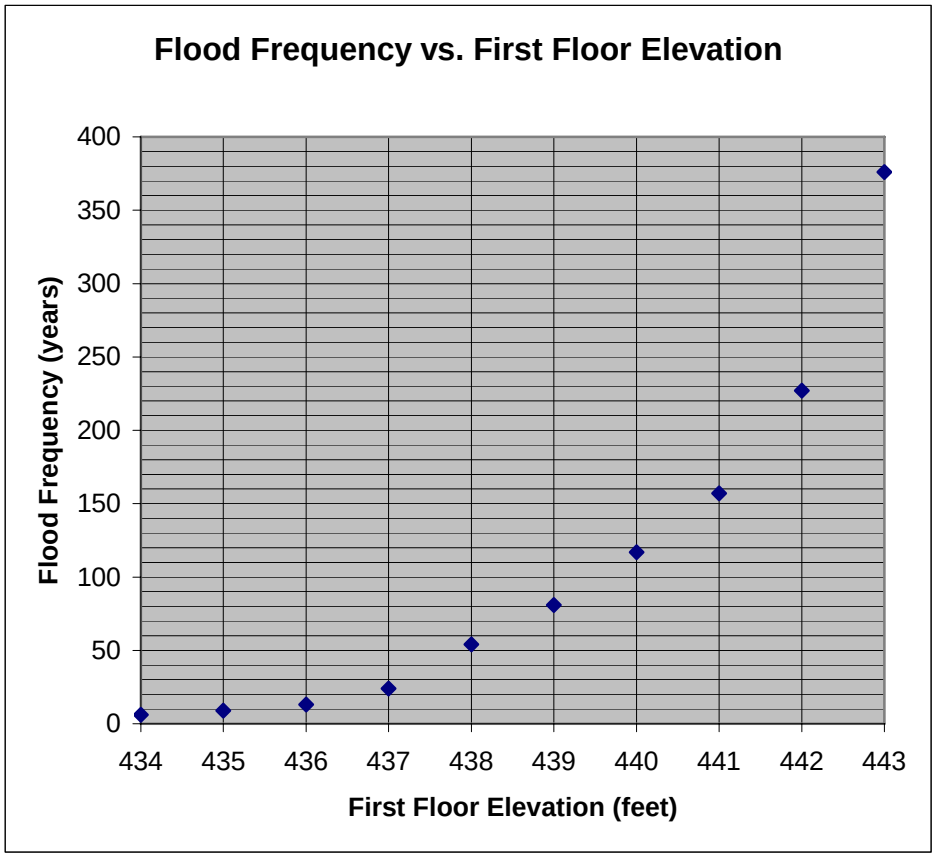
Table FL.1 Flood Hazard Data Willamette River at the State Highway 126 in Springfield

Flood Frequency (years)	Discharge (cfs)	Elevation (feet)
10	40,000	435.3
50	59,000	437.8
100	71,000	439.4
500	111,000	443.4

The stream discharge data shown above are from the table on page 28 of the FEMA Flood Insurance Study (FIS) for Lane County. Stream discharge means the volume of water flowing down the river and is typically measured in cubic feet of water per second (cfs). The flood elevation data are from the Flood Profile Graph 193P at the end of the FIS. Flood elevation data vary with location along the reach of the river and thus separate flood elevation data points must be read from the graph at each location along the river.

Quantitative flood hazard data, such as shown above, are very important for mitigation planning purposes because they allow quantitative determination of the frequency and severity (i.e., depth) of flooding for any building or other facility (e.g., road or water treatment plant) for which elevation data exist. Such quantitative flood hazard data also facilitate detailed economic analysis (benefit-cost analysis) of mitigation projects to reduce the level of flood risk for a particular building or other facility. Further details and examples of how such data are used are given in the Appendix (Mitigation Project Examples).

Figure FL.3 Flood Return Period vs. First Floor Elevation



The Flood Insurance Study (FIS) for the Eugene/Springfield area was completed on June 2, 1999, although much of the data is from older sources. Flood Insurance Studies, FIRM maps, and flood hazard data are a snapshot in time and cannot take into account development or other watershed changes that may occur subsequent to the study date for a FIS.

Flood hazard data change with time as channels and watersheds evolve with increasing development and other changes. Increasing development often increases runoff and increases flood discharges and elevations. Over time, the accuracy of an FIS typically diminishes and any FIS should be redone periodically to ensure that data are accurate and up to date for flood zoning and mitigation planning purposes. Simply because an FIS is old, does not necessarily mean that a FIS is outdated or inaccurate. However, the older a study is, and the more development that has occurred within the watershed, the more likely it is that channel or watershed conditions have changed over time. Therefore, as time passes, care should be taken in interpreting and using data from the FIS, especially in reaches of rivers or streams where substantial channel changes are documented or flood control measures have been added. Over time, the slow filling of the floodplain and even minor watercourse alterations due to development may push future floodwaters to unanticipated and unaware areas within the community.

In at least one location, along Amazon Creek, the FEMA Flood Insurance Study appears to be already out of date. Evidently, recent significant improvements/changes in the Amazon Creek channel are not reflected in the FEMA FIS or flood plain maps for Amazon Creek. The FEMA FIS and maps should be updated to accurately reflect current flood hazards along Amazon Creek.

There are also significant portions of the floodplains in the Eugene/Springfield area that are mapped only as approximate Zone A areas. Zone A areas are based upon approximate and historical data for which detailed flood hazard studies have not been performed. Some of these areas, such as the River Road/Santa Clara area are rapidly developing, although they did not have enough development at the time of the FIS to warrant a detailed study.

For mitigation planning purposes, it is very important to recognize that flood risk for a community is not limited only to areas of mapped floodplains. Other portions of the Eugene/ Springfield Metro Area outside of the mapped floodplains are also at relatively high risk from over bank flooding from streams too small to be mapped by FEMA or from local stormwater drainage.

Repetitive, damaging floods from stormwater drainage affect many areas of the United States, including the Eugene/Springfield area. As in most cities, local stormwater drainage systems are designed to handle only small to moderate size rainfall events. Stormwater systems are sometimes designed to handle only 2-year or 5-year flood events, and are rarely designed to handle rainfall events greater than 10-year or 15-year events.

For local rainfall events that exceed the collection and conveyance capacities of the stormwater drainage system, some level of flooding inevitably occurs. In many cases, local stormwater drainage systems are designed to allow minor street flooding to carry off stormwater that exceeds the capacity of the stormwater drainage system. In larger rainfall events, flooding may extend beyond streets to include yards. In major rainfall events, local stormwater drainage flooding can also flood buildings. In extreme cases, local stormwater drainage flooding can sometimes result in several feet of water in buildings, with correspondingly high damage levels.

In the Eugene/Springfield area, the stormwater drainage system includes a combination of natural and built systems that have evolved over time. The built system includes flood control structures on the major rivers, along with smaller scale local drainage systems.

Performance of the local stormwater drainage systems has generally been very good. The system handled the February 1996 flood event with relatively few problems, even though much of the system was designed for 5-year or 10-year events and the February 1996 event was approximately a 25-year event.

Many areas of Springfield are served by somewhat inadequate stormwater drainage systems, as shown by the limited capacities of some systems to accommodate new development and to control flooding. The City's assessment of stormwater system capacity needs and corresponding recommendations for future capital improvements are in the Stormwater Facility Master Plan, which was completed in 2004.

Eugene is a participant in the National Flood Insurance Program (NFIP) with their initial Flood Hazard Base Map dated June 7, 1974 and initial Flood Insurance Rate Map (FIRM) is dated September 26, 1986. As mentioned above, the current effective FIRM date is June 2, 1999. As of July 31st, 2009, the city has 854 NFIP policies in force at a total value of $224,143,400. There have been 17 claims, 10 of which are closed and 7 closed without payment. Total loss payments amount to $116,465.04. Additionally, Eugene has had 0 repetitive loss properties. Eugene's last Community Assistance Visit (CAV) occurred on June 25, 1999. No visits or Community Assistance Contacts (CAC) have occurred since 1999. There have been 454 Letters of Map Change.

Springfield is also a participant in the National Flood Insurance Program with their initial Flood Hazard Base Map dated June 18, 1971 and their initial FIRM is dated September 27, 1985. Like Eugene, their current effective FIRM is June 2, 1999. As of July 31, 2009, Springfield has 119 NFIP policies valued at $32,023,700. There have been 27 claims, 22 of which are closed and 5 closed without payment. There have also been 8 BCX claims. Total loss payments amount to $402,491.98. Springfield's last CAV occurred on July 6, 2006. There have been no CACs since that time. There have been 44 Letters of Map Change.

The National Flood Insurance Program (NFIP) maintains a database of all flood insurance policies in the United States. Of these properties with flood loss claims, 4 are on FEMA's national repetitive loss list.

FEMA's repetitive loss list includes all insured properties that have experienced two or more insured losses of at least $1,000 for which the flood events were at least 10 days apart but not more than 10 years apart. However, because these claims do not consider the severity or frequency of the flood events causing the flood loss claims, the repetitive loss list is not mathematically rigorous. For example, some properties on the list may have simply been unlucky and have experienced two flood events with low probabilities (e.g., 100-year or greater events) within a short time period. Thus, the properties on the repetitive loss list may be at relatively high flood risk or they may not. Correspondingly, there are almost certainly other properties within the Eugene/Springfield area at equal or higher levels of flood risk that are not on the FEMA repetitive loss list. These properties may not have flood insurance or simply may have been lucky over the relatively short reporting period for the NFIP repetitive loss list (data since 1978).

Despite these limitations of FEMA's repetitive loss list, properties within the Eugene/Springfield area on the repetitive loss list may be good targets of opportunity for flood mitigation. Most of FEMA's mitigation programs list repetitive loss properties as high priorities for mitigation and thus obtaining FEMA funding for properties on the repetitive loss list may be more likely than for properties not on the list.

The flood prone inventory of buildings, infrastructure and people in the Eugene/Springfield area is summarized below in Table FL.2.

Table FL.2 Flood Prone Inventory in the Eugene/Springfield area

Inventory	Probable Impacts
Buildings: Within Mapped Floodplains	4,460 of the 110,807 addresses in the Metro plan area are within the mapped 100-year floodplain, including 230 within mapped floodways. These flood prone properties are along the Willamette and McKenzie Rivers and along smaller FEMA-mapped creeks
Buildings: Outside Mapped Floodplains	Buildings located in areas subjected to storm water drainage flooding and/or overbank flooding from streams too small to be mapped. See 19 problem areas identified in Table 6.3
Streets and Roads	61 miles of the 1170 miles of streets and roads in the Metro plan area are within the 100-year floodplain and 5 miles are within floodways. Additional streets and roads located in areas subjected to storm water drainage flooding and/or overbank flooding from streams too small to be mapped. See 19 problem areas identified in Table 6.3
Critical Facilities	A few critical facilities have footprints within or very near the 100-year floodplain, including Camp Creek Elementary School, McKenzie Camp Creek Fire Station 16-2, Eugene Fire Station 9, and Santa Clara Fire Station 62. Other critical facilities may be at flood risk in extreme flood events.
Electric power	Relatively minor impacts expected in most flood events.
Other Utilities	All water and wastewater treatment plants are located at relatively low elevations in or near mapped floodplains or other water sources and thus many facilities may be at flood risk. Generally minor impacts for other utilities.
Casualties	Small potential for casualties (deaths and injuries) since most floods would have substantial warning time

The Eugene and Springfield Steering Committees estimated their vulnerability for riverine flooding as 'moderate' and for stormwater flooding as 'low'. A 'moderate' vulnerability indicates that between 1% and 10% of the population would be impacted, and a 'low' vulnerability indicates that less than 1% of the population would be impacted.

Risk Analysis

As noted above, each of the rivers and streams for which there are mapped flood plains includes developed areas where streets and buildings are at risk for flood damages. There are also a few critical facilities, including one school and several fire stations with footprints within or very near the mapped 100-year flood plains and most of the water and wastewater treatment plants are located in or near mapped floodplains.

For Eugene, the local drainage basins managed include both those within the city limits as well as the unincorporated areas west of Interstate 5, both within and outside the UGB. The total drainage basin management area is about 49,000 acres. There are about 540 miles of stormwater drainage pipes, mostly within city limits, that convey stormwater to receiving waters such as Amazon Creek and the Willamette River. There are also about 30 miles of open drainage channels maintained by the City and additional private stormwater drainage infrastructure that is not maintained by the City.

The general characteristics of the Springfield stormwater drainage system are outlined in the City of Springfield Stormwater Management Plan. The drainage area managed by the City of Springfield includes about 14,000 acres, with about 2/3rds of the total area within City limits and 1/3rd outside of City limits within the UGB. Springfield's stormwater drainage includes two major drainages, which flow to the McKenzie and Willamette Rivers, and 15 separate drainage sub-basin.

Springfield's built system includes 170 miles of piped drainage system and 13 miles of open channel waterways, as well as 4,000 catch basins and two municipally-owned stormwater detention ponds. As in Eugene, Springfield's stormwater system also includes private stormwater infrastructure such as detention ponds that have been included in new development since the 1980s to reduce the volume and pollutant content of stormwater entering the public stormwater system and/or local rivers and streams.

As of 2004, data maintained by the Lane Council of Governments show 110,807 addresses within the Eugene-Springfield Metro Plan area. Of these, 4,460 fall within the mapped 100-year flood plains and 230 are within the mapped floodways. Thus, about 4% and 0.2% of the structures in the Eugene-Springfield Metro Area appear to lie at least in part within the mapped 100-year flood plains or floodways, respectively. There are about 1170 miles of streets and roads in the Metro Plan area, of which about 61 miles lie within the 100-year flood plains and 5 miles of which lie within the mapped floodways.

As noted above, some areas of the Eugene/Springfield area that are outside of the mapped floodplains are also subject to relatively high levels of flood risk. To quantify the level of flood risk posed by these areas, historical data should be compiled to include: frequency and severity of flooding. Severity of flooding can include estimates of past damages, if available, and/or simple narratives reporting whether the flooding in a given area is limited to street flooding only, or affects yards or buildings as well.

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.)

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.

For most residential structures and many similar commercial and public structures, the likely amount of building damage from floods of any given depth can be estimated approximately using FEMA depth-damage tables. These depth damage tables are derived from Federal Insurance Administration flood insurance claims data for several million properties and thus represent typical damage levels for typical structures. Although actual damages will vary somewhat from structure to structure, depending also on flood conditions such as duration, velocity, and degree of contamination, these typical values represent a good starting point to estimate flood damages for typical structures and thus to help quantify the level of flood risk.

When estimating flood losses or evaluating flood risk (for a structure or a whole community) it is very important to recognize that the economic impact of floods includes not only damages to buildings and contents but other economic impacts as well, including:

1. damages to yards, vehicles, and outbuildings (not in depth damage data above),
2. displacement costs for temporary quarters while repairs are made,
3. loss of business income,

4. loss of public services.

Existing Hazard Mitigation Activities

Historically, the focus of local stormwater maintenance practices has been limited to drainage and flood control. More recently, the focus has widened to include management of riparian vegetation by allowing it to remain in streams and channels for the beneficial effects of slowing runoff for filtration and sedimentation.

Eugene and Springfield have actively pursued several flood hazard mitigation activities in an effort to reduce vulnerability to damage and disruption from flooding events. Efforts include:

- Both cities participate in the National Flood Insurance Program, which enables property and business owners to qualify for federally underwritten flood insurance.
- Eugene is a participant in the Community Rating System (CRS) program and has a rating of 7.
- Both Eugene and Springfield have Stormwater Management Plans. The first goal of this plan is to protect citizens and property from urban flooding through planning for and building adequate stormwater systems.

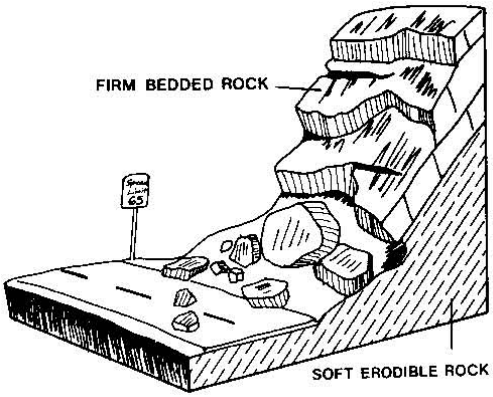
Volume II: Hazard Annex
Landslide

Landslide Causes and Characteristics

The term "landslide" refers to a variety of slope instabilities that result in the downward and outward movement of slope-forming materials, including rocks, soils and artificial fill. Four types of landslides that could occur in the Eugene/Springfield area are identified based on the types of materials involved and on the mode of movement. These four types of landslides are described below and illustrated in Figures LA.1 to LA.4.

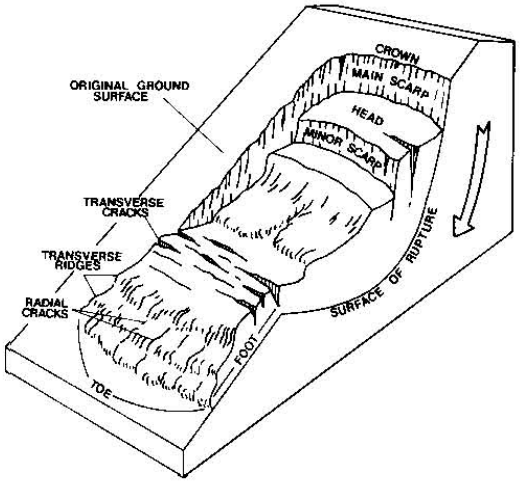
Rockfalls are abrupt movements of masses of geologic materials (rocks and soils) that become detached from steep slopes or cliffs. Movement occurs by free-fall, bouncing and rolling. Falls are strongly influenced by gravity, weathering, undercutting or erosion.

Figure LA.1 Rockfall Diagram



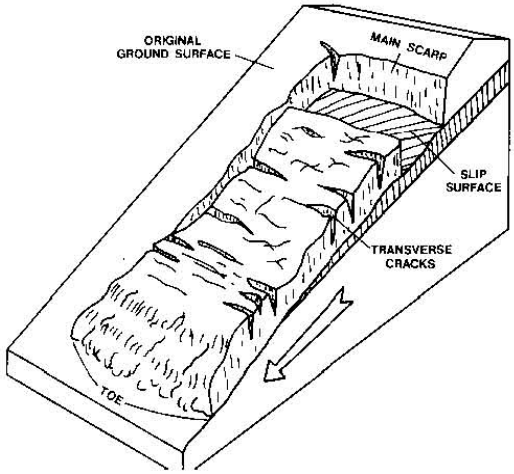
Rotational Slides are those in which the rupture surface is curved concavely upwards and the slide movement is rotational about an axis parallel to the slope. Rotational slides usually have a steep scarp at the upslope end and a bulging "toe" of the slid material at the bottom of the slide. Roads constructed by cut and fill along the side of a slope are prone to slumping on the fill side of the road. Rotational slides may creep slowly or move large distances suddenly.

LA.2 Rotational Landslide Diagram



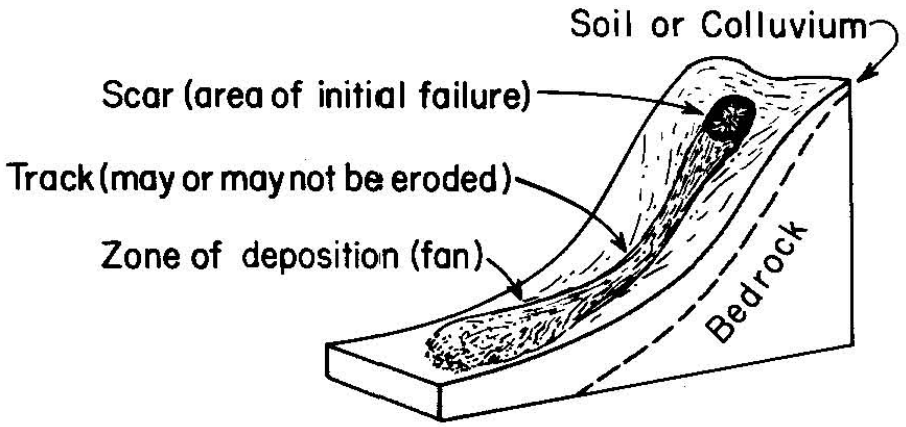
Translational Slides are those in which the moving material slides along a more or less flat surface. Translational slides occur on surfaces of weaknesses, such as faults and bedding planes or at the contact between firm rock and overlying loose soils. Translational slides may creep slowly or move large distances rather suddenly.

LA.3 Translational Landslide Diagram



Flows are 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.

LA. 4. Debris Flow Diagram



Rapidly moving flow landslides are often referred to a debris flows. 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 risk from debris flows.

The consistency of a 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 of landslide-related deaths and injuries during the 1996 storm in Oregon.

Conditions Affecting Landslides

Natural conditions and human activities can both 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, ineffective stormwater 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.

The water content of soils/rock is a major factor in determining the likelihood of sliding for any given slide-prone location. Thus, most landslides happen during rainy months, when soils are saturated with water. Winter storms with intense rainfalls are the most common trigger for landslides in Oregon, including within Lane County and within the Eugene/Springfield area.

Landslides may also happen at any time of the year, but such occurrences are isolated and not likely to result in the type of fairly widespread landslide effects that are possible during winter storms. In addition to landslides triggered by a combination of slope stability and water content, landslides may also be triggered by earthquakes. Areas prone to seismically triggered landslides are exactly the same as those prone to ordinary (i.e., non-seismic) landslides. See Hazard Annex-Earthquakes for further commentary on earthquake-triggered landslides. As with ordinary landslides, seismically triggered landslides are more likely for earthquakes that occur when soils are saturated with water.

History the Hazard in Eugene/Springfield

Debris flows and landslides are a very common occurrence in Oregon. DOGAMI conducted a statewide survey of landslides arising from the winter storms in February 1996, November 1996, December 1996 and January 1997 and found 9,582 documented landslide locations. The actual number of landslides was estimated to be many times the documented number.

The Eugene/Springfield area has experienced several landslide events, which are described in Table LA.1 below.

Table LA.1 Historic Landslide events in Eugene/Springfield

Date	Event
February 1996	Heavy rains and rapidly melting snow contributed to hundreds of landslides/debris flows across the state
November 1996	Heavy rain triggered mudslides in Lane County.
Mid to late 1990s	Gradual landslides occurred near Springfield city limits.
January 2008	A 64 acre Frazier Landslide occurred near the city of Oakridge, approximately 50 miles from Eugene. The landslide disrupted freight and Amtrak service south of Eugene until May 2008.
February 2008	On South 67th and Ivy, alongside Potato Hill in Springfield, a landslide threatened homes during construction of the Mountain Gate subdivision, causing four homes to be evacuated for fear of landslide at the bottom of the hill. Residents had to be evacuated until a retaining wall could be built in March 2008.

Risk Assessment

Where are Hazard Areas Located?

Specific areas that have had historical problems with debris flows and/or landslides within the Eugene/Springfield area are summarized below in Table 8.2. A more detailed landslide hazard assessment requires a site-specific analysis of the slope, soil/rock, vegetation and groundwater characteristics. Such assessments are often conducted prior to major development projects in areas with moderate to high landslide potential, to evaluate the specific hazard at the development site.

Table LA.2 Debris Flow and Landslide Problem Areas in the Eugene/Springfield area

Eugene
Capital-Essex Lane
Dillard Road
Brookside Drive
Cresta de Ruta
Goodpasture Island Road
Springfield
Thurston Hills area
Willamette Heights area
Kelly Butte area

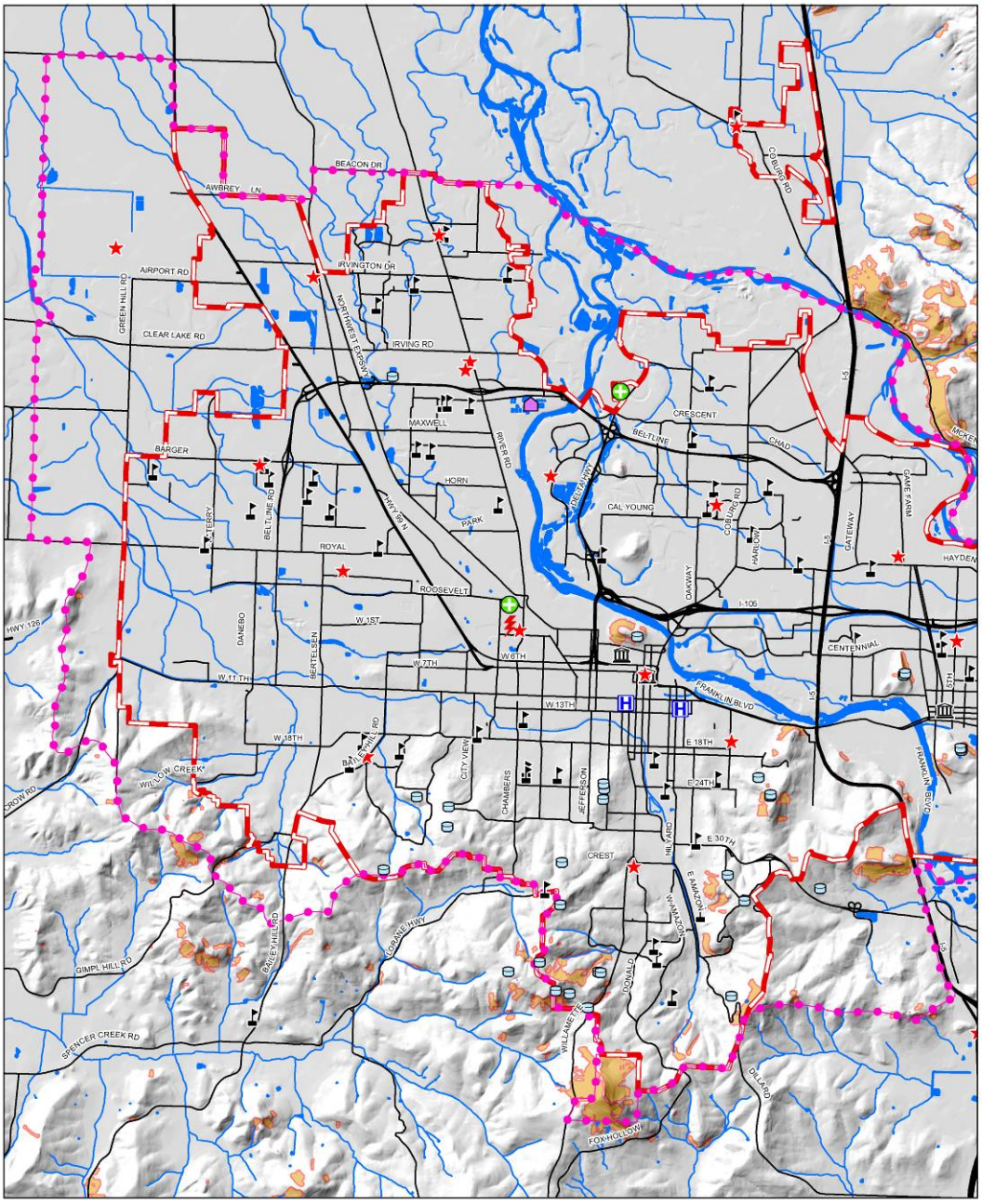
Furthermore, figures LA.2 to LA.5 show the locations with high landslide potential within the Eugene/Springfield area's urban growth boundary due to steep slope or possible debris flows.

Figures LA.2 and LA.3 show locations in the Eugene/Springfield area that have a high potential for surface debris flows. Areas with landslide potential include the hilly regions northeast of the Eugene/Springfield area and hilly regions south of the Eugene/ Springfield Metro Area. Fortunately, most of these high hazard areas are largely undeveloped and most of these areas are outside of the Eugene/ Springfield urban growth boundaries. However, there are small pockets of high debris flow hazard within the developed areas, primarily in the southern hilly portions of both Eugene and Springfield.

Figures LA.4 and LA.5 show DOGAMI's classification of landslide hazard areas for the overall Eugene/Springfield area (Relative Slope Instability maps). The high landslide potential areas on Figures LA.4 and LA.5 represent areas with high potential for earthquake induced landslides which also have a high potential for rockfalls, rotational slides, and translational slides from non-earthquake events (such as heavy rainfalls). The distribution of these landslide hazard areas within the Eugene/Springfield area is generally similar to that shown in Figures LA.4 to LA.5, although with some differences in details.

Figures LA.2 to LA.5 should be interpreted cautiously. These maps provide a regional overview of areas with generally high potential for debris flows or slope instabilities. However, such regional maps have limited spatial resolution and thus may not represent the specific landslide risk for any particular parcel in the Eugene/Springfield area. Thus, these maps are useful for general hazard awareness and mitigation planning purposes, but should not be used for regulatory purposes.

Figure LA.5 Debris Flow Hazard Areas for Eugene



Legend

- 911 Comm. Centers
- Hospitals and Urgent Care
- Schools
- Fire Stations
- Jails, Police Depts., City Halls
- Public Water Treatment/Storage
- Municipal Wastewater Facility
- Public Works Shops
- Urban Growth Boundaries
- Metro Plan Boundary
- Rivers and Streams
- Debris-Flow Hazard Areas

Source:
Debris-Flow Hazard Areas are
DOGAMI SB12 Further Review Areas.

Debris-Flow Hazard Areas in Eugene

0 1 2 Miles

N

Maps produced for the City of Eugene, by Lane Council of Governments, under a grant from the Federal Emergency Management Agency.

Figure LA.6 Debris Flow Hazard Areas for Springfield

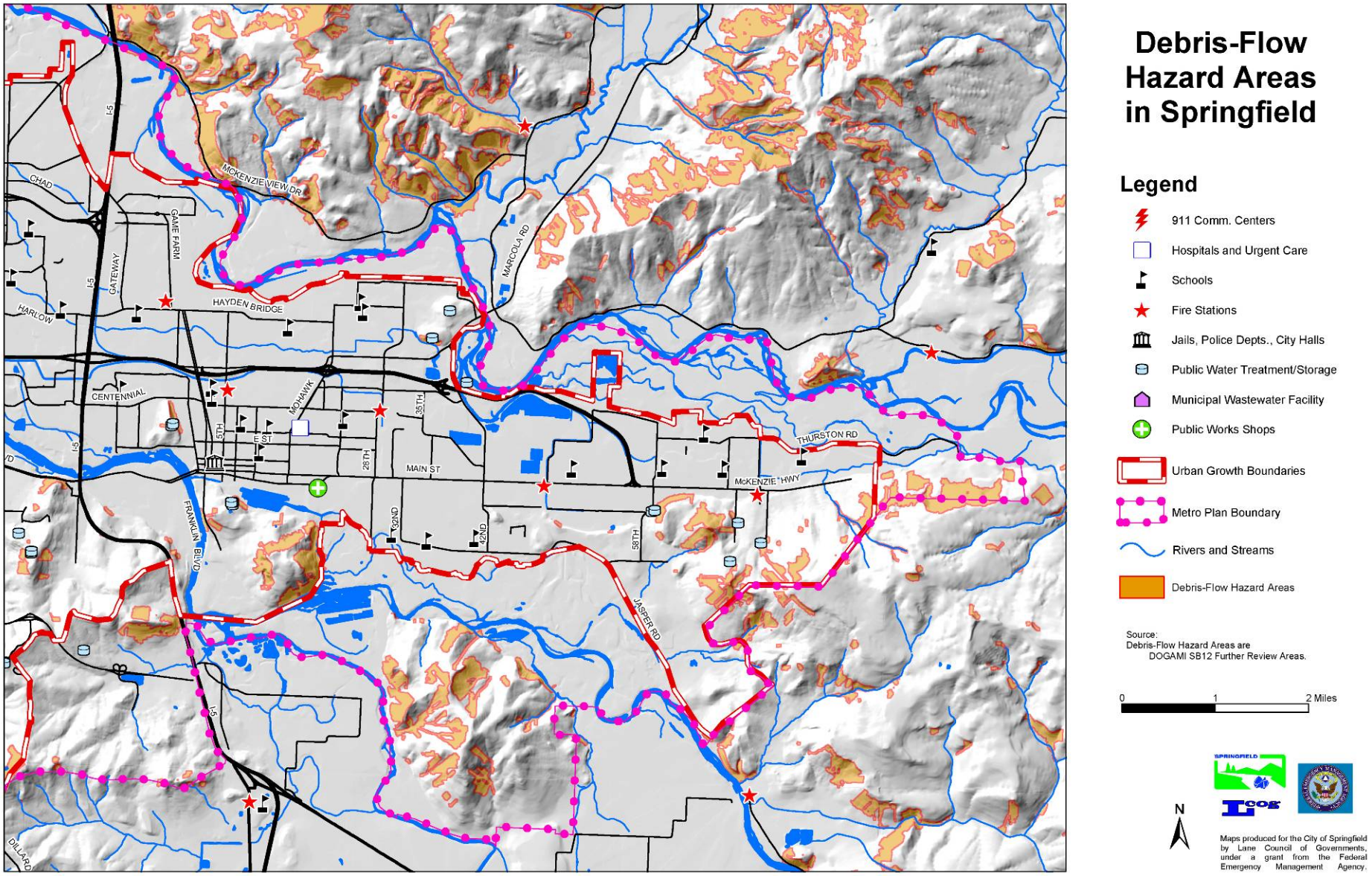
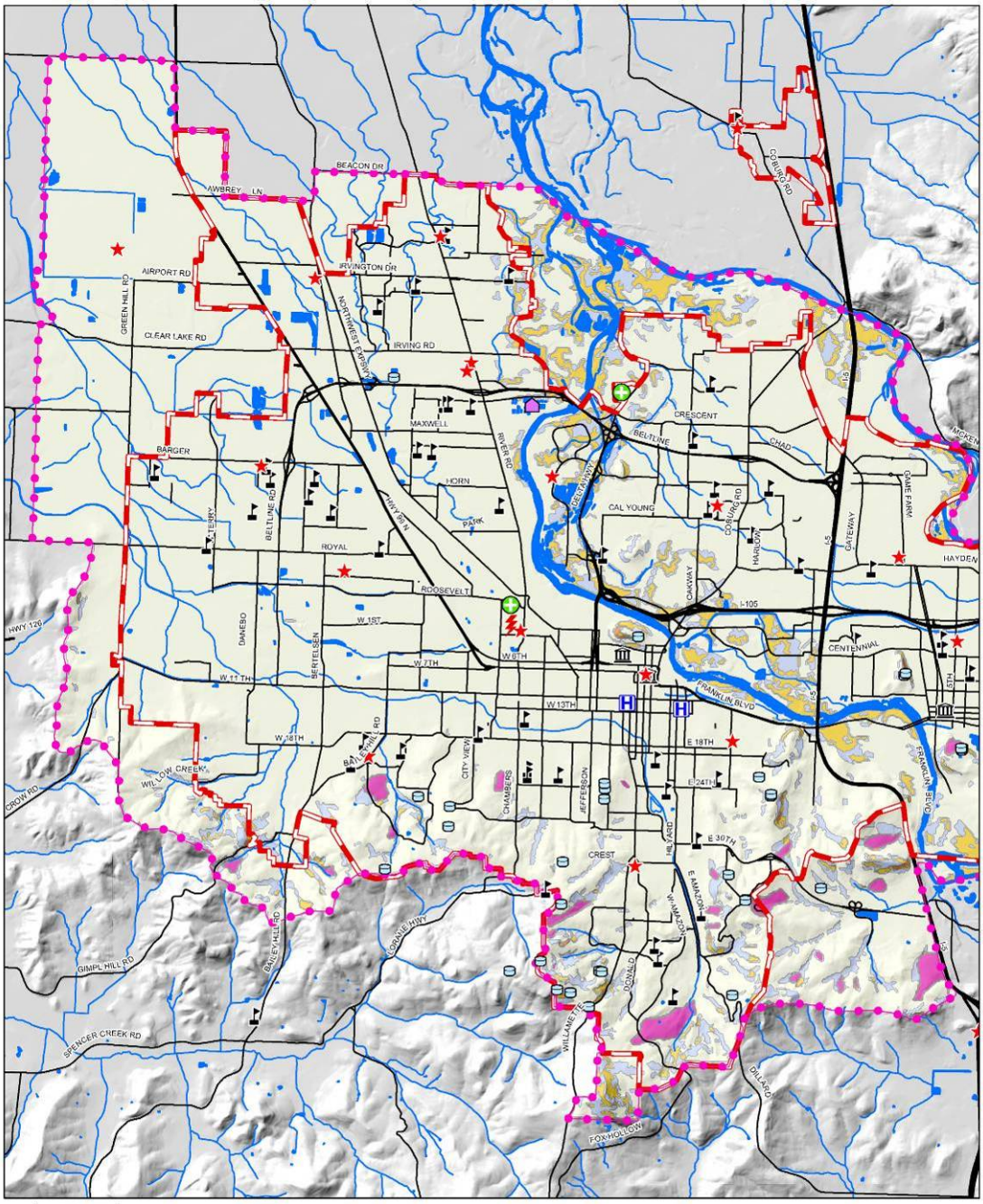


Figure LA.7 DOGAMI Earthquake Induced Landslide Map - Eugene



Legend

- 911 Comm. Centers
- Hospitals and Urgent Care
- Schools
- Fire Stations
- Police Depts. and City Halls
- Public Water Treatment/Storage
- Municipal Wastewater Facility
- Public Works Shops
- Urban Growth Boundaries
- Metro Plan Boundary

RELATIVE SLOPE INSTABILITY

- 1 - No Hazard
- 2 - Low Hazard
- 3 - Moderate Hazard
- 4 - High Hazard
- 5 - Existing Landslides

Source: Relative Earthquake Hazard Map of the Eugene-Springfield Metropolitan Area, Lane County, Oregon (IMS-14 Ore. Dept. of Geology & Mineral Industries)

Relative Slope Instability Hazards in Eugene

0 1 2 Miles

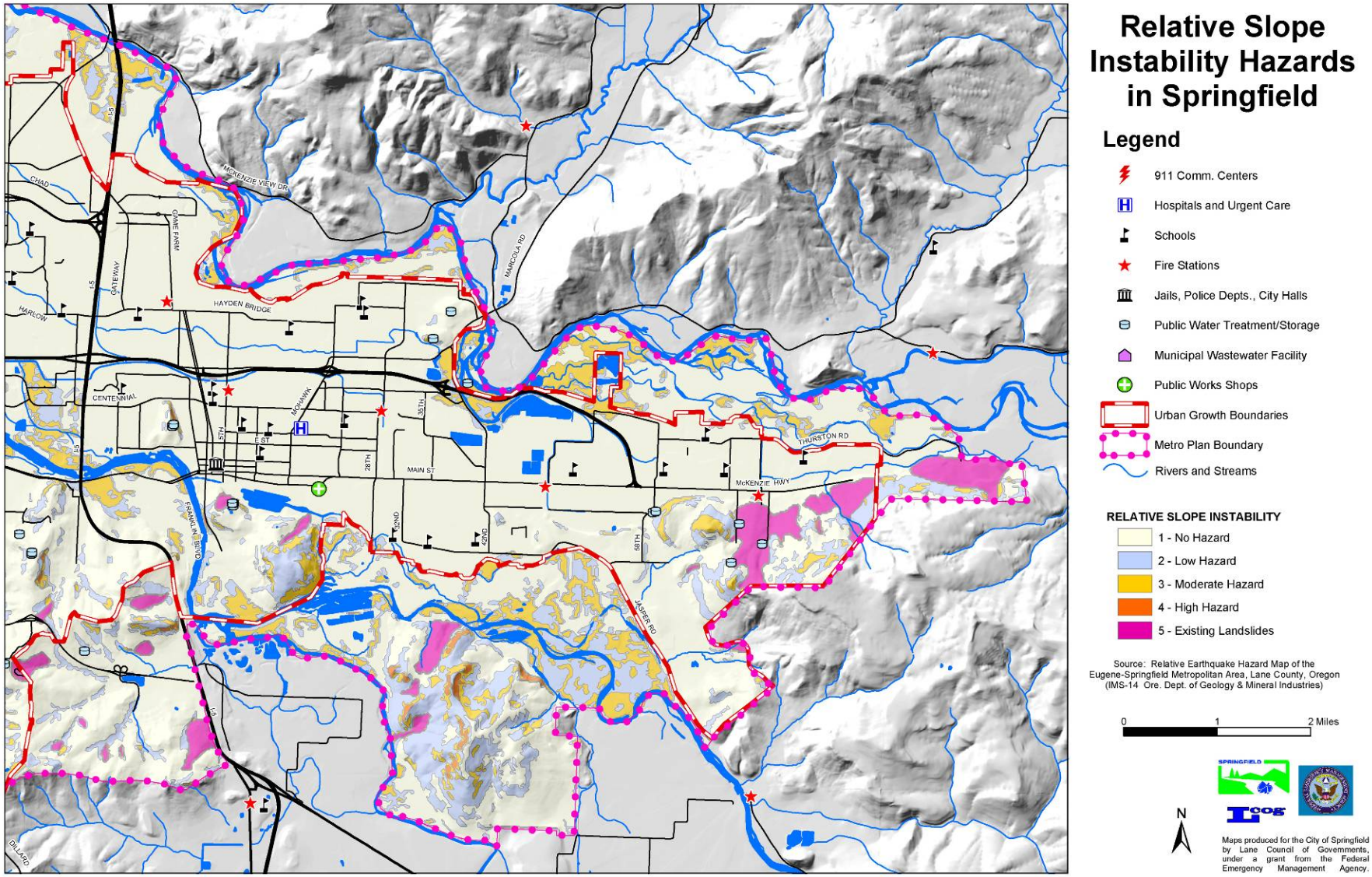
N

EUGENE

LCOG

Maps produced for the City of Eugene, by Lane Council of Governments, under a grant from the Federal Emergency Management Agency.

Figure LA.8 DOGAMI Earthquake Induced Landslide Hazard Map - Springfield



Probability of Future Occurrences

The probability of a landslide occurring in the Eugene/Springfield area depends upon a number of factors, including 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), and most landslides occur during rainy months of the year. The Eugene and Springfield Steering Committees rated the probability of a landslide occurring as high in Eugene and moderate in Springfield. Springfield's probability rating is lower due to the fact that Springfield has fewer dramatic changes in elevation. The high rating means that one incident is likely in a 10 to 35 year period; a moderate rating means that one incident is likely in a 35 to 75 year period.

Vulnerability Assessment

Landslides can occur during any time of the year in the Eugene/Springfield area. To minimize future landslide impacts to new developments, hazards areas must be identified and siting standards applied.

The Eugene and Springfield Steering Committees rated the cities' vulnerability to landslides as low, meaningless that 1% of the population or regional assets would be affected by a landslide event.

Risk Analysis

Eugene and Springfield have not completed a full risk analysis at this time for the landslide hazard.

Community Hazard Issues

What is susceptible to damage during a hazard event?

For the Eugene/Springfield area, the threat posed by landslides is significant in the pockets of high hazard potential which overlap with developed areas (see figures LA.5 to LA.8). Significant landslides in these areas could damage or destroy one or more homes, damage utilities and roads in the area, and pose some level of life safety risk for residents.

In addition to direct landslide damages within the Eugene/Springfield area, the area is subject to the economic impacts of road closures due to landslides, which disrupt access/egress to/from the area. Landslide induced road closures affecting the Eugene/Springfield area are possible in or near the high hazard areas shown on the maps, as well as further away on highways into the Cascades or through the Coast Range. The February 1996 winter storms provided numerous examples of landslide damages, especially to the road system, with landslides and mudslides closing many roads in Lane County and other nearby counties.

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

- Improper excavation practices, sometimes aggravated by drainage issues, can reduce the stability of otherwise stable slopes.
- Allowing development on or adjacent to existing landslides or known landslide-prone areas raises the risk of future slides regardless of excavation and drainage practices. Homeowners and developers should understand that in many potential landslide settings there are no development practices that can completely assure slope stability from future slide events
- Building on fairly gentle slopes can still be subject to landslides that begin a long distance away from the development. Sites at greatest risk are those situated against the base of very steep slopes, in confined stream channels (small canyons), and on fans (rises) at the mouth of these confined channels. Home siting practices do not cause these landslides, but rather put residents and property at risk of landslide impacts. In these cases, the simplest way to avoid such potential effects is to locate development out of the impact area, or construct debris flow diversions for the structures that are at risk.

More specific impacts of landslides and debris flows on the Eugene/Springfield area are summarized below in Table LA.3.

Table LA.3 Potential Impacts of Landslides and Debris Flows in the Eugene/Springfield area

Inventory	Probable Impacts
Portion of Eugene/Springfield Metro Area affected	Landslides are likely to directly affect only limited portions of Eugene/Springfield Metro Area as shown above. .
Buildings	Medium and high landslide potential areas are residential. Small landslides are likely to affect no buildings or only 1 or 2 buildings. Larger landslides could affect several buildings.
Streets within Metro Area	Minor road closures possible from landslides; limited impact because of short detour routes within Eugene/Springfield Metro Area
Roads to/from Metro Area	Potential closures of major highways due to landsides, especially roads into the Cascades and Coast Range.
Electric power	Potential for localized loss of electric power due to landslides affecting power lines in or near Eugene/Springfield Metro Area
Other Utilities	Potential minor outages of water, wastewater and natural gas from pipe breaks from landslides. Probable impacts would generally be very localized.
Casualties	Landslides that impact buildings or roads could result in a small number of casualties (deaths and injuries)

Existing Hazard Mitigation Activities

In Eugene and Springfield, mitigation of the landslide hazard is accomplished through land use and development regulations. Springfield's Hillside Development Overlay District is designed to minimize the risk of landslides for residential hillside development. The city of Eugene requires geotechnical analyses for areas with a slope of more than 5% to determine whether or not a development is appropriate for the area.

Volume II: Hazard Annex
Volcano

Causes and Characteristics of the Volcano Hazard

The Cascades, which run from British Columbia through Washington and Oregon into northern California, contain more than a dozen major volcanoes and hundreds of smaller volcanic features. In the past 200 years, seven of the Cascade volcanoes in the United States have erupted, including: Mt. Baker, Glacier Peak, Mt. Rainier, Mount St. Helens, Mt. Hood, Mt. Shasta, and Mt. Lassen.

Over the past 4000 years in Oregon there have been three eruptions of Mt. Hood, four eruptions in the Three Sisters area, and two eruptions in the Newberry Volcano area and minor eruptions near Mt. Jefferson, at Blue Lake Crater, in the Sand Mountain Field (Santiam Pass), near Mt. Washington, and near Belknap Crater. During this time period, the most active volcano in the Cascades has been Mount St. Helens with about 14 eruptions.

The numerous volcanoes of the Cascades differ markedly in their geological characteristics. The largest volcanoes are generally what geologists call composite or stratovolcanoes. These volcanoes may be active for tens of thousands of years to hundreds of thousands of years. In some cases, these large volcanoes may have explosive eruptions such as Mt. St. Helens in 1980 or Crater Lake about 7,700 years ago. The much more numerous sites of volcanic activity are generally what geologists call mafic volcanoes. This type of volcano is typically active for much shorter time periods, up to a few hundred years, and generally forms small craters or cones. Mafic volcanoes are not subject to large explosive events. Prominent mafic volcanoes include North Sister, Mount Bachelor, Belknap Cater, Black Butte, and Mount Washington. Mafic volcanoes often form broad fields of volcanic vents such as in the Sand Mountain Field near the Santiam Pass, north of the Three Sisters.

The existence, position and recurrent activity of Cascades 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.

Volcanic eruptions often involve several distinct types of hazards to people and property, as well evidenced by the Mount St. Helens eruption. Major volcanic hazards include: lava flows, blast effects, pyroclastic flows, ash flows, lahars, and landslides or debris flows. Some of these hazards (e.g., lava flows) only affect areas very near the volcano. Other hazards may

affect areas 10 or 20 miles away from the volcano, while ash falls may affect areas many miles downwind of the eruption site.

Lava flows are eruptions of molten rock. Lava flows for the major Cascades volcanoes tend to be thick and viscous, forming cones and thus typically affecting areas only very near the eruption vent. However, flows from the smaller mafic volcanoes may be less viscous flows that spread out over wider areas. Lava flows obviously destroy everything in their path.

Blast effects may occur with violent eruptions, such as Mount St. Helens in 1980. Most volcanic blasts are largely upwards. However, the Mount St. Helens blast was lateral, with impacts 17 miles from the volcano. Similar or larger blast zones are possible in future eruptions of any of the major Cascades volcanoes.

Pyroclastic flows are high-speed avalanches of hot ash, rock fragments and gases. Pyroclastic flows can be as hot as 1500 ^{o}F and move downslope at 100 to 150 miles per hour. Pyroclastic flows are extremely deadly for anyone caught in their path.

Ash falls result when explosive eruptions blast rock fragments into the air. Such blasts may include tephra (solid and molten rock fragments). The largest rock fragments (sometimes called "bombs") generally fall within two miles of the eruption vent. Smaller ash fragments (less than about 0.1") typically rise into the area forming a huge eruption column. In very large eruptions, ash falls may total many feet in depth near the vent and extent for hundreds or even thousands of miles downwind.

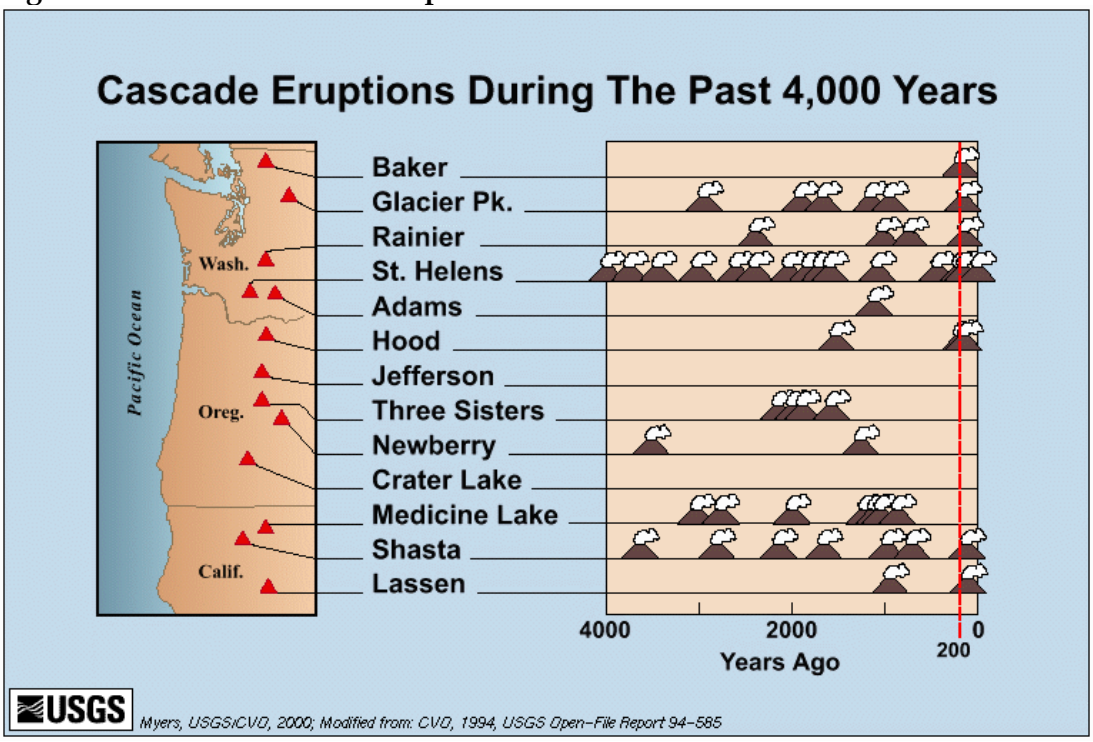
Lahars or mudflows are common during eruptions of volcanoes with heavy loading of ice and snow. These flows of mud, rock and water can rush down channels at 20 to 40 miles an hour and can extend for more than 50 miles. For some volcanoes, lahars are a major hazard because highly populated areas are built on lahar flows from previous eruptions.

Landslides or debris flows are the rapid downslope movement of rocky material, snow and/or ice. Volcano landslides can range from small movements of loose debris to massive collapses of the entire summit or sides of a volcano. Landslides on volcanic slopes may be triggered be eruptions or by earthquakes or simply by heavy rainfall.

History of the Hazard in Eugene/Springfield

The history of volcanic activity in the Cascades is contained in its geologic record and the age of the volcanoes vary considerably. Figure V.1 below shows the history of volcanic events in the Cascades.

Figure V.1 Historic Cascade Eruptions



Source: *W.E. Scott et al., 1997*, http://vulcan.wr.usgs.gov/Volcanoes/Cascades/EruptiveHistory/cascades_eruptions_4000yrs.html

In Oregon, awareness of the potential for volcanic eruptions was greatly increased by the May 18, 1980 eruption of nearby Mount St. Helens in Washington which killed 57 people. In this eruption, lateral blast effects covered 230 square miles and reached 17 miles northwest of the crater, pyroclastic flows covered six square miles and reached 5 miles north of the crater, and landslides covered 23 square miles. Ash accumulations were about 10 inches at 10 miles downwind, 1 inch at 60 miles downwind, and ½ inch at 300 miles downwind. Lahars (mudflows) affected the North and South Forks of the Toutle River, the Green River, and ultimately the Columbia River as far as 70 miles from the volcano.

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 V.2 and V.3, respectively.

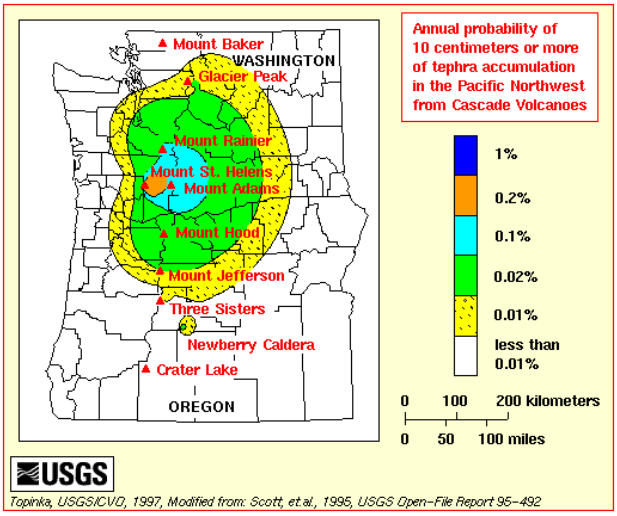


Figure V.2. Map showing annual probability of 10 cm (~4 inches) or more tephra accumulation in Oregon and Washington from eruptions throughout the Cascade Range.

Source: http://vulcan.wr.usgs.gov/Imgs/Gif/Hazards/Tephra/ash_accumulation_10cm.gif

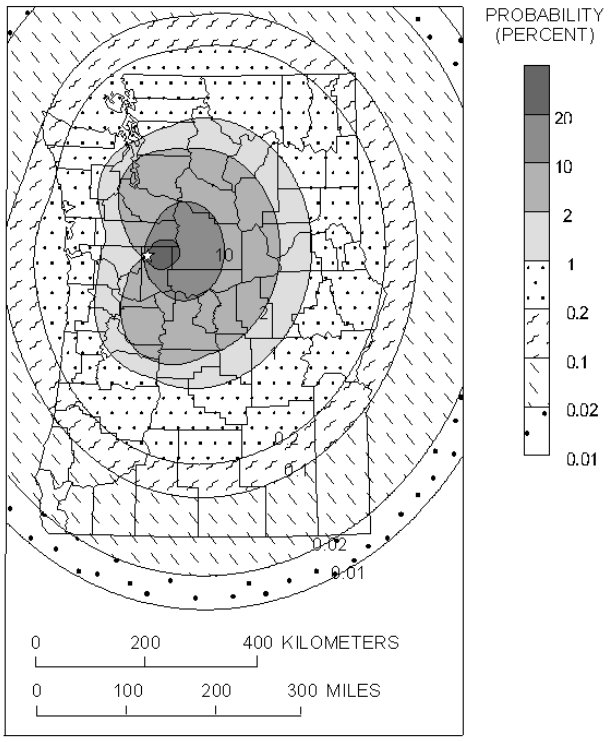


Figure V.3. Map of Washington and Oregon showing the percentage probability of accumulation of ten or more centimeters (four or more inches) of tephra from a large eruption of Mount St. Helens.

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

Several of the 20 active volcanoes in Oregon are located along the crest of the Cascades near the eastern boundary of Lane County. These volcanoes include the Three Sisters, Mt. Bachelor and the Davis Lake volcanic field. Other relatively nearby active volcanoes include several near the eastern boundary of Linn County, including: Mt. Jefferson, Blue Lake Crater, Mt. Washington, the Belknap Crater field, and the Sand Mountain field. Some of the more prominent active volcanoes and their potential impacts on the region are described below in Table V.1.

Table V.1 Prominent Cascade Volcanoes

NAME	ELEVATION	TYPE	REMARKS
Mt. Jefferson	10,495 ft.	Composite	Capable of large explosive eruptions. Not extinct. Partly on Warm Springs Reservation. Lahar inundation zones on Shitike Creek; Warm Springs settlement endangered. Lahars could enter Lake Billy Chinook via the White River, overtop dam and create damage below. (USGS OFR 99-24)
Mt. Washington	7,796 ft.	Mafic volcano	Popular recreation area. Information on Mt. Washington is very limited. Best source: USGS Cascade Volcano Observatory (CVO) web sites. No report on potential hazards. Mafic volcanoes are less explosive than composite volcanoes.
North Sister	10,085 ft.	Mafic volcano	
Middle Sister	10,047 ft.	Composite volcano	May erupt explosively in the future (USGS OFR 99-437)
South Sister	10,358 ft.	Composite volcano	May erupt explosively in the future. Carver Lake on mountain is formed by a natural debris dam. Dam failure, for any reason, could send flood water down Squaw Creek toward City of Sisters (Ref. USGS OFR 87-41 and Deschutes Co. Flood Insurance Study). In addition, the McKenzie River Channel could be impacted by sediment filling the channel, increasing turbidity in the McKenzie River. (USGS OFR 99-437) Recent uplift detected near the South Sister (about 1 in./yr), but no indication of pending eruption.
Broken Top	9,152 ft.	Composite volcano	Popular hiking destination; Source of Bend water supply
Mt. Bachelor	9,065 ft.	Mafic volcano	All-season recreation area. Mt. Bachelor ski resort.
Newberry Crater	7,984 ft.	Composite volcano	Popular recreation area. Less than 25 miles from Bend. Violent eruptions in past. Will erupt in future. Lahars could reach residential areas in the vicinity of Sun River via Little Deschutes River (USGS OFR 99-437)
Mt. Thielsen	9,187 ft.	Basalt/andesite Shield volcano	Popular hiking / climbing destination
Crater Lake (Mt. Mazama)	8,926 ft. (Mt. Scott)	Overlapping shield and composite volcanoes	Popular destination.
Mt. McLaughlin	9,496 ft.	Mafic volcano	Less explosive than composite volcanoes

Source: USGS Cascades Volcano Observatory.

The active volcanoes that pose the most threat to the Eugene/Springfield area are the Three Sisters, approximately 50 miles away. This distance is large enough that the Eugene/Springfield area is unlikely to experience lava flow, pyroclastic flows, or debris flows/avalanches from an eruption in the Sisters. However, hazard zone maps for the Three Sisters show that

landslides, debris flows, lahars, and snowmelt runoff from an eruption could enter the McKenzie River and its tributaries, causing flooding in the McKenzie that could extend to the Eugene/Springfield area.[5] The most flood prone areas would be very similar to the FEMA-mapped floodplains of the McKenzie River.

Ash fall could also extend to the Eugene/Springfield area from an eruption in the Sisters as well as from other eruptions such as Mount St. Helens. In all but the most extreme events, ash falls in the Eugene/ Springfield Metro Area are likely to be very minor with an inch or less of ash likely. There is also a possibility that a major eruption in the Cascades could affect public water supplies via heavy ash falls or lahars into streams/rivers upstream from public water supply intakes.

Probability of Future Occurrence

The probability of volcanic activity can be very difficult to predict, unless there are obvious precursors. The precursors might include increased seismic activity, temperature and chemical changes in groundwater, etc. Probability is especially difficult when the volcano has been inactive for many thousands of years and lacks a clear geologic record of past events. Also, the knowledge of volcanoes is too limited to know how long a dormant period at any volcano can last, and this probably is the case for most Cascade volcanoes.

The most active volcanoes that pose the most threat to the Eugene/Springfield area are the Three Sisters. Because geologic history is fragmentary for these volcanoes, the probability of future explosive eruptions is difficult to estimate. Only two explosive episodes have occurred at the South Sister since the ending of the ice age (about 12,000 years ago). However, since 2001, uplift was discovered in South Sister when geologists and volcanologists saw an area roughly 10 miles in diameter had risen roughly 4 inches at its center. The center of this area was roughly 3 miles from the summit of the South Sister Volcano. Uplift continued at roughly 1 inch per year until 2004, and since that time the uplift continued at roughly one half inch a year.[6] While this uplift is significant, it does not indicate an eruption is imminent. Given the fragmentary record, the annual probability of the South and Middle Sister entering a new period of eruptive activity has been estimated from 1 in several thousand to 1 in 10,000).[7]

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[5] William E. Scott, Richard Iverson, Steven Schilling, Bruce Fisher, *Volcano Hazards in the Three Sisters Region, Oregon (2001)*, Plate 1, OF 99-437, http://geopubs.wr.usgs.gov/open-file/of99-437/of99-437map.pdf.

[6] USGS, *Three Sisters, Oregon Information Statement*, April 11, 2007, http://vulcan.wr.usgs.gov/Volcanoes/Sisters/WestUplift/information_statement_04-11-07.html.

[7] *State of Oregon Natural Hazards Mitigation Plan*, Region 3: Mid/Southern Willamette Valley Regional Profile, January 2009, R3-35-37.

Given the presence of active volcanoes in the Cascades that could impact the Eugene/Springfield area, including the Three Sisters, the Eugene and Springfield steering committees estimated the probability of a new volcanic event occurring as moderate. A moderate rating means that one incident is likely within a 35 to 75 year period.

Vulnerability Assessment

The Eugene steering committee rated the vulnerability to a volcanic event as moderate, meaning that 1-10% of the population and or regional assets would be impacted by a volcanic event. This moderate rating is due to the fact that the impacts of an eruption for Eugene would be limited to ash fall or a decrease in water quality from the McKenzie River. The Springfield steering committee listed its vulnerability as high given that large portions of Springfield are located in the McKenzie River floodplain and that any lahars that enter the McKenzie River could flood portions of the city. A high vulnerability means that more than 10% of the population or regional assets would be affected.

Risk Analysis

The effects of a major volcanic event can be widespread and devastating. However specific estimates for life and property losses are not available at this time.

Community Hazard Issues

What is susceptible to damage during a hazard event?

Volcanic eruptions can have significant impacts for the cities of Eugene and Springfield. Volcanic events in the Three Sisters area, the McKenzie Pass area or in the Santiam Pass area could temporarily close some highways thus affecting transportation to/from the Eugene/Springfield area and Central Oregon. However, as noted in the hazard identification section above, the Eugene/Springfield area is most likely to experience flooding from lahars or ash fall from a volcanic eruption in the Cascades.

Lahars

Flooding in Eugene/Springfield would be caused by lahars, or mudflows consisting of mud, rock and water that follow a volcanic eruption. Lahars can occur during an eruption and when a volcano is quiet. The water that creates lahars can come from melting snow and ice (especially water from a glacier melted by a pyroclastic flow or surge), intense rainfall, or the breakout of a summit crater lake. Some lahars contain so much rock debris (60 to 90% by weight) that they look like fast-moving rivers of wet concrete. Historically, lahars have been one of the deadliest volcano hazards. Close to their source, these flows are powerful enough to rip up and carry trees, houses and huge boulders miles downstream. Farther downstream they can entomb in mud everything in their path. Large

lahars are a potential hazard to many communities downstream from glacier-clad volcanoes.

An eruption in the Three Sisters can cause lahars to rush down the McKenzie River, flooding areas more than 50 miles from the eruption. Flooding on the McKenzie could significantly impact the city of Springfield, portions of which are located in the McKenzie River's watershed. Lahars running through the McKenzie River could also lead to high turbidity in the water, causing degradation of water quality and operational problems at water treatment plants. This could significantly impact the city of Eugene which relies on the McKenzie River for most of its water needs. However, minimal impact would occur in the upper Willamette tributaries, presenting low risk to the Springfield Utility Board's treatment plant on the middle fork of the Willamette.

Ash Fall

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 vent. 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. Ash fall additionally hurts tourist-reliant businesses and logging operations, and can damage fish populations and vulnerable plant life. Ash fall could also degrade water quality in the McKenzie and Willamette Rivers, causing problems with water treatment systems for Eugene and for Springfield.

Table V.3 summarizes the potential impacts of volcanic eruptions on the Eugene/Springfield area.

Table V.3 Potential Impacts of Volcanic Eruptions on the Eugene/Springfield area

Inventory	Probable Impacts
Portion of Eugene/Springfield Metro Area affected	Entire City and surrounding region
Buildings	Negligible impact, other than minor cleanup required
Streets within Metro Area	Negligible impact, other than minor cleanup required
Roads to/from Metro Area	Negligible impact, other than minor cleanup required
Electric power	Power outages likely from short circuits caused by ash falls
Other Utilities	Negligible impact, other than minor cleanup required for most utilities. Potential to impact water treatment plants which may require additional maintenance to deal with high turbidity water
Casualties	Some potential for health impacts, especially for frail people with respiratory problems.
McKenzie River Floodplain	Volcanic eruptions, especially of Three Sisters, have the potential to cause major flooding along the McKenzie River. A worst case scenario would be failure of debris dams impounding substantial quantities of water.

Volume II: Hazard Annex
Wildfire

Causes and Characteristics of Wildfires

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.

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.

Wildfires may be started by natural causes, such as lightning strikes, or by human activity. US Forest Service data indicate that about 13% of wildfires are started by lightning, about 25% of wildfires are arson, while the rest are due to a variety of human causes including debris burns, discarded smoking materials, sparks from vehicles, sparks from power lines and so on.

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 Eugene/Springfield

Historical wildfire events that have impacted Lane County and Eugene/Springfield are indicated in Table WF.1 below.

Table WF.1 Historic Wildfire Events in Lane County and the Eugene/Springfield area

Date	Event
1910	Nelson Mountain Fire burned in areas that are now state forestlands in Lane County.
1929	Series of large fires burned areas in Lane County's Central Coast Range covering nearly 80,000 acres.
1966	Oxbow fire burns 44,000 acres.
2003	B&B Complex Fire burns 90,769 acres
2007	Small fire by Fern Ridge Reservoir
2008	Large grass fires occurred near the Eugene city limits.

Within the Eugene/Springfield area, few large wildfires have occurred. Some smaller fires have been recorded by the Eugene and Springfield fire departments and the number of these fires and their damage are indicated in Table WF.2 below.

Table WF.2 Eugene Fire Data

	Brush, Grass, Wildlands[1]		Outside of Structures[2]	
Year	**Fires**	**Damage**	**Fires**	**Damage**
1997	119	$9,213	41	$10,868
1998	118	$6,363	64	$92,096
1999	138	$1,620	50	$41,375
2000	130	$1,764	47	$51,885
2001	109	$2,651	46	$18,575
2002	134	$3,277	72	$50,225
2003	141	$8,700	40	$43,730
Average	127	$4,798	51	$44,108

[1] Excludes crops and timber.

[2] Excludes vehicles, includes outside storage, crops and timber. The vast majority of these fires are outside storage, rather than crops or timber.

Risk Assessment

How are Hazard Areas Identified

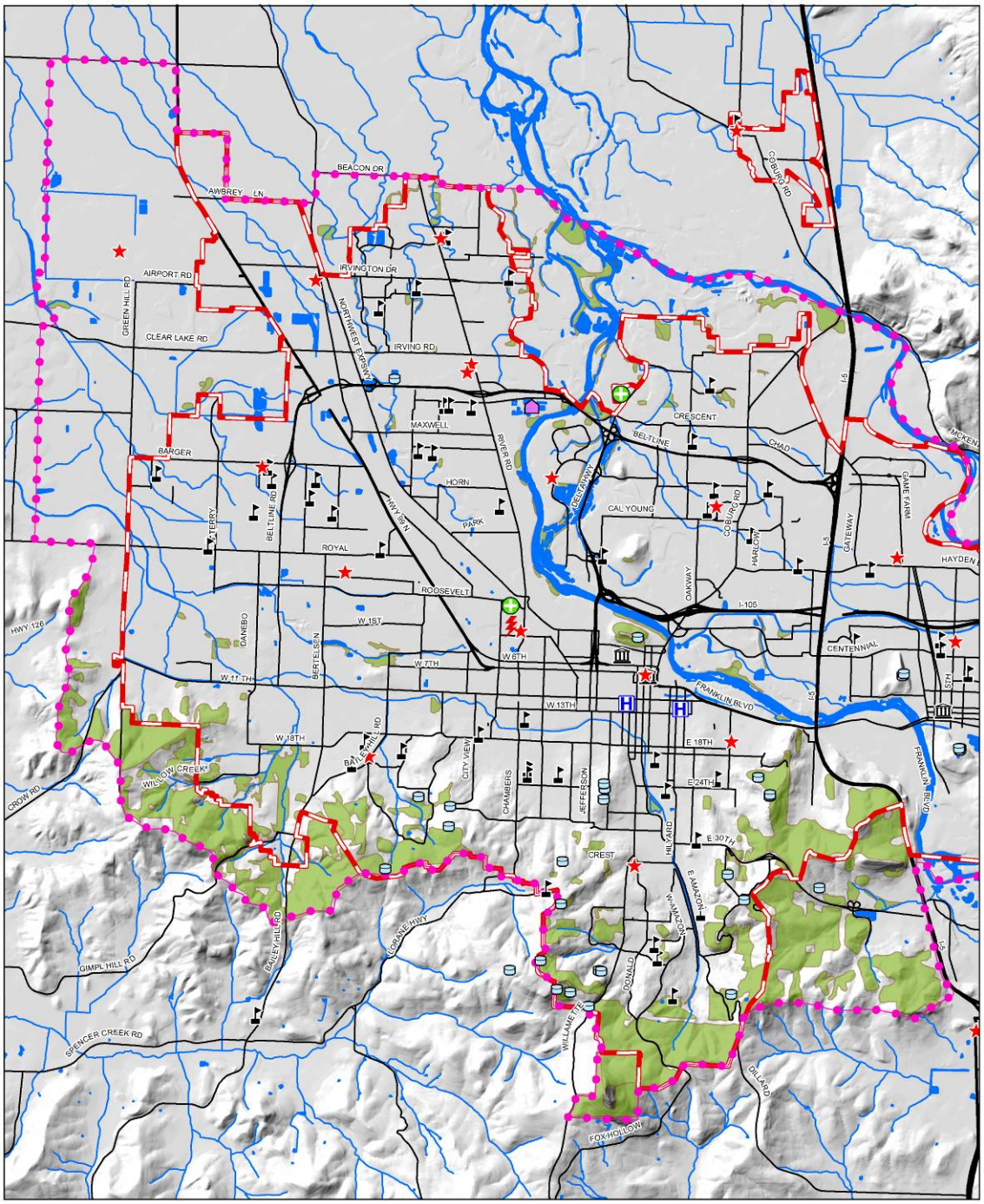
The Eugene/Springfield area is bordered by grasslands, agricultural lands, and forests. The wildfire hazard is primarily located in the southern hilly areas of both Eugene and Springfield where forested areas interface directly with built areas or are close to built areas. Other areas, including northeast Springfield, also have large areas with high vegetative fuel loads interfacing with or very close to developed or developing built areas. The

Lane County Community Wildfire Protection Plan's (CWPP) risk assessment for Eugene and Springfield identifies specific neighborhoods in Eugene/Springfield as areas at risk. These areas of concern include the South Hills neighborhood of Eugene, southwest Eugene/Spencer Creek area, Thurston Hills in Springfield, and Harbor Drive/South 2nd area in Springfield.[8]

The forest cover patterns for lands surrounding the Eugene/Springfield area are shown in Figures WF.1 and WF.2 and show the location of the wildfire hazard in the two cities.

[8] Oregon Natural Hazards Workgroup, *Lane County Community Wildfire Protection Plan*, (Eugene, OR: 2005), 2-10, 2-11.

Figure WF.1 Forest Cover Patterns in Eugene and Vicinity



Legend

- 911 Comm. Centers
- Hospitals and Urgent Care
- Schools
- Fire Stations
- Jails, Police Depts., City Halls
- Public Water Treatment/Storage
- Municipal Wastewater Facility
- Public Works Shops
- Urban Growth Boundaries
- Metro Plan Boundary
- Rivers and Streams
- Generalized Forest Cover

Source:
Data created at LCOG for Eugene Stormwater Management Plans.

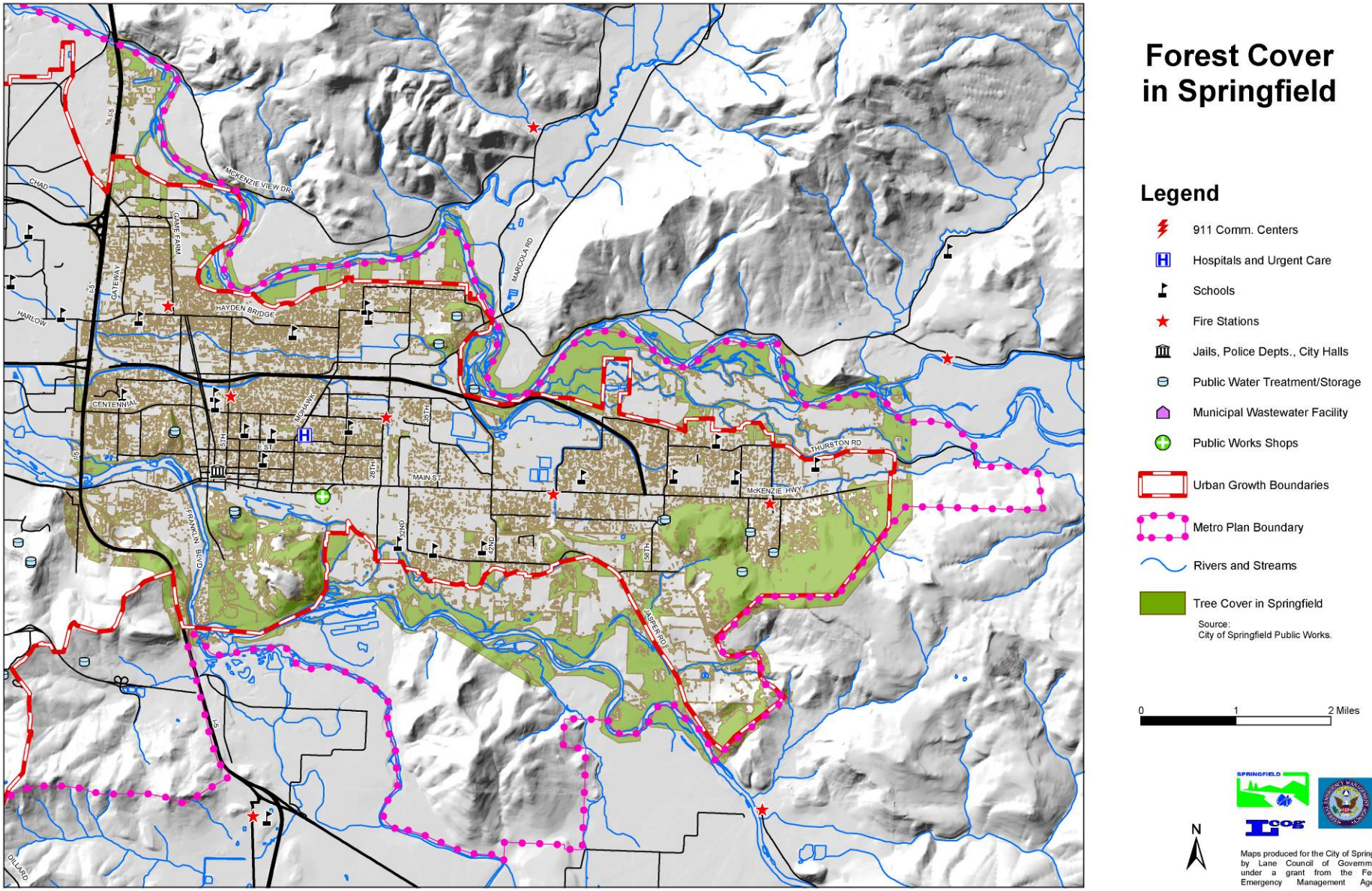
Forest Cover in Eugene

0 1 2 Miles

N

Maps produced for the City of Eugene, by Lane Council of Governments, under a grant from the Federal Emergency Management Agency.

Figure WF.2 Forest Cover Patterns in Springfield and Vicinity



The extent of the wildfire hazard depends on a number of factors including fuel, topography, weather, the extent of development and the presence of ignition sources.

For the Eugene/ Springfield Metro Area, the fuel load in the nearby forested areas is generally high and relatively continuous across large geographic areas. Because of historical logging activities, much of the forest is composed of relatively young trees, with a high density of trees per acre. Such forests may pose a higher fire hazard than do old growth forests with fewer, larger trees.

Topography contributes to fire hazard because fires spread much more quickly up steep slopes. Weather is very important in governing the level of fire hazard. Rainfall amounts and patterns contribute to the level of fuel load and also to moisture levels in vegetation. During fires, temperature, humidity and wind speed are major factors governing the rate of spread of wildland fires and are thus major factors governing the ease or difficulty with which a given fire is likely to be contained.

Typical annual rainfall amounts for the Eugene/Springfield area are moderately high to high, with annual rainfall of about 46 inches. However, rainfall is not evenly distributed through the year. Summer months are typically quite dry, with the highest temperatures, lowest humidity, and highest fire danger. Fire hazards near the Eugene/ Springfield Metro Area would be highest during prolonged periods of drought, especially after periods of normal to above normal rainfall, which would result in a combination of high fuel loads and unusually dry conditions.

Probability of Future Occurrence

The Eugene and Springfield Steering Committees identified the probability of a wildfire occurring in the Eugene/Springfield area as high, given the high fuel load in nearby forested areas, hilly topography, and dry summers. A high probability means that one event is likely to occur within a 10 to 35 year period.

Vulnerability Assessment

The hazard identification section above lists the neighborhoods and developments that could be exposed to wildfire. These developments could be vulnerable to wildfire, depending on the following factors:

1) Amount of vegetative fuel loads on the property, and the degree of continuity of fuel load (i.e., amount of significant firebreaks). If properties are surrounded by large amounts of fuel, without significant firebreaks, vulnerability to wildfire is greater. Risk may be particularly high if the fuel load is grass, brush and smaller trees, that have very low moisture levels in short duration drought periods.

2) Degree of slope. Higher slopes cause fires to spread more rapidly than in flatter terrain.

3) Fire suppression capacity. Limited fire suppression capacity, including limited water supply capacity for fire suppression purposes, limited fire fighting personnel and apparatus, and typically long response times for fire alarms, increase vulnerability to wildfire events.

4) Access for firefighting apparatus and resident evacuation. Limited access/egress increases vulnerability.

5) Construction materials.

6) Maintenance of firebreaks and defensible zones around structures.

Given the amount of residential development in the south hills of Eugene, the Eugene steering committee rated their vulnerability to wildfire as being moderate, meaning that a wildfire could impact 1-10% of the population or local assets in Eugene. The Springfield steering committee rated the vulnerability of the wildfire hazard in Springfield as low given the smaller amount of development in the south hills area of Springfield and in the northeastern portion of Springfield. A low rating means that less than 1% of the population or regional assets would be affected.

Risk Analysis

A risk analysis has not been completed for the Eugene/Springfield area for wildland-urban interface fire due to insufficient information. Given that Eugene and Springfield have a high probability rating for a wildfire recurring, and that there are areas with a moderate vulnerability to wildfire in Eugene, a risk analysis should be completed in the future.

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 forest and wildlands depend upon fire to maintain various functions. These benefits can include, depending upon location and other circumstances, reduced fuel load, disposal of slash and thinned tree stands, increased forage plant production, and improved wildlife habitats, hydrological processes and aesthetic environments. 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

Table WF.3 below indicates more specific future impacts of Wildland/Urban Interface fires in the Eugene/Springfield area.

Table WF.3 Potential Impacts of Wildland/Urban Interface Fires in the Eugene/Springfield area.

Inventory	Probable Impacts
Portion of Eugene/Springfield area affected	Highest risk areas are residential areas bordering heavily vegetated wildland areas as shown in Figures WF.1 and WF.2.
Buildings	Small wildland/urban interface fires could affect a few residential buildings. Larger fires could affect entire neighborhoods and extreme events could affect hundreds of buildings.
Streets within Metro Area	Minor road closures possible from fires; limited impact because of short detour routes within Eugene/Springfield area
Roads to/from Metro Area	Potential closures of major highways due to fires, especially roads into the Cascades and the Coast Range
Electric power	Potential for localized loss of electric power due to fires affecting power lines in or near Eugene/Springfield area.
Other utilities	Generally minor or no impacts on other utilities from fires, except for possible loss of telephone service due to fires affecting phone poles/lines.
Casualties	Potential for deaths and injuries in major wildland/urban interface fires, especially if evacuations are not completed expeditiously.

Existing Mitigation Activities

Eugene and Springfield both conduct a number of mitigation activities to reduce their vulnerability to wildfire hazards. The fire departments in both cities conduct regular educational campaigns to inform residents about actions they can take to reduce wildfire hazards on their property. In addition, the city of Eugene has a South Hills fire plan that addresses specific wildfire hazards in Eugene's South Hills neighborhood.

Volume II: Hazard Annex
Winter Storm

Causes and Characteristics of the Hazard

Winter storms affecting the Eugene/Springfield area are characterized by a combination of heavy rains and high winds. Heavy rains can result in flooding, as well as debris slides and landslides. High winds commonly result in tree falls which primarily affect the electric power system, but which may also affect buildings and vehicles. This chapter deals primarily with the rain and wind effects of winter storms. Larger scale flooding is addressed in the Flood Annex. Debris flows and landslides are addressed in the Landslide Annex.

Winter storms can also involve ice and snow, most commonly at higher elevations than the immediate Eugene/Springfield area. The most likely effects of snow and ice events are road closures limiting access/egress to/from the Eugene/Springfield area, especially roads to higher elevations such the highways into the Cascades or over the Coast Range. Winter storms with heavy wet snow and ice storms also may result in power outages from downed transmission lines and/or poles.

Average annual snowfall gauged by the Eugene Airport weather station is 6.4". Since the weather station was established in 1939, maximum monthly snowfall has been 47.1" (January 1969), with maximum seasonal snowfall also of 47.1" (1969). Maximum monthly snowfalls for other months for February, March, November, and December are 8.8", 10.8", 6.0" and 10.2", respectively.

Climate and weather conditions in Oregon make the occurrence of major tornadoes extremely unlikely. In fact, some, or even many, of the reported historical tornadoes in Lane County and throughout Oregon may not actually be tornadoes at all, but rather other severe weather phenomena, such as downbursts, often associated with severe thunderstorms. For Eugene and Springfield, the risk posed by tornadoes appears negligible. Furthermore, the only practical mitigation actions for tornadoes are public warnings and taking shelter.

History of the Hazard in Eugene/Springfield

Major winter storm events do occur occasionally. Major snow storms affecting the Willamette Valley occurred in 1884, 1892, 1909, 1916, 1919, 1937, 1950, 1969, 1989, 2002, 2004 and 2008. January 1950 snowfalls were especially high, with 54" in Albany and 36" in Eugene. The Columbus Day Windstorm is known as the most damaging winter storm to ever hit the area with buildings damaged and transportation networks disrupted. In January 1969, Eugene had 47" of snow. In December of 2008, significant snow and ice disrupted transportation throughout the Willamette Valley.

For the Eugene/Springfield area, most winters result in little snowfall, with major storms of 10" or more snow occurring typically about every 10 or 20 years. There are few practical mitigation actions for such infrequent major snow storms, other than commonsense measures applicable to many hazards, such as encouraging residents to maintain emergency supplies of food and water for a few days and emergency generators for critical facilities.

Historical winter storm data compiled by the Portland Office of the National Weather Service list the following major winter storm events with substantial wind damage in Oregon:

1. Dec. 2008-Jan. 2009
2. Dec. 2003-Jan. 2004
3. March 12, 2002
4. February 7, 2002
5. December 12, 1995
6. November 13-15, 1981
7. March 25-26, 1971
8. October 2, 1967
9. March 27, 1963
10. October 12, 1962
11. November 3, 1958
12. December 21-23, 1955
13. December 4, 1951
14. November 10-11, 1951
15. April 21-22, 1931
16. January 20, 1921
17. January 9, 1880.

The effects of the major historical winter storm events listed above varied significantly with geographic location. Similar variations in effects occur as well with the numerous smaller winter storm events. However, in terms of sustained wind speeds in the Willamette Valley and damage levels, the 1880 and 1962 storms stand out as the most severe such events.

A major winter storm event to significantly affect the Eugene/Springfield area was the February 7, 2002 storm. National Weather Service data show peak sustained winds and peak gusts at the Eugene Airport of 49 mph and

70 mph, respectively. This windstorm was a Federally-declared disaster (FEMA-1405-DR-OR) for five counties, including Lane County. In the five county disaster area, damages and costs to public facilities eligible for FEMA reimbursement (75%) totaled more than $6 million. Damages to private property are not included in this $6 million figure.

The 2002 windstorm event had significant effects on the Eugene/Springfield area, primarily from tree falls. Widespread tree falls resulted in significant damages to utility lines and poles as well as damages to vehicles and buildings. The most widespread impact on the Eugene/Springfield area was numerous areas with localized loss of electric power from downed electric lines and poles.

For completeness, the plan briefly addresses other severe weather events, including hail, severe heat, lightning strikes and tornadoes. Hail events are possible in the Eugene/Springfield area, generally during summer thunderstorms, with the most recent significant event being August 4, 1999. However, hail damage is generally minor and few practical mitigation alternatives are applicable to hail.

Severe heat is also possible, though rare, in Eugene and Springfield. Severe heat events occur during the summer months, tax utility systems and endanger the health of some citizens. One recent heat event occurred from July 25th to August 3rd. During these all of the days the high temperature exceeded 90 degrees, and for three days it exceeded 100 degrees. These events are relatively rare and there are almost no practical mitigation activities possible.

Lightning strikes also occur in the Eugene/Springfield area. Lightning strike damage to buildings or infrastructure is generally relatively minor and few practical mitigation alternatives are applicable to lightning, other than installing lightning arrestors on critical facilities subject to lightning damage. However, nationwide NOAA data show that lightning causes about 90 deaths per year, with at least 230 injuries (NOAA Technical Memorandum NWS SR-193, 1997). Lightning injuries appear to be systematically underreported and thus the actual injury total is most likely significantly higher. For Oregon, however, casualties from lightning are very low, with totals of only 7 deaths and 19 injuries reported over a 35 year period (NOAA). Thus, the level of risk posed by lightning strikes, while not zero, is very low. Public education about safe practices during electrical storms is the only available mitigation measure to reduce casualties from lightning.

Tornadoes also do occur occasionally in Oregon. However, Oregon is not among the 39 states with any reported tornado deaths since 1950. NOAA records (Portland office) show four historical tornadoes in Lane County. On November 24, 1989, a tornado touched down in the south hills of Eugene, uprooting several tall fir trees, and damaging utility lines and a camper, but causing no injuries. Another poorly documented tornado may have occurred in 1975 near Eugene, with very minor damage. In 1984, a

small tornado was reported near Junction City with damage to a barn and shelter. In 1937, a possible tornado uprooted hundreds of trees and demolished summer homes and camps near McKenzie Bridge.

Risk Assessment

How are Hazard Areas Identified?

Virtually every area of the Eugene/Springfield area is susceptible to winter storm damage.

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.[9] The recurrence interval for severe winter storms throughout Oregon is about every 13 years; however, there can be many localized storms between these periods.

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.

Eugene and Springfield Steering Committees ranked their probability for winter storms as 'high,' which indicates that at least one major emergency or disaster because of a winter storm is likely within a 10 to 35 year period.

Vulnerability Assessment

Many buildings, utilities, and transportation systems in the Eugene/Springfield area are vulnerable to winter storm damage. This is especially 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 as ice-loading and high winds often accompany winter storms.

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 trees growing next to a house. In some situations, strategic pruning may be the answer. Eugene and Springfield works with utility companies in identifying problem areas and establishing a tree maintenance / removal program.

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[9] OPDR. *Winter Storms Chapter*, *http://www.oregonshowcase.org/downloads/pdf/stateplan/ORSNHMP_winterstorm_chapter.pdf*

Both winter storm flood hazards and winter storm wind hazards have highly localized impacts. The location and severity of such impacts depend very strongly on specific local conditions. Therefore, it is difficult to make regional risk assessment or loss estimates from mapping the hazards and overlaying the inventory: such a risk assessment simply requires too much detailed data which are not available.

An alternative approach is to document the severity and locations of winter storm flood and wind damage from historical events. A good example of this approach is the excellent summary of damages and losses experienced in the February 1996 floods: **The Cascades West Region of Oregon and the February Flood of 1996: A Regional Flood Recovery Plan for Benton, Lane, Lincoln, and Linn Counties**, Oregon Cascades West Council of Governments, November 1996.

For more quantitative risk assessment of localized flooding and wind damages arising from winter storms, the best approach is to systematically gather data on sites of repetitive damages due to localized flooding or wind damages. By documenting (and mapping using GIS) the sites of repetitive damage events, along with documentation of the type and cost of damages and losses, the most seriously affected sites can be clearly identified. Clearly, such repetitive loss sites with significant damages are likely candidates for mitigation actions.

The potential impacts of winter storms on the Eugene/Springfield area are summarized below in Table WS.1.

Table WS.1 Potential Impacts of Winter Storms on the Eugene/Springfield area

Inventory	Probable Impacts
Portion of Eugene/Springfield Metro Area affected	Entire city may be affected by road closures or loss of electric power; otherwise direct damages to buildings and infrastructure are likely to be localized and relatively minor
Buildings	Isolated minor damage from tree falls, some buildings affected by flood damage in major storms, especially in the storm water drainage problem areas
Streets within Metro Area	Minor road closures due to tree falls and flooding; limited impact because of short detour routes within Eugene/Springfield Metro Area
Roads to/from Metro Area	Potential closures of major highways due to snow, debris flows or landslides, localized flooding and tree falls, especially routes into the Cascades and Coast Range
Electric power	Loss of electric power may be localized due to tree falls on local distribution lines or affect entire city if tree falls affect transmission lines feeding Eugene/Springfield Metro Area
Other Utilities	Generally minor or no impacts on other utilities from winter storms
Casualties	Small potential for casualties (deaths and injuries) from tree falls or contact with downed power lines

The Eugene and Springfield Steering Committees have both rated their vulnerability to winter storms as 'high'. This would indicate a winter storm would impact more than 10% of both Eugene and Springfield's population.

Risk Analysis

Damages and lost estimates related to winter storms are not available at this time. Post-disaster damage estimates can be found following presidentially-declared disasters.

Community Hazard Issues

What is susceptible to damage during a hazard event?

Severe winter weather can be a deceptive killer. Winter storms which 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 which 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. Down 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.

Winter storms can result in collapsed or damaged buildings, damaged or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Roads blocked by fallen trees during a winter storm may have severe consequences to people who need access to emergency services. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted.

Historically, falling trees have been the major cause of power outages in winter storms. Windstorms can cause flying debris which can also damage utility lines. Overhead power lines can be damaged even in relatively minor windstorm events.

Industry and commerce can suffer losses from interruptions in electric service and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from winter storms related to both physical damages and interrupted services.

The high winds that often accompany winter storms can be particularly damaging to manufactured homes and other non-permanent housing structures, which, in 2007, accounted for 10% of the housing units in the

Eugene/Springfield.[10] Special attention should be given to securing these types of structures.

Existing Hazard Mitigation Activities

Eugene and Springfield are participating in winter storm mitigation activities.

- Development Codes: Both jurisdictions require 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.
- Tree-Trimming: The Eugene Water and Electric Board and the Springfield Utility Board engage in tree-trimming around power lines.
- Building Codes: Eugene and Springfield Building Codes adhere to the Oregon Structural Specialty Code guidelines for new development.

[10] US Census Bureau 2005-2007 American Community Survey 3-Year Estimates "Units in Structure"

Volume II: Hazard Annex
Dam Safety

Characteristics of Dams

Dams are impervious structures that block the flow of water in a river or stream and thereby impound water behind the dam. Dams have been built for thousands of years from a wide range of materials, including earth, stone, masonry, wood, and concrete. Large modern dams are almost always embankment dams (built primarily from soil, rock, or mixtures) or concrete dams.

Dams are built for many purposes including water storage for potable water supply, livestock water supply, irrigation, fire suppression, flood control, hydroelectric power, to contain mine tailings, or for navigation. Many dams also provide recreational activities, but recreation is rarely the primary motivation for dam construction. Dams are also commonly multifunctional, serving two or more of these purposes.

Large modern dams almost always have control mechanisms such as gated spillways or outlet pipes for releasing water in a controlled fashion. Typically, dams are operated to smooth natural variations in water flow. During high water flow periods, water is stored behind a dam, while in low water flow periods, water is released to increase flows. Controlled releases typically result in lower peak (flood) flows and higher minimum flows than in uncontrolled streams. The specific patterns of water storage and release vary from dam to dam, depending on the primary purpose(s) of the dam and on a wide variety of economic, regulatory and environmental considerations.

Modern dams, whether embankment dams or concrete dams, are typically constructed on a foundation, which may be concrete, natural rock or soils, or compacted soils. Dams are usually constructed along a constricted part of a river valley to minimize cost. Dams are also connected to the surrounding natural valley walls, which become the abutments of the dam structure itself.

Embankment dams are commonly termed earthfill or rockfill dams, depending on the primary material used in their construction. Embankment dams are broad flat structures, typically at least twice as wide at the base as their height. Depending on the permeability of the materials used in an embankment dam, impervious layers may be added to the upstream side of the structure or in the center core of the structure. Embankment dams are subject to erosion by running water. Thus, modern embankment dams always have erosion-resistant materials used in the water release and control mechanisms of the dam. Typically, concrete spillways with concrete or steel gates are used to control releases. Many

dams also have outlet pipe systems with concrete or steel pipes as part of the water release control system.

Modern concrete dams fall into two major classes: gravity dams and arch dams. Concrete gravity dams are designed on principles similar to embankment dams. Concrete gravity dams are broad structures, generally triangular in shape with a flat base, a narrow top, a flat upstream side and a broad sloping downstream side. Much of these dams' capacity to impound water arises from the weight of the dam. Typically, gravity dams are keyed into bedrock foundations and abutments to increase the stability of the dam.

Concrete arch dams rely primarily on the strength of concrete to impound water. Concrete arch dams are much thinner in cross section than concrete gravity dams and are always convex on the upstream side and concave on the downstream side because concrete is much stronger in compression than in tension. With this arch design, the pressure of impounded water compresses the concrete and makes the dam stronger. Like concrete gravity dams, concrete arch dams are also keyed into bedrock foundations and abutments to provide stability. A less common variation of a concrete arch dam is a concrete buttress dam. Buttress dams are arched or straight dams with additional strength provided by buttresses perpendicular to the long axis of the dam.

Causes of Dam Failure

Dam failures can occur at any time in a dam's life; however, failures are most common when water storage for the dam is at or near design capacity. At high water levels, the water force on the dam is higher and several of the most common failure modes are more likely to occur. Correspondingly, for any dam, the probability of failure is much lower when water levels are substantially below the design capacity for the reservoir.

For embankment dams, the most common failure mode is erosion of the dam during prolonged periods of rainfall and flooding. When dams are full and water inflow rates exceed the capacity of the controlled release mechanisms (spillways and outlet pipes), overtopping may occur. When overtopping occurs, scour and erosion of either the dam itself and/or the abutments may lead to partial or complete failure of the dam. Especially for embankment dams, internal erosion, piping or seepage through the dam, foundation, or abutments can also lead to failure. For smaller dams, erosion and weakening of dam structures by growth of vegetation and burrowing animals is a common cause of failure.

For embankment dams, earthquake ground motions may cause dams to settle or spread laterally. Such settlement does not generally lead, by itself, to immediate failure. However, if the dam is full, relatively minor amounts of settling may cause overtopping to occur, with resulting scour and erosion that may progress to failure.

For any dam, improper design or construction or inadequate preparation of foundations and abutments can also cause failures. Improper operation of a dam, such as failure to open gates or valves during high flow periods can also trigger dam failure. For any dam, unusual hydrodynamic (water) forces can also initiate failure. Landslides into the reservoir, which may occur on their own or be triggered by earthquakes, may lead to surge waves which overtop dams or hydrodynamic forces which cause dams to fail under the unexpected load. Earthquakes can also cause seiches (waves) in reservoirs that may overtop or overload dam structures. In rare cases, high winds may also cause waves that overtop or overload dam structures.

Concrete dams are also subject to failure due to seepage of water through foundations or abutments. Dams of any construction type are also subject to deliberate damage via sabotage or terrorism. For waterways with a series of dams, downstream dams are also subject to failure induced by the failure of an upstream dam. If an upstream dam fails, then downstream dams also fail due to overtopping or due to hydrodynamic forces.

A National Research Council study[4] of dam failures in the United States and Western Europe from 1900 to 1969 compiled historical data on the observed probability of failure as a function of type of dam. Dam failures are quite common in the United States. For example, FEMA data from Tropical Storm Alberto (1994) show 230 dam failures in the State of Georgia from this single event.[11] Fortunately, most dam failures are of small dams where the failure poses little or no risk to life safety and only minor, localized property damage.

History of the Hazard in Eugene/Springfield

A 1987 report on Dam/Levee Failure by the Oregon Emergency Management Division lists 51 historical dam failures in Oregon from 1896 through the 1980s.[12] However, there have been no reported dam failures in Oregon that have impacted Eugene/Springfield.

Risk Assessment

How are Hazard Areas Identified?

Although the likelihood of failure is very low, all dams upstream from the Eugene/Springfield area have the potential of causing widespread flooding should they fail. The dams that could cause the greatest loss of life and economic loss have been inventoried by the Army Corps of Engineers in the National Inventory of Dams (NID). The NID lists approximately 79,000 dams in the US that have the potential to cause

[11] FEMA [Federal Emergency Management Agency]. 1999- National dam safety program (http://www.fema.gov/mit/ndspweb.htm).

[12] Oregon Emergency Management Division, Dam/Levee Failure, Statewide Hazard Analysis, March, 1987.

significant damage. The NID rates each dam either a high, significant, or low hazard classification depending on the probable impacts if a dam fails, but is not based on whether the dam is unsafe or likely to fail. A High Potential Hazard classification is the only classification that takes into account whether people are at risk downstream from the dam in the inundation area, if the dam were to fail.

In Lane County, there are 9 dams in the High Potential Hazard Category meaning that people are at risk from a dam failure and there would be significant economic and environmental losses. Lane County's 9 High Potential Hazard dams are listed below in Table DA.1, and all dams, except Fern Ridge, are upstream from the Eugene/Springfield area.

Table DA.1 NID High Potential Hazard Dams Lane County

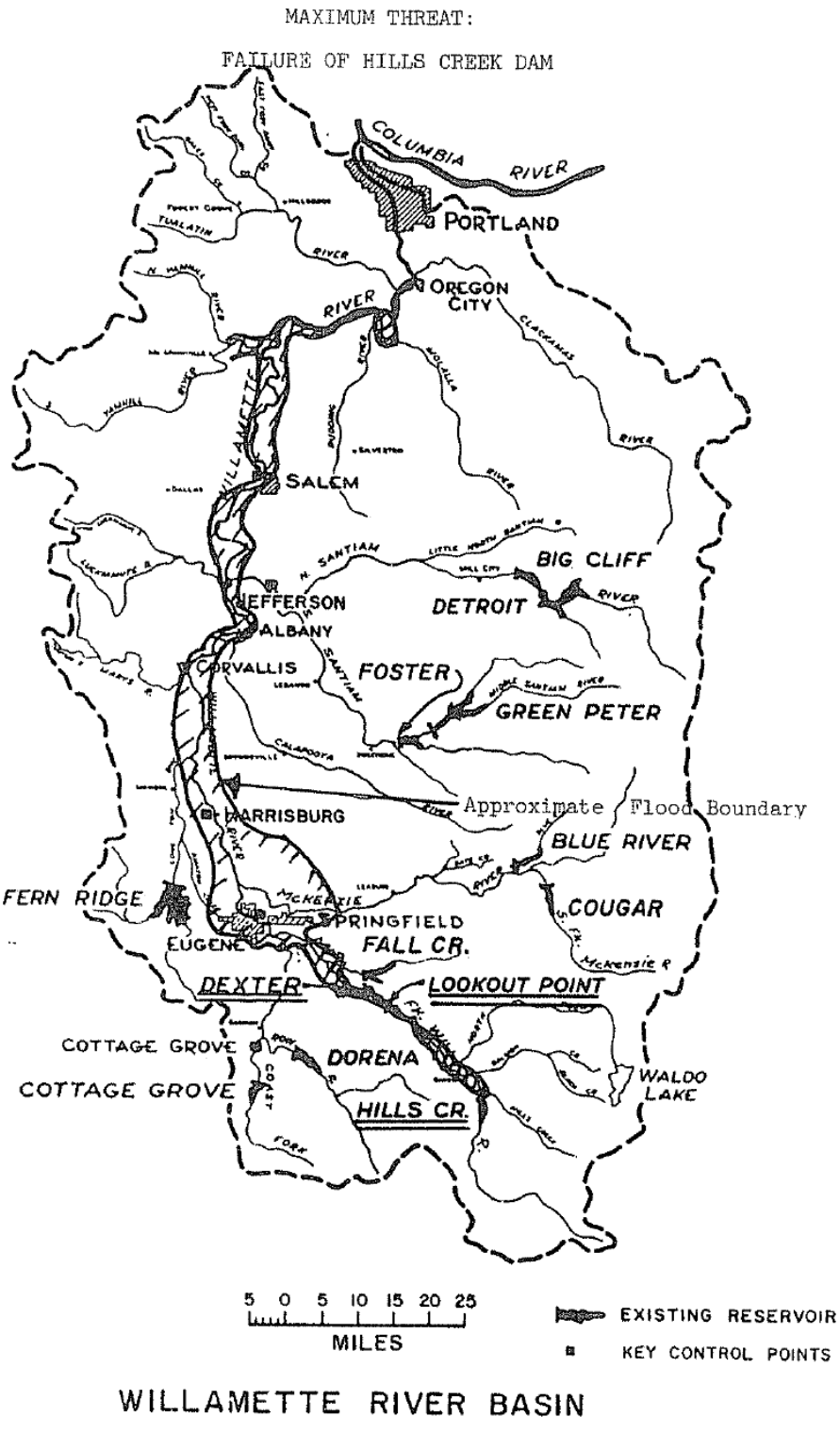
County	Dam Name	River	City	NID Height (feet)	NID Storage (acre feet)
Lane	Cottage Grove	Coast Fork Willamette River	COTTAGE GROVE	103	50,000
Lane	Dexter	Middle Fork Willamette River	EUGENE	117	29,900
Lane	Fall Creek	Fall Creek	SPRINGFIELD	205	125,000
Lane	Dorena	Row River	COTTAGE GROVE	154	131,000
Lane	Lookout Point	Middle Fork Willamette River	EUGENE	276	477,700
Lane	Blue River Dam	Blue River	SPRINGFIELD	312	89,000
Lane	Hills Creek	Middle Fork Willamette River	OAKRIDGE	341	356,000
Lane	Cougar	South Fork McKenzie River	SPRINGFIELD	519	219,000
Lane	Fern Ridge	Long Tom River	EUGENE	49	121,000

The extent of the flood hazard from these dams depends on which dam fails, how much water is behind the dam at the time of failure, time of day, the degree to which the dam failed, and the dam's proximity to population centers. For example, in a worst case scenario, if the Hills Creek Dam were to fail catastrophically, the volume of water released would breach the Lookout Point Dam and Dexter Dam, releasing 872,600 acre feet of water into the Willamette Valley if the dams were at full capacity.[13] If just the Dexter dam failed, the volume of water released would be significantly less, as would the damage to the Eugene/Springfield area.

Figure DA.1 below indicates the location and extent of the flood hazard from a worst case scenario should the Hills Creek Dam fail catastrophically.

[13] Oregon Emergency Management Division, Dam/Levee Failure, Statewide Hazard Analysis, March, 1987.

Figure DA.1 Inundation Areas During the Failure of the Hills Creek Dam



Source: Oregon Emergency Management, *Dam/Levee Failure Statewide Hazard Analysis*, 1987.

Probability of Future Occurrence

To evaluate the probability of a dam collapse upstream from the Eugene/Springfield area, the type of dam for each of the 9 high hazard potential dams in Lane County should be considered. Table DA.2 provides additional information on the type of dam.

Table DA.2 Additional Data on NID High Hazard Potential Dams

County	Dam Name	River	Storage (acre feet)	Date Built	Dam Type	EAP	Owner
Lane	Cottage Grove	Coast Fork Willamette	50,000	1942	RE	Y	Corps
Lane	Dexter	Middle Fork Willamette	29,900	1955	RE	Y	Corps
Lane	Fall Creek	Fall Creek	125,000	1965	ER	Y	Corps
Lane	Dorena	Row River	131,000	1949	RE	Y	Corps
Lane	Lookout Point	Middle Fork Willamette	477,700	1953	RE	Y	Corps
Lane	Blue River Dam	Blue River	89,000	1968	RE	Y	Corps
Lane	Hills Creek	Middle Fork Willamette	356,000	1962	RE	Y	Corps
Lane	Cougar	South Fork McKenzie	219,000	1964	ER	Y	Corps
Lane	Fern Ridge	Long Tom	121,000	1941	RE	Y	Corps

The NID dam type classification includes the following types of dams:

RE: rockfill/earthfill embankment dams, primarily rockfill (fill >3" size)

ER: rockfill/earthfill embankment dams, primarily earthfill (fill <3" size)

Lane County's high hazard potential dams were completed between 1941 and 1968. All dams are rockfill/earthfill embankment dams, except Cougar which is an earthfill/rockfill embankment dam. All dams are operated by the US Army Corps of Engineers and all have emergency operations plans in place. All Corps dams are maintained on a regular schedule and undergo regular inspections, with major re-inspections every five years. Furthermore, the Corps is highly experienced in the construction, operation, and maintenance of dams.

For embankment dams the most common failure modes are overtopping, foundation failures, and seepage through the dam. However, all of the Corps dams were designed and built with specific flood capacities. In addition, the Hills Creek Dam likely has the capacity to withstand floods at least as large as a 1,000 year flood event without expected damage. The other Corps dams have similar margins of flood design safety. Under normal or flood conditions, the probability of failure of the Corps operated dams appears highly unlikely.

In addition, all of Lane County's dams were designed and built in the 1940s to 1960s before seismic design standards were put in place. A summary tabulation of the seismic design basis and inspection history of these dams is given below in Table 12.5 (Corps of Engineers, Portland District Office, March, 2001).

Table DA.3 Seismic Design, Evaluation and Inspection Data Corps of Engineers Dams

Dam	Date of Last Seismic Evaluation	Seismic Design Basis		Date of Last Periodic (not Major) Inspection
		Original	Current	
Cottage Grove	1981	None	0.21 g	1997
Dexter	1981	0.10 g	0.21 g	1996
Fall Creek	1981	0.10 g	0.21 g	1999
Dorena	1981	none	0.21 g	1997
Lookout Point	1981	0.10 g	0.21 g	1999
Blue River	1994	0.10 g	0.24 g	1996
Hills Creek	2000	0.10 g	0.22 g	1999
Cougar	1994	0.10 g	0.24 g	1997
Fern Ridge	2001	none	0.35 g	2000

As Table DA.3 shows, seismic considerations were completely absent in the design of Dorena and Fern Ridge dams. The others were explicitly designed or probably designed to ground shaking levels of 0.10 g, which is the maximum seismic design level for any of the Corps dams in western Oregon. In contrast, the current Corps seismic design levels for dams at these sites (i.e., if new dams were to be built today) would be 0.21 g to 0.24g for the dams in eastern Lane County and 0.35 g for Fern Ridge . Thus, current seismic design requirements are for levels of ground shaking about two times higher than the probable design levels for most of these dams and about three times higher for Fern Ridge. To ensure that dam failures will not occur, the Army Corps of Engineers conducts regular seismic evaluations of each of the dams, and ensures that all dams meet current safety requirements.

The probability of catastrophic failure of these dams is impossible to estimate with any accuracy, from present data. Most likely, the probability is less than 0.1% per year (less than once in 1,000 years, on average) and perhaps substantially less. The Army Corps of Engineers indicates that Lane County's Dams all meet seismic standards and flood standards and that the probability of a dam failure is low, meaning that one incident is likely in a 75 to 100 year period. The Eugene and Springfield steering committees agree with this assessment.

Vulnerability Assessment

Eugene and Springfield are both highly vulnerable to inundation from a flood should one of the dams collapse. Both the Eugene and Springfield

steering committees rate both cities as highly vulnerable to flooding events caused by dam failure, meaning that more than 10% of the population or regional assets could be affected.

Risk Analysis

Detailed loss estimates for possible failures of these dams are beyond the scope of this mitigation plan. However, a 1987 Dam/Levee Failure Statewide Hazard Analysis indicates that a completely catastrophic failure of the Hills Creek Dam, an extremely unlikely event, could require the evacuation of over 250,000 people with damages in excess of $10 billion. Adjusting these 1987 estimates for inflation and for population growth suggests that damages could easily exceed $20 billion. Detailed casualty estimates have not been made for catastrophic dam failures affecting Lane County. However, given the large inundation areas, high water depths, and the logistical difficulties in evacuating 250,000 people to safe ground, it is not difficult to imagine that a truly catastrophic dam failure could potentially result in 1,000 or more deaths.

Community Hazard Issues

What is susceptible to damage during a hazard event?

The potential impacts of dam failures on the Eugene/Springfield area are summarized below in Table DA.4

Table DA.4.Potential Impacts of Dam Failures on the Eugene/Springfield area

Inventory	Probable Impacts
Portion of Eugene/Springfield Metro Area affected	Direct impacts limited to mapped inundation areas for dam failures, or to smaller areas for more likely partial failures
Buildings	Heavy damage in inundation areas
Streets within Metro Area	Damage and closures in inundation areas
Roads to/from Metro Area	Damage and closures in inundation areas
Electric power	Damage and loss of service in inundation areas
Other Utilities	Damage and loss of service in inundation areas. Potential for major damage to water and wastewater treatment plants in extreme events
Casualties	Potential for high casualties (deaths and injuries) in extremely unlikely major dam failures, depending on warning time available and effectiveness of evacuations

Existing Mitigation Activities

The Army Corps of Engineers conducts annual inspections of all dams that it owns, has completed Emergency Action Plans for all dams should they fail, and completes thorough evaluations of each dam every five years. All these actions have help to significantly reduce the probability that a dam will fail.

References

1. FEMA, Federal Guidelines for Dam Safety: Hazard Potential Classification Systems for Dams, FEMA 333, October 1998.

2. FEMA, Multihazard Identification and Risk Assessment, A Cornerstone of the National Mitigation Strategy, Chapter 20, Dam Failures, 1997.

3. FEMA, Dam Safety: An Owner's Guidance Manual, FEMA 145, August 1987.

4. National Research Council, Safety of Existing Dams, Evaluation and Improvement, National Academy Press, 1983.

5. FEMA website (www.fema.gov), National Dam Safety Program webpage.

6. Oregon Emergency Management Division, Dam/Levee Failure, Statewide Hazard Analysis, March, 1987.

7. Hills Creek Lake Project, Emergency Response Flowchart, Distributed January 2000, United States Army Corps of Engineers, Portland District, 5 pages

Volume II: Hazard Annex
Terrorism

Causes and Characteristics of the Hazard

For mitigation planning, terrorism is broadly inclusive of a wide range of deliberate malevolent acts intended to damage buildings, infrastructure or to result in deaths and injuries. The possibility of international terrorist organizations targeting the Eugene/ Springfield area, while not zero, is certainly small. However, the Eugene/Springfield area is certainly subject to deliberate malevolent acts from many sources including vandals, mentally disturbed individuals, domestic terrorist groups, as well as by disgruntled residents, and past or present employees.

The range of possible malevolent actions includes vandalism, arson, explosions and armed attacks, as well as use of chemical, biological, radiological or nuclear materials. Chemical attacks include deliberate release of on-site chemicals as well as deliberate dispersal of transported hazardous materials. Biological attacks include deliberate dispersal of biologically active materials (e.g., anthrax) capable of causing sickness or death. Radiological attacks include deliberate dispersal of radioactive materials, via dirty bombs (conventional explosives laced with radioactive materials) or other methods. Nuclear attacks include explosion of nuclear devices and the radioactive fallout from such explosions.

The range of possible malevolent actions also includes cyber-terrorism, or deliberate disruption/damage of computer systems and data. Especially for utility systems, cyberterrorism can also result in loss of service due to disruption/damage to automated SCADA (Supervisory Control and Data Acquisition) systems widely used by utilities.

History of the Hazard in Eugene/Springfield

Below is a list of terrorist incidents that have impacted Eugene and Springfield.

- **Oct. 26, 1986 -** The Animal Liberation Front (ALF) claimed an attack on a University of Oregon laboratory that did nearly $120,000 in damage.
- **Dec. 24, 1995 -** The ALF planted incendiary devices under three Dutch Girl Ice Cream trucks, causing $15,600 in damage.
- **Oct. 30, 1996 –** The ALF and the Earth Liberation Front (ELF) burned the U.S. Forest Service Oakridge Ranger Station, causing $5.3 million in damage.

- **May 9, 1999 –** ALF set a fire that destroyed a two-story office building, a shipping dock and a refrigeration unit at Childer's Meat Co., causing about $150,000 in damage.
- **June 14, 1999 –** Pipe bombs found a day before a visit from President Clinton at a culvert near the airport.
- **Mar. 30, 2001 –** Thirty SUVs at Joe Romania's car dealership were torched, causing about $1 million in damage. The ELF said the attack was in support of Jeff "Free" Luers, who was serving at the time a 23-year prison sentence, in part for torching cars at the same dealership.
- **Dec. 2005 through Jan. 2006 -** Operation Backfire is held, coordinated out of Portland. This included multiple investigations of the ALF and ELF beginning in 2004.

Risk Assessment

At the present time, there isn't any available data to quantify the risk terrorism poses.

How are Hazard Areas Identified?

Potentially, any area in Eugene and Springfield could be the target of a terrorist attack.

Probability of Future Occurrence

The Eugene and Springfield Steering Committees have chosen to split this hazard out into two categories: international and domestic terrorism. They agree that the probability of a domestic terrorist incident to be 'high' and of an international terrorist incident to be 'low'. These estimates are informed by the history of past occurrences.

Vulnerability Assessment

The Eugene and Springfield Steering Committees have designated their vulnerability to domestic terrorism to be 'low' and to international terrorism to be 'moderate'.

Risk Analysis

There isn't sufficient data to perform a risk assessment.

Community Hazard Issues

The probable impacts of terrorist events on the Eugene/Springfield area are summarized below in Table TR.1. For the Eugene/Springfield area, the most probable malevolent events are small scale events (vandalism or minor damage) by insiders or local outsiders or computer hackers. Large scale terrorist actions by domestic or international groups are possible, but with a low probability.

Evaluation of the potential for terrorist actions has many similarities to other hazards such as dam failures or major earthquakes where the annual probability of such events is low, but the consequences may be extremely high. Thus, such unlikely, but certainly possible, events must be included in prudent mitigation planning. The consequences of major terrorist actions are extremely high and therefore, pragmatic measures to reduce the probability of such occurrences and/or to reduce the consequences if they do occur are certainly warranted.

Table TR.1 Probable Impacts of Terrorist Events on the Eugene/Springfield Area

Inventory	Probable Impacts
Portion of Eugene/Springfield area affected	Localized impacts for minor incidents, large portions or the entire City for extremely unlikely major incidents
Buildings	Localized impacts to a single building or a few nearby buildings, except for extremely unlikely major incidents
Streets within Metro Area	Some incidents may include temporary street closures
Roads to/from Metro Area	Some incidents may include temporary road closures
Electric power	Some incidents may include temporary loss of electric power in localized parts of Eugene/Springfield area or for the entire City
Other Utilities	Some incidents may include temporary loss of utilities in localized parts of Eugene/Springfield area or for the entire City. Major damage to water or wastewater treatment plant could result in full or partial loss of service for extended time periods
Casualties	Major events may result in significant casualties (deaths and injuries)

Volume II: Hazard Annex
Hazardous Materials

Causes and Characteristics of the Hazard

For mitigation planning, hazardous materials may be defined simply as any materials that may have negative impacts on human health. That is, exposure to hazardous materials may result in injury, sickness, or death. The impacts of hazardous materials may be short-term with negative effects immediately or in a few seconds, minutes or hours or they may be long-term with negative effects in days, weeks, or in some cases years after exposure. Hazardous materials also include materials that may cause negative impacts on the environment or on animal or plant species.

Hazardous materials vary widely in their toxicity to humans. Some hazardous materials are highly toxic so that even brief exposures to small amounts may be dangerous or even fatal. Other hazardous materials are much less toxic and negative effects may occur only after exposure to large amounts over longer time periods. The technical term "toxic," which is widely used to describe hazardous materials, is simply a synonym for the more common terms "poison" or "poisonous."

Hazardous chemicals are widely used in heavy industry, manufacturing, agriculture, mining, the oil and gas industry, forestry, and transportation as well as in medical facilities and commercial, public, and residential buildings. There are literally hundreds of thousands of chemicals that may be hazardous to human health, at least to some extent. A typical single family home may contain dozens of potentially hazardous materials including fuels, paints, solvents, cleaning chemicals, pesticides, herbicides, medicines and others.

However, for mitigation planning purposes, small quantities of slightly or moderately hazardous materials being used by end users are rarely the focus of interest. Rather, interest is focused primarily on larger quantities of hazardous materials in industrial use and on hazardous materials being transported, where the potential for accidental spills is high. Situations involving extremely hazardous materials or large quantities of hazardous materials in locations where accidents or malevolent actions (terrorism or sabotage) may result in significant public health risk are of special concern for planning purposes.

For mitigation planning purposes, the toxicity of particular hazardous materials is an important measure of the potential impact of hazardous materials on affected communities, but not the only important measure. Other characteristics of hazardous materials, especially the quantity of material and the ease of dispersal of the material may be as important as or

more important than toxicity in governing the level of potential threat to a community. For example, a small quantity of a very toxic solid hazardous material in a research laboratory may pose a much smaller level of risk for a community than a large quantity of a less toxic gaseous material in an industrial site upwind from a populated area.

The severity of any hazardous material release incident for an affected community depends on several factors, including:

a) the toxicity of the hazardous material,

b) the quantity of the hazardous material released,

c) the dispersal characteristics of the hazardous material,

d) the local conditions such as wind direction and topography, soil and ground water characteristics and proximity to vulnerable resources such as public drinking water resources,

e) the population of nearby areas likely to be affected by hazardous materials incidents, and

f) the efficacy of response and recovery actions.

There are three principal modes of human exposure to hazardous materials:

a) **Inhalation** of gaseous or particulate materials via the respiratory (breathing) process,

b) **Ingestion** of hazardous materials via contaminated food or water, and

c) **Direct contact** with skin or eyes.

Exposure to hazardous materials can result in a wide range of negative health effects on humans. Hazardous materials are generally classified by their health effects. The most common classes of hazardous materials are summarized below.

Flammable materials are substances where fire is the primary threat, although explosions and chemical effects listed below may also occur. Common examples include gasoline, diesel fuel, and propane.

Explosives are materials where explosion is the primary threat, although fires and chemical effects listed below may also occur. Common examples include dynamite and other explosives used in construction or demolition.

Irritants are substances that cause inflammation or chemical burns of the eyes, nose, throat, lungs, skin or other tissues of the body in which they come in contact. Examples of irritants are strong acids such as sulfuric or nitric acid.

Asphyxiants are substances which interfere with breathing. Simple asphyxiants cause injury or death by displacing the oxygen necessary for life. Nitrogen is a good example. Nitrogen is a normally harmless gas that constitutes about 78% of the atmosphere. However, nitrogen releases in a confined space may result in asphyxiation by displacing oxygen. Chemical asphyxiants are substances that prevent the body from using oxygen or otherwise interfere with the breathing process. Common examples are carbon monoxide and cyanides.

Anesthetics and Narcotics are substances which act on the body by depressing the central nervous system. Signs and symptoms include drowsiness, weakness, fatigue, and incoordination, unconsciousness, paralysis of the respiratory system and death. Examples include numerous hydrocarbon and organic compounds.

Hazardous materials may also have a wide variety of more specialized impacts on human health. Other types of toxic effects are briefly summarized in Table HZ.1.

Table HZ.1 Other Types of Hazardous Materials

Type of Hazardous Material	Effects on Humans
Hepatotoxin	Liver damage
Nephrotoxin	Kidney damage
Neurotoxin	Neurological (nerve) damage
Carcinogen	May result in cancer
Mutagen	May produce changes in the genetic material of cells
Teratogen	May have adverse affects on sperm, ova, or fetal tissue
Radioactive materials	May result directly in radiation sickness at high exposure levels or act as carcinogen, mutagen, or teratogen
Infectious substances	Biological materials such as bacteria or viruses that may cause illness or death

History of the Hazard in Eugene/Springfield

Large-scale hazardous materials events have been rare. Small-scale or household spills or events are also deemed to be relatively uncommon.

Risk Assessment

At the present time, there isn't reliable data for assessing the level of risk posed by hazardous materials.

How are Hazard Areas Identified?

Just about any area within the Eugene/Springfield area may have hazardous materials on or around it.

Probability of Future Occurrence

At least 289 hazardous materials incidents of varying magnitude have occurred in the Eugene/Springfield area over the last 5 years, with a roughly even distribution of incidents for each year. Given the increasing populations of both Eugene and Springfield there is no reason to believe that this number will noticeably drop.

The Eugene and Springfield Steering Committees listed the probability of a hazardous material incident as 'high'.

Vulnerability Assessment

As mentioned above, many areas with the Eugene/Springfield area may contain hazardous materials, though areas that transport and store such materials and the areas around them are especially vulnerable. These areas include the railroad that runs through Eugene and Springfield as well as any pipelines in the area.

The Eugene and Springfield Steering Committees estimate their vulnerability to hazardous material incidents as 'moderate'.

Risk Analysis

Due to insufficient data, Eugene and Springfield are unable to perform a quantitative risk assessment at this time. The cities will be completing a risk assessment as data and resources become available.

Community Hazard Issues

What is susceptible to damage during a hazard event?

The potential impacts of hazardous materials incidents on the Eugene/Springfield area are summarized below.

Table HZ.2 Potential Impacts of Hazardous Material Incidents on the Eugene/Springfield area

Inventory	Probable Impacts
Portion of Eugene/Springfield Metro Area affected	Most hazmat incident impacts would be localized near source of spill, but major spills could have extensive evacuation zones and affect a significant portion of the Eugene/Springfield Metro Area
Buildings	Negligible impact, except for very near incidents which involve explosions
Streets within Metro Area	Temporary street closures likely
Roads to/from Metro Area	Temporary road closures likely
Electric power	Negligible impact, except for very near incidents which involve explosions
Other Utilities	Negligible impacts, except for incidents which spilled hazmat into rivers upstream from water intakes for Eugene/Springfield water systems
Casualties	Potential for casualties (deaths and injuries), depending on location and identify of hazmat material(s) involved, time of day and effectiveness of evacuations

Existing Hazard Mitigation Activities

Perhaps the single most critical factor in enhancing both mitigation planning and emergency response planning is **specific inventory awareness** for major hazardous materials sites within each jurisdiction. Specific inventory awareness means detailed knowledge of the types of hazardous materials, quantities of hazardous materials and locations of every location in a jurisdiction with significant quantities of hazardous materials. In this context, what constitutes a significant quantity varies depending on the toxicity of the material, the dispersal characteristics and the nature and population of nearby areas likely to be affected by hazardous materials incidents.

The Office of State Fire Marshal's Hazardous Substance Information System (HSIS) database contains a vast amount of information on the inventories of hazardous materials at fixed locations in the Eugene/Springfield area. This detailed inventory information along with data hazardous materials being transported within or through the Eugene/Springfield area, provides the basic data for specific inventory awareness and is integrated into Eugene and Springfield's Fire Departments.

In addition, Springfield Utility Board has created a Wellhead Protection program that limits what types of hazardous materials may be kept near wellheads. This is important as Springfield gets the vast majority of its water from wells.

Appendix A:
New Action Item Forms

Multi-Hazard # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Continue to support/develop public and private sector partnerships to foster hazard mitigation activities.	***Goals 6, 7***

Rationale for Proposed Action Item:

Developing partnerships among public agencies and the private sector can help in collaborating and sharing the responsibility of implementing natural hazard mitigation activities. These partnerships can help Eugene/Springfield reduce its risk from the natural hazards addressed in the Natural Hazards Mitigation Plan.

The cities of Eugene and Springfield have developed several partnerships between the public and private sector to coordinate their emergency management activities. Examples include coordinating with public and private organizations to prepare for the Olympic Track and Field Trials at the University of Oregon in 2008 and being involved in the Lane Preparedness Coalition to address pandemic flu issues. Continuing to support and develop these public and private sector partnerships help enable Eugene and Springfield to implement their mitigation activities and reduce the level of risk these cities face from natural hazards.

Ideas for Implementation:

Continue involvement with the Lane Preparedness Coalition which is comprised of public agencies and private sector businesses, to support/develop public and private sector partnerships.

Coordinating Organization:	**Lane Preparedness Coalition**

Internal Partners:	**External Partners:**
Eugene Emergency Management, Springfield Emergency Management	**OEM, private businesses, other local agencies and volunteer groups**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued action item from 2004 plan with rewording.

Multi-Hazard # 2

Proposed Action Item:	**Alignment with Plan Goals:**
Maintain and continue to deliver existing education programs aimed at mitigating the risk posed by hazards.	***Goals 1, 2, 3, 4***

Rationale for Proposed Action Item:

The cities of Eugene and Springfield have a number of education and outreach programs to teach the public about mitigating their risk to natural hazards. The city of Eugene has CERT classes that prepare members of the public in emergency management. The Springfield Steering Committee indicated a desire to develop a CERT team for their city. In addition, both Eugene and Springfield have education programs about wildfire prevention, bird flu preparedness, and developing 72 hour kits. Maintaining these education and outreach programs, and continuing to develop them, will educate the public about the risk posed by natural hazards and ways for reducing their overall risk.

The Disaster Mitigation Act of 2000 requires communities to identify how the community will continue to involve the public in the plan maintenance process [201.6(c)(4)(iii)]. Educating the public helps keep the public informed of what is being done with the plan, how Eugene and Springfield are working to mitigate their risk to hazards, and allows for feedback and suggestions from the public for improving, updating, and maintaining the plan.

Ideas for Implementation:

Partner with organizations such as the Red Cross to improve education and outreach of natural hazard risks and mitigation activities.

Coordinating Organization:	**Eugene Emergency Management/Springfield Emergency Management**

Internal Partners:	**External Partners:**
Eugene/Springfield Public Works, Police, Fire, and Planning	**OEM, FEMA, Red Cross**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued action item from 2004 plan with rewording.

Multi-Hazard # 3

Proposed Action Item:	**Alignment with Plan Goals:**
Continue to educate businesses and governmental organizations about the importance of developing continuity of operations plans.	***Goals 2,3, 4***

Rationale for Proposed Action Item:

Continuity of operations plans can help businesses and governmental organizations continue core operations in the event of an emergency situation, including natural disasters. These plans detail how essential business functions will be maintained in the event of an emergency that disrupts normal functions. Continuity of operations plans can also assist a community in planning how it will respond in the event of a natural disaster, and help a community mitigate the effects potential natural hazard events may have on the community.

Eugene and Springfield are vulnerable to a number of natural hazards that could affect the administration and management of local government and of local businesses. According to the Eugene/Springfield risk assessment, each city has either a high or moderate probability of a landslide, volcanic event, winter storm, wildfire, hazardous materials, or terrorism event from recurring. Any of these events could disrupt business and government activity. Continuing to educate businesses and governmental organizations about the importance of continuity of operations plans will encourage their development and assist in making local governments and businesses more disaster resilient.

Staff turnover is likely to occur after a disaster. Veteran staff is critical after a disaster. It is important to prevent turnover so that existing personnel do not have to take on extra responsibilities during an already stressful time. Continuity planning can also help lessen turnover by ensuring competitive salaries and benefits and by reducing the amount of stress staff will have to endure.

The Disaster Mitigation Act of 2000 requires communities to develop actions that reduce the impact of a natural hazard [201.6(c)(3)(ii)]. Educating businesses and governmental organizations about the importance of continuity of operations plans can encourage the development of plans and make businesses and governmental organizations more resilient to natural hazards.

Ideas for Implementation:

Host an Open for Business training workshop, developed by the Institute for Business and Home Safety (IBHS) to educate businesses on the importance of continuity of operations plans and how to develop a plan for their business.
For governmental organizations, research and review completed continuity of operations plans to provide a foundation of expected content and issues to review. The COOP may ensure shelter housing for critical staff and family members such as city officials, public works employees, emergency response, and others.
Assess and prioritize critical positions and resources vital to the continuance of important functions.
Incorporate COOP into the existing Emergency Operations Plans where applicable.

Coordinating Organization:	**Eugene Emergency Management/Springfield Emergency Management**

Internal Partners:	**External Partners:**
Eugene/Springfield Public Works, Police, Fire, Regional 911 Center	**School Districts, LPC; Park Districts; Utilities**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years) / Ongoing	

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: New 2009 action item.

Multi-Hazard # 4

Proposed Action Item:	**Alignment with Plan Goals:**
Encourage citizens and city employees to prepare and maintain 72 hour kits.	***Goals 1, 4, 7***

Rationale for Proposed Action Item:

Eugene and Springfield are vulnerable to a number of natural hazards that could disrupt services. According to the Eugene/Springfield risk assessment, each city has either a high or moderate probability of a landslide, volcanic event, winter storm, wildfire, hazardous materials, or terrorism event from recurring. In a major disaster, utilities, transportation networks, and businesses could be disrupted, and it may take days until vital services are restored. Preparing a 72 hour kit can help community members survive on their own without relying too heavily on emergency services.

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 and preparedness would be a way to keep the public informed of, and involved in, the city's actions to mitigate and prepare for hazards.

Ideas for Implementation:

Provide educational material and examples of how to assemble 72 hour kits to residents of the city and employees. Outreach and awareness campaigns need to be carefully organized and developed to ensure that residents receive critical information. Information can be disseminated through the city's website or in the local newspaper. Involving the local chambers of commerce can also help to reach out to businesses.

Coordinate efforts with the Red Cross who sell the 72 hour kits.

Dedicate one Lane Preparedness Coalition meeting to disaster education to ensure a consistent message and a focused effort for preparing and mitigation natural hazards.

During National Emergency Preparedness Month or National Night Out, use first responders and community members to host educational presentations to groups within the community to encourage individuals to put together their own kit. Encourage radio and news releases about 72 hour kits during this month.

Resources like www.preparedness.gov or www.72hours.org can provide content needs for 72 hour kits.

Coordinating Organization:	**Eugene Emergency Management/Springfield Emergency Management**

Internal Partners:	**External Partners:**
Eugene Public Information Officer, Springfield Public Information Officer, Eugene/Springfield Fire Departments	**Lane Preparedness Coalition, Area Hospitals, Lane County Emergency Management, CERT teams**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: New 2009 action Item

Multi-Hazard # 5

Proposed Action Item:	**Alignment with Plan Goals:**
Coordinate efforts with Lane Council of Governments to develop new hazard maps for the Eugene/Springfield Natural Hazards Mitigation Plan.	***Goal 6***

Rationale for Proposed Action Item:

The Eugene/Springfield Natural Hazards Mitigation Plan completed its 5-year update in October 2009. The current maps in the plan adequately show the presence of natural hazards in the community and the location of critical facilities, but should be updated to show changes in city boundaries, additional critical facilities, and incorporate new hazard information when new information becomes available. Within 1 year after the plan update, the Eugene/Springfield Natural Hazards Mitigation Plan should update maps for the following natural hazards:

1) Earthquake showing amplification, liquefaction, and landslide-induced
2) Landslide showing debris flow and slope instability
3) Flood showing floodplain
4) Wildfire showing forest cover in the Eugene/Springfield area

Ideas for Implementation:

Set up a meeting between the Lane Council of Governments and the GIS departments of Eugene and Springfield to coordinate efforts in developing natural hazards mitigation maps.

Develop a map template that all the jurisdictions can work from.

Review existing critical facilities displayed in maps and update as needed.

When available, use new information to update hazard, including earthquake information from the Oregon Department of Geology and Mineral Industries (DOGAMI).

Coordinating Organization:	**Springfield and Eugene GIS departments**

Internal Partners:	**External Partners:**
Lane Council of Governments GIS	**FEMA, DOGAMI, OEM, Oregon Partnership for Disaster Resilience (OPDR), Lane Preparedness Coalition**

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

Form Submitted by:	**Springfield and Eugene Steering Committees**

Action Item Status: New 2009 action item

Flood # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Consult with property owners and explore mitigation actions for the 4 properties on FEMA's national repetitive loss list.	***Goals 1, 2, 4***

Rationale for Proposed Action Item:

The city of Springfield has four repetitive flood loss properties in the city's Urban Growth Boundary (UGB) but outside of the city limits. However, once these properties are annexed into the city limits, they can be a burden on the city's services if they have not been mitigated for floods. Repetitive loss properties are insurable buildings that have seen more than $1,000 paid by the National Flood Insurance Program within any rolling 10-year period, since 1978. Mitigating these properties for floods will reduce the property's NFIP premiums, help save lives, and reduce the cost to the city of Springfield and Lane County should a response be required.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Consulting with property owners to explore mitigation options will reduce the flood risk to these existing four repetitive flood loss properties.

Ideas for Implementation:

Consult with Lane County Emergency Management, OEM, and DLCD to develop appropriate mitigation activities for property owners.

Conduct a cost benefit analysis for flood mitigation projects for each of the four properties.

Consider requiring flood mitigation activities on the property prior to allowing the property to be annexed into the city of Springfield.

Seek funding to pay for flood mitigation activities, such as through the federal Flood Mitigation Assistance (FMA) Program.

Coordinating Organization:	**Springfield Emergency Management**

Internal Partners:	**External Partners:**
Springfield Public Works, Springfield Planning Department	**Lane County, FEMA, OEM, DLCD**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued action item from 2004 plan.

Flood # 2

Proposed Action Item:	**Alignment with Plan Goals:**
Support FEMA in updating the Flood Insurance Study, in selected areas, including Amazon and Cedar Creeks and the McKenzie River.	***Goals 1, 2, 4***

Rationale for Proposed Action Item:

FEMA is in the process of updating the Flood Insurance Study and developing digital flood maps along Amazon and Cedar Creeks as well as the McKenzie Rivers. Recently, the city of Springfield conducted a public forum about developing new flood maps in the Glenwood area. Updated digital maps can provide easy access to flood information in the Eugene/Springfield metropolitan area and support a flood program that reflects the actual flood risk faced by a community. Supporting FEMA in this effort will improve understanding of the flood risk in the community and help in developing appropriate mitigation measures in the community.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Supporting FEMA to update their flood insurance study in selected areas, including Amazon and Cedar Creeks and the McKenzie River, will provide useful planning information for existing and future buildings and developments.

Ideas for Implementation:

Support FEMA's efforts by hosting public forums with the community when updating Flood Insurance Studies.

Post information about current efforts to update Flood Insurance Studies on the Eugene and Springfield city websites.

Coordinating Organization:	**Springfield Emergency Management**

Internal Partners:	**External Partners:**
Eugene/Springfield Planning Department, Public Works Department	**OEM, FEMA, DLCD**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Action item continued from 2004 plan with rewording.

Flood # 3

Proposed Action Item:	**Alignment with Plan Goals:**
Compile and evaluate elevation data for structures within the 100-year floodplain as new data becomes available.	***Goals 1, 2, 3, 4***

Rationale for Proposed Action Item:

Elevation data for structures within the 100-year floodplain can provide valuable information regarding the height of a building in relation to the base flood elevation. This information can help to identify structures that may experience significant flooding losses during a 100-year flood. Using this information, appropriate mitigation measures can be developed. Given the high number of buildings in the floodplain, especially in the city of Springfield, only new information can be compiled and evaluated as it becomes available because both cities have limited resources to survey all buildings in the floodplain. However, flood elevation certificates for new buildings can be easily incorporated as they are received by the city.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Compiling and evaluating elevation data for structures in the 100-year floodplain as they become available will help to reduce the impact of floods on new buildings.

Ideas for Implementation:

Develop a database of elevation data using floodplain elevation certificates for buildings within the 100-year floodplain. Consider integrating information into a GIS program to identify the elevation of structures in the floodplain.

Using the elevation data, evaluate the information to assess areas that may experience future problems from floods.

Evaluate new federal policies and procedures relating to the mapping of a 500-year floodplain as appropriate or necessary.

Coordinating Organization:	**Eugene Building Permit Services, Springfield Development Services Department**

Internal Partners:	**External Partners:**
Eugene/Springfield Public Works, Planning, GIS	**Lane Council of Governments (for GIS data), FEMA**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan with rewording.

Flood # 4

Proposed Action Item:	**Alignment with Plan Goals:**
For structures within the 100 year floodplain, explore mitigation options with property owners upon request.	***Goals 1, 2, 3, 7***

Rationale for Proposed Action Item:

Eugene and Springfield both have neighborhoods that are in the 100-year floodplain. However, not all structures are at risk to floods because their main finished floor is above the base flood elevation, or other flood mitigation factors have been developed for the structure. Nevertheless, some property owners that are in the floodplain may want to develop mitigation measures to reduce their risk to floods. Providing appropriate mitigation options with property owners upon their request will help inform property owners on how to reduce their risk to floods and inform the cities of Eugene and Springfield on structures that need flood mitigation. In addition, providing information with property owners upon their request reduces the need for the cities of Eugene and Springfield to waste resources contacting all property owners in the floodplain.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Exploring and providing mitigation options with property owners upon request will help to reduce the impact of floods on new and existing buildings and infrastructure.

Ideas for Implementation:

Develop education and outreach materials regarding flood mitigation options to provide to property owners who request it.

Coordinate flood mitigation options with Oregon Emergency Management to see if federal funding would be available to pay for mitigation actions.

Consult with the city's floodplain managers, if available, to develop appropriate mitigation strategies.

Consider posting flood mitigation options on the city website or hosting a public forum to educate property owners about flood mitigation options.

Coordinating Organization:	**Eugene Building Permit Services, Springfield Development Services Department**

Internal Partners:	**External Partners:**
Eugene/Springfield Planning, Public Works, Engineering	**OEM, FEMA, DLCD, Lane County**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued action item from 2004 plan with rewording.

Flood # 5

Proposed Action Item:	**Alignment with Plan Goals:**
Maintain and update the inventory of locations in the Eugene/Springfield Metro Area subject to frequent storm water flooding.	***Goal 2, 3, 4, 5***

Rationale for Proposed Action Item:

The cities of Eugene and Springfield have each developed an inventory of locations in the Eugene/Springfield Metro Area that are subject to frequent storm water flooding. Developing an inventory is a goal in Springfield's 2008 Storm Water Management Plan, and an inventory has also been developed for the city of Eugene. Maintaining and updating the inventory of locations subject to frequent storm water flooding will ensure that the responsible departments remain aware of areas with flooding problems and develop priority projects. Developing an inventory can also help a community to track progress in mitigating storm water flooding in the community.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Maintaining and updating the inventory of locations in the Eugene/Springfield Metro Area subject to frequent storm water flooding will reduce the impact of floods on the storm water infrastructure and potential damage to new and existing buildings.

Ideas for Implementation:

Use the inventory to track progress for implementing mitigation actions.

Once a year, review the inventory and update as necessary with any new changes

Evaluate if this inventory can be visually represented via GIS.

Coordinating Organization:	**Eugene/Springfield Public Works Departments**

Internal Partners:	**External Partners:**
Planning Department	**OEM, FEMA**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from the 2004 plan with rewording.

Flood # 6

Proposed Action Item:	**Alignment with Plan Goals:**
For locations with repetitive flooding and significant damages or road closures, determine and implement mitigation measures such as upsizing culverts or storm water drainage ditches	***Goals 1, 2, 4, 5***

Rationale for Proposed Action Item:

Repetitive flooding can cause significant damage to roads and storm water infrastructure such as culverts, and can lead to road closures and expensive repairs. In addition, erosion caused by flooding of roads can degrade water quality. Identifying locations with repetitive flooding and developing appropriate mitigation measures can reduce the risk of floods on roadways and improve water quality within the Eugene/Springfield metro area. Depending on the location, mitigation measures can include upsizing culverts or storm water drainage ditches.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Developing and implementing flood mitigation projects to address repetitive flooding and damage to roads can reduce the impact of floods on critical infrastructure.

Ideas for Implementation:

Seek funding sources to help implement mitigation actions. Potential federal funding sources can be from the Pre-Disaster Mitigation Program or the Flood Mitigation Assistance Program. Other potential sources of funding include the Oregon Watershed Enhancement Board, which provides grants for improving infrastructure that has a negative impact on watersheds and water quality.

Use the inventory developed in action item Flood # 5 to identify areas that need improvements and prioritize mitigation projects.

Coordinate efforts, where needed, with the Oregon Department of Transportation and Lane County.

Incorporate projects into city Capital Improvement Plans to ensure their implementation and provide a steady source of funding.

Coordinating Organization:	**Eugene/Springfield Public Works Departments**

Internal Partners:	**External Partners:**
Eugene/Springfield Planning, Neighborhood Associations	**Local watershed councils, OEM, FEMA, Lane County**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued action from 2004 plan.

Flood # 7

Proposed Action Item:	**Alignment with Plan Goals:**
Continue compliance with the National Flood Insurance Program (NFIP) through enforcement of local floodplain ordinances.	***Goals 2, 4, 7***

Rationale for Proposed Action Item:

The National Flood Insurance Program provides communities with 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.

Ideas for Implementation:

Actively participate with DLCD and FEMA during Community Assistance Visits. The Community Assistance 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 Eugene/Springfield's floodplain ordinances to ensure they reflect current flood hazards.

Coordinate with the county to ensure that floodplain ordinances and NFIP regulations are maintained and enforced. Continue to assess the need for updated ordinances.

Mitigate areas that are prone to flooding and/or have the potential to flood.

FEMA now allows the use of digital FIRM if desired by jurisdiction. Ordinances may need to adjusted to reflect this change

Coordinating Organization:	**Eugene Planning Department, Springfield Development Services Department**

Internal Partners:	**External Partners:**
Planning Commission, Planning and Public Works	FEMA, OEM, Lane County

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: New 2009 action item.

Winter Storm # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Continue tree trimming efforts especially for transmission lines and trunk distribution lines.	***Goals 2, 3, 4***

Rationale for Proposed Action Item:

High winds and ice during winter storms can topple trees and break limbs which in turn can result in power outages and disrupt telephone, computer, and TV and radio service. Both the Eugene Water and Electric Board (EWEB) and the Springfield Utility Board (SUB) trim trees on public property, as well as private property when necessary, to reduce the likelihood that tree limbs will cause future power outages. Continuing proper tree trimming for transmission lines and trunk distribution lines will help prevent power outages and damage to property from winter storms.

Eugene and Springfield have both experienced severe winter storm events in the past and are highly vulnerable to future winter storms. The winter storm risk assessment notes that Eugene and Springfield both have a high probability and high vulnerability to winter storms. Continuing tree trimming efforts near transmission lines and trunk distribution lines will reduce Eugene and Springfield's vulnerability to future winter storms.

The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Continuing tree trimming efforts, especially around transmission lines and trunk distribution lines, will protect critical infrastructure, such as power lines, from damage in winter storms.

Ideas for Implementation:

Identify areas that experience frequent power outages caused by falling tree limbs and focus tree trimming efforts on those areas.

Inform property owners and neighborhood associations about the importance of tree trimming and how they can assist the utility boards in identifying areas in need of trimming.

Coordinating Organization:	**Eugene Water and Electric Board (EWEB), Springfield Utility Board (SUB)**

Internal Partners:	**External Partners:**
Eugene/Springfield Public Works Departments	**Neighborhood Associations**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years) / Ongoing	

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Action item continued from 2004 plan with rewording.

Winter Storm # 2

Proposed Action Item:	**Alignment with Plan Goals:**
Continue to educate private property owners about dangers of vegetation near distribution lines and service drops	***Goals 2, 3, 4***

Rationale for Proposed Action Item:

High winds and ice during winter storms can topple trees and break limbs which in turn can result in power outages and disrupt telephone, computer, and TV and radio service. While the Eugene Water and Electric Board (EWEB) and the Springfield Utility Board (SUB) manage vegetation near power lines in public areas, private property owners are responsible for informing the utility companies about vegetation on their property that must be removed. Both utility companies educate property owners about the dangers of vegetation near distribution lines and service drops, and they send letters to property owners if there is a problem with vegetation near lines. Continuing these efforts will further help to prevent power outages and damage to property from winter storms.

Eugene and Springfield have both experienced severe winter storm events in the past and are highly vulnerable to future winter storms. The winter storm risk assessment notes that Eugene and Springfield both have a high probability of winter storm recurring and a high vulnerability to winter storms. Continuing to educate the public about the dangers of vegetation near distribution lines and service drops will reduce both cities' vulnerability to winter storms.

The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Continuing to educate private property owners about the dangers of vegetation near distribution lines and service drops will reduce the impact of winter storms on private property owners.

Ideas for Implementation:

Educate homeowners in pruning of vegetation, tree care safety, and proper tree care for trees bordering utility corridors and public rights of way via Safety Fair, Website, or Quarterly Newsletter.

Coordinate with arboricultural groups, public agencies, and utilities to promote proper tree pruning and care practices that can reduce the risk of tree failure and property damage. Common messages refined by state level entities such as the Oregon Department of Forestry (ODF) and OSU Extension can help provide continuity and efficiency across the state.

Coordinating Organization:	**Eugene Water and Electric Board (EWEB), Springfield Utility Board (SUB)**

Internal Partners:	**External Partners:**
Eugene/Springfield Public Works	**Lane County, ODF, OEM**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan with rewording.

Winter Storm # 3

Proposed Action Item:	**Alignment with Plan Goals:**
Encourage critical facilities in the Eugene/Springfield Metro Area to have backup power and emergency operations plans to deal with power outages.	***Goal 2, 4***

Rationale for Proposed Action Item:

High winds and ice during winter storms can topple trees and break limbs which in turn can result in power outages and disrupt telephone, computer, and TV and radio service. Encouraging critical facilities to have backup power and/or emergency operations plans to deal with power outages will allow for continuous service.

After Hurricane Katrina, Harrison County Mississippi noted that "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."[1] Encouraging all critical facilities to have backup power and/or emergency operations plans to deal with power outages will assist residents in recovering from a natural disaster.

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)]. Encouraging all critical facilities to have backup power and/or emergency operations plans to deal with power outages will help protect existing buildings and infrastructure and allow for continuous service.

Ideas for Implementation:

Conduct an assessment of critical facilities to determine their priority in an emergency and whether they should have backup generators and/or emergency operations plans.

Seek funding from Federal and state resources to obtain generators and to develop emergency operations plans.

Coordinate efforts to improve emergency operations plans with Eugene/Springfield's response planning efforts.

Coordinating Organization:	**Eugene/Springfield Emergency Management**

Internal Partners:		**External Partners:**
EWEB, SUB		**FEMA, OEM**
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Action continued from 2004 plan.

[1] Source: Harrison County Community Recovery Plan. August 2006. FEMA ESF-14 in support of the state of Mississippi. p. 61.

Winter Storm # 4

Proposed Action Item:	**Alignment with Plan Goals:**
Consider upgrading lines and poles to improve wind/ice loading, undergrounding critical lines, and adding interconnect switches to allow alternative feed paths and disconnect switches to minimize outage areas.	***Goal 2, 4***

Rationale for Proposed Action Item:

High winds and ice during winter storms can topple trees and break limbs which in turn can result in power outages and disrupt telephone, computer, and TV and radio service. In addition, ice from winter storms can accumulate on power lines, causing lines and poles to break. While the Eugene Water and Electric Board (EWEB) and the Springfield Utility Board (SUB) construct them to meet certain loading standards, some lines and poles should be upgraded to improve wind and ice loading, critical lines should be undergrounded, interconnect switches should be installed in areas to allow alternative feed paths, and disconnect switches should be installed to minimize outage areas. Each of these efforts would significantly improve service in the Eugene/Springfield metro area and protect power infrastructure from winter storms.

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)]. Improving power infrastructure by upgrading lines and poles to improve wind/ice loading, undergrounding critical lines, adding interconnect switches to allow alternative feed paths, and disconnecting switches to minimize outage areas will all help to improve electrical service in the Eugene/Springfield metro area and protect this critical infrastructure from winter storms.

Ideas for Implementation:

Identify areas that are subject to frequent power outages and develop appropriate solutions to reduce the likelihood of a power outage.

Seek funding for specific areas subject to frequent power outages from winter storms. For a list of funding resources, see the Resources Appendix in this mitigation plan.

Coordinating Organization:	**Eugene Water and Electric Board (EWEB), Springfield Utility Board (SUB)**

Internal Partners:	**External Partners:**
Eugene/Springfield Public Works	**OEM, FEMA**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan.

Winter Storm # 5

Proposed Action Item:	**Alignment with Plan Goals:**
Continue to encourage cities of Eugene and Springfield to underground key power lines and new developments to include underground power lines.	***Goals 1, 2, 4***

Rationale for Proposed Action Item:

High winds and ice during winter storms can topple trees and break limbs which in turn can result in power outages and disrupt telephone, computer, and TV and radio service. Eugene and Springfield's risk assessment also notes that both cities have a high probability a winter storm will occur and a high vulnerability to winter storms. Encouraging the undergrounding of key power lines and including underground power lines in new developments can significantly reduce Eugene and Springfield's vulnerability from winter storm events.

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)]. Undergrounding key power lines and requiring new developments to have underground power lines will protect this critical infrastructure from winds and ice during winter storms.

Ideas for Implementation:

Identify key power lines in Eugene and Springfield that should be undergrounded.

Provide stronger enforcement of undergrounding power lines in new developments.

Consider incentives to utility companies to encourage undergrounding power lines in the community.

Coordinating Organization:	**Eugene Planning Department, Springfield Development Services Department**

Internal Partners:	**External Partners:**
EWEB, SUB, Public Works	**Lane County**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Action item continued from 2004 plan with rewording.

Landslide #1

Proposed Action Item:	**Alignment with Plan Goals:**
Support ongoing efforts to document and monitor landslide areas and make use of data when it is available.	***Goal 1, 2, 4***

Rationale for Proposed Action Item:

Supporting ongoing efforts to document and monitor landslide areas and make use of data when it is available should be done to identify areas prone to landslide and develop appropriate measures to prevent future landslides from affecting private property.

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 in fact 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:

Develop public information brochures that emphasize economic risk when building on potential or historical landslide areas;

Identify funding sources to enhance site-specific geohazard mapping for the Urban Growth Boundary; and

Identify existing mechanisms for public outreach.

Coordinating Organization:	**Eugene Planning Dept., Springfield Development Services Dept.**

Internal Partners:		**External Partners:**
Eugene Public Works Dept., Springfield Public Works Dept		**DOGAMI**
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**TBD**

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan with rewording.

Landslide #2

Proposed Action Item:	**Alignment with Plan Goals:**
Consider landslide mitigation action items for buildings and public infrastructure subject to landslide threat and after landslide events.	***Goal 2, 3, 4***

Rationale for Proposed Action Item:

While there are relatively few areas in Eugene or Springfield that are at risk for landslides, mitigation actions should be taken to mitigate their risk, contingent on funding. Some, but not all, areas in Eugene vulnerable to landslide hazards include:

- Capital-Essex Lane
- Dillard Road
- Brookside Drive
- Cresta de Ruta
- Goodpasture Island Road

Some, but not all areas in Springfield vulnerable to landslide hazards include:

- Thurston Hills
- Willamette Heights
- Kelly Butte

Developing appropriate mitigation actions for buildings and public infrastructure in these areas will help in reducing the landslide hazard risk in Eugene/Springfield.

Ideas for Implementation:

Explore ditching possibilities in high impact areas where reoccurring slides create a continual hazard to residents and roadways.

Reassess geo-hazard areas for stabilization priorities and possibilities.

Develop engineering studies of chronic slide areas for mitigation strategies.

Explore funding sources for geo studies and assessments.

Coordinating Organization:	**Eugene Planning Dept., Springfield Development Services Dept.**

Internal Partners:		**External Partners:**
Eugene Public Works Dept., Springfield Public Works Dept		**DOGAMI**
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	**TBD**
	Ongoing	

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan with rewording.

Landslide #3

Proposed Action Item:	**Alignment with Plan Goals:**
Use available data to determine areas and buildings at risk to landslides and propose comprehensive and land use policies accordingly.	***Goal 1, 2***

Rationale for Proposed Action Item:

Depending on the type, location, severity and area affected, severe property damage, injuries and loss of life can be caused by landslide hazards. In addition, landslides can damage or temporarily disrupt utility services, roads, and other transportation / communication systems, including emergency response, fire, medical, police, etc. Data showing landslide hazards is currently being developed from steep slope and debris flow analyses, and can be used to determine areas and buildings at risk to landslide events. In addition, where relevant, this data can be used to propose policies and regulations for comprehensive and land use plans that can reduce the impact of landslide events to existing and future developments.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Using steep slope and debris flow data to determine areas and buildings at risk to landslides, and proposing policies accordingly, can reduce the potential damage caused by landslide events.

Ideas for Implementation:

Improve knowledge of debris flow (rapid moving) landslide hazard areas.

Map steep slope areas.

Research existing community ordinances related to steep slope development.

Coordinating Organization:	**Eugene Planning Dept., Springfield Development Services Dept.**

Internal Partners:	**External Partners:**
Eugene Public Works Dept., Springfield Public Works Dept	**DOGAMI**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: New 2009 action item

Wildland/Urban Interface Fire #1

Proposed Action Item:	**Alignment with Plan Goals:**
Review and update list of specific parts of the Eugene/Springfield Metro Area at high risk for urban/wildland urban interface fires because of fuel loading, topography and prevailing construction practices.	***Goal 1***

Rationale for Proposed Action Item:

The Lane County Community Wildfire Protection Plan identifies areas in the Eugene/Springfield metro area that are considered at risk due to their topography and forest cover. These areas of concern include the South Hills neighborhood of Eugene, southwest Eugene/Spencer Creek area, Thurston Hills in Springfield, and Harbor Drive/South 2nd area in Springfield. Reviewing and updating a list of specific areas within these neighborhoods, and evaluating their level of risk based on fuel loading, topography, and prevailing construction practices, can help the Eugene and Springfield fire departments improve their understanding of the wildfire risks these areas face and future mitigation actions that need to be implemented.

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)]. Reviewing and updating a list of specific parts of the Eugene/Springfield metro area at high risk for urban/wildland fires can help protect existing structures from future wildfire events.

Ideas for Implementation:

Conduct a survey of areas and buildings at risk to wildfire hazards in the Eugene/Springfield metro area, and consider developing an assessment of risk for areas based on fuel loading, topography, and construction type.

Use the list to develop a targeted mitigation strategy to reduce the risk of wildfire in these areas.

Coordinating Organization:	**Eugene Fire Department, Springfield Fire Department**

Internal Partners:	**External Partners:**
Eugene Planning Dept., Springfield Development Services Dept., Fire Defense Board	**Oregon State Fire Marshal, Oregon Dept. of Forestry, EWEB, SUB, Lane Fire Prevention Coalition**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Completed and continued action from 2004 plan.

Wildland/Urban Interface Fire #2

Proposed Action Item:	**Alignment with Plan Goals:**
Continue to review and modify evacuation routes and procedures for high risk areas and educate the public.	***Goal 1, 4***

Rationale for Proposed Action Item:

Wildfires on the wildland/urban interface can cause disruptions and evacuations. During such times, it is important to know ahead of time multiple evacuation routes so residents can safely evacuate. Reviewing and modifying evacuation routes and procedures for high risk areas, together with educating the public about the routes, will improve evacuation procedures for the public and reduce their vulnerability to wildfire events.

Ideas for Implementation:

Explore fire agencies using GPS for pre arrival response planning and mapping.

Seek funding for countywide GPS for mapping purposes.

Create current road and trail maps of region.

Share information gained through this process with county emergency response agencies, 9-1-1, and emergency medical responders.

Coordinating Organization:	**Eugene Fire Department, Springfield Fire Department**

Internal Partners:	**External Partners:**
Eugene/Springfield GIS	**Lane Council of Governments GIS, Oregon State Fire Marshal, Oregon Dept. of Forestry, EWEB, SUB, Lane Fire Prevention Coalition**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued with rewording from 2004 plan.

Wildland/Urban Interface Fire #3

Proposed Action Item:	**Alignment with Plan Goals:**
Educate homeowners in high-risk areas about fire safe construction practices for existing and new construction	***Goal 2, 4***

Rationale for Proposed Action Item:

Homeowners in areas at risk to wildfire can take a number of steps to reduce their vulnerability, such as installing metal roofs on their home or creating a defensible space. By educating home-owners in high risk areas, Eugene and Springfield can empower individual property owners to take steps to minimize their risk to wildfires.

The Disaster Mitigation Act of 2000 requires communities to identify how the community will continue to involve the public in the plan maintenance process [201.6(c)(4)(iii)]. Educating the public helps keep the public informed of what is being done with the plan, how Eugene and Springfield are working to mitigate their risk to hazards, and allows for feedback and suggestions from the public for improving, updating, and maintaining the plan.

Ideas for Implementation:

Focus on individual community outreach efforts through:

- Working demonstrations of risk reduction measures (i.e. survivable space around structures; driveway, road and bridge specifications; and landscaping);
- Voluntary site visits by fire crews to consult with landowners about specific ways to reduce risk to their property and to identify properties that would not be saved if a wildfire event occurred;
- Mailings
    - Public service announcements in the media;
    - Warn prospective buyers to ask about the level of fire protection available and fire insurance rating for properties; and
    - Noxious weed abatement.

Coordinating Organization:	**Eugene Planning Department, Springfield Development Services Department**

Internal Partners:	**External Partners:**
Eugene Fire Department, Springfield Fire Department	**Oregon Department of Forestry, Oregon State Fire Marshal, EWEB, SUB, Lane Fire Prevention Coalition**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued with rewording from 2004 plan

Earthquake #1

Proposed Action Item:	**Alignment with Plan Goals:**
Educate homeowners about structural and non-structural retrofitting of vulnerable homes and encourage retrofit	***Goals 1, 2, 4***

Rationale for Proposed Action Item:

The Eugene/Springfield Natural Hazard Mitigation Plan indicates that the area's vulnerability to a future earthquake event is high. Increasing public outreach to educate residents about retrofitting homes and structures can help mitigate the area's vulnerability to future earthquakes.

The Disaster Mitigation Act of 2000 requires communities to identify how the community will continue to involve the public in the plan maintenance process [201.6(c)(4)(iii)]. Educating the public helps keep the public informed of what is being done with the plan, how Eugene and Springfield are working to mitigate their risk to hazards, and allows for feedback and suggestions from the public for improving, updating, and maintaining the plan.

Ideas for Implementation:

Develop dissemination methods for structural and non-structural earthquake retrofitting to homeowners that would likely include:

- Mailings
- Television public service announcements
- Newspaper inserts/spots

Distribute Institute for Business and Home Safety Homeowner Retrofit Guides when requested

Coordinating Organization:	**Eugene Emergency Management, Springfield Emergency Management**

Internal Partners:	**External Partners:**
Eugene/Springfield Building Departments, Planning/Development Services	**DOGAMI, FEMA, OEM, USGS, Cascadia Region Earthquake Workgroup**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 with rewording

Earthquake #2

Proposed Action Item:	**Alignment with Plan Goals:**
Consider seismic vulnerability assessments, and develop mitigation strategies for seismic retrofit of critical public buildings and critical utility infrastructure identified as particularly vulnerable.	***Goals 2, 4***

Rationale for Proposed Action Item:

Eugene and Springfield have developed seismic vulnerability estimates for a number of public buildings, including city hall and all fire stations, and have also completed a number of vulnerability estimates for critical infrastructure such as the Glenwood Bridge in Springfield. However, a number of other public facilities and utility infrastructure, including bridges crossing the Willamette, and water and sewer mains, may have not undergone seismic vulnerability assessments. In determining which critical facilities are particularly seismically vulnerable, Eugene and Springfield can proceed with a fact-based vulnerability assessment to develop mitigation strategies to address specific needs.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6(c)(3)(ii)]. Identifying critical and essential facilities for seismic retrofit will help to identify major seismic issues and appropriate mitigation actions to protect critical and essential facilities.

Ideas for Implementation:

Explore funding opportunities to develop an inventory of schools, universities, large employers' facilities, marketplaces and critical facilities that do not meet current seismic standards.

Use DOGAMI's Seismic Vulnerability Assessment completed in 2007 to begin developing an inventory.

Develop Pre-Disaster Mitigation Grant proposal based on the Capital Improvements Plan assessment and priority for seismic upgrades.

Coordinating Organization:	**Eugene Emergency Management, Springfield Emergency Management**

Internal Partners:	**External Partners:**
Eugene/Springfield Public Works, Eugene Water and Electric Board (EWEB), Springfield Utility Board (SUB)	**DOGAMI, OEM**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan with rewording

Earthquake #3

Proposed Action Item:	**Alignment with Plan Goals:**
Conduct benefit-cost analyses contingent upon funding for retrofit projects of important public facilities, including utility systems, bridges and dams and special hazard private facilities such as bulk fuel storage and hazmat facilities	***Goal 2***

Rationale for Proposed Action Item:

Conducting a benefit-cost analysis is the first step toward FEMA-funding of mitigation projects and can help determine whether a project is financially beneficial to implement. However, these analyses are often costly and can only be conducted if funding is present.

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6(c)(3)(ii)]. Identifying critical and essential facilities for seismic retrofit will help to identify major seismic issues and appropriate mitigation actions to protect critical and essential facilities

Ideas for Implementation:

Address the two city hall's seismic vulnerability

Consult with the jurisdiction's Capital Improvement Plans to determine which facilities will be replaced relatively soon and which will be in service for the foreseeable future.

Determine possible vendors capable of conducting seismic benefit-cost analyses.

Coordinating Organization:	**Eugene Emergency Management, Springfield Emergency Management**

Internal Partners:	**External Partners:**
Eugene/Springfield Public Works	**DOGAMI, OEM**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Reworded from 2004 plan.

Earthquake #4

Proposed Action Item:	**Alignment with Plan Goals:**
Encourage partners to seek funding to further assess the "probability of collapse" for critical buildings/schools listed in DOGAMI's rapid visual assessment and structurally reinforce vulnerable buildings to prevent loss of life	***Goals 1, 2, 4***

Rationale for Proposed Action Item:

In 2007 DOGAMI completed a Statewide Seismic Needs Assessment that used Rapid Visual Screening (RVS) to assess the seismic risk, also known as collapse potential, of schools, hospitals, and critical facilities such as police and fire stations in the state of Oregon. The RVS assessment is based on the maximum considered earthquake for the location being assessed, and rates buildings by a Very High, High, Moderate, or Low seismic risk. The Seismic Needs Assessment assessed that a total of 34 buildings in the Eugene/Springfield area that had a 'high' or 'very high' risk of collapse. The full data set can be found here: http://www.oregongeology.com/sub/projects/rvs/SSNA-abridged-data.pdf

The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Assessing the "probability of collapse" for buildings surveyed by DOGAMI and seismically retrofitting them will reduce their vulnerability by preventing damage to life and property.

Ideas for Implementation:

Further assess structures that were identified in DOGAMI's Seismic Needs Assessment as having a 'high' or 'very high' risk of collapse. Prioritize buildings for seismic retrofit and coordinate with OEM seismic grants coordinator to apply for funding.

Coordinating Organization:	**Eugene Emergency Management, Springfield Emergency Management**

Internal Partners:		**External Partners:**
Eugene/Springfield Building Department, Public Works		**FEMA, OEM, DOGAMI**
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
2 years		

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: New 2009 action item.

Volcano #1

Proposed Action Item:	**Alignment with Plan Goals:**
Update public emergency notification procedures for ash fall events	***Goal 2***

Rationale for Proposed Action Item:

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, and updating public emergency notification procedures for ash fall events will help reduce vulnerability to ash fall and prepare the Eugene/Springfield community appropriately.

Ash fall distribution is not predictable due to its dependence on wind speed and direction. Therefore, the Eugene and Springfield can alert their communities when volcanoes produce ash, and distribute information quickly about air quality and visibility, and whether it is safe for residents to go outdoors or travel.

Ideas for Implementation:

Evaluate current outreach efforts and modify as necessary. Determine methods for protecting respiratory health in the event of a volcanic eruption.

Support Health Department staff in the dissemination of information regarding respiration hazards in the event of a volcano.

Utilize Community Emergency Notification System (CENS) and Emergency Alert System during ashfall events for notification of the public.

Coordinating Organization:	**Eugene Public Information Officer, Springfield Public Information Officer**

Internal Partners:	**External Partners:**
Eugene/Springfield Public Works, Central Lane Communications	**DOGAMI, Lane County Emergency Management, USGS**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued action item from 2004 plan.

Volcano #2

Proposed Action Item:	**Alignment with Plan Goals:**
Evaluate capability of water treatment plants, including wells, to deal with high turbidity from ash falls and upgrade treatment facilities and emergency response plans to deal with ash falls.	***Goal 2, 4***

Rationale for Proposed Action Item:

Ash fall events have the potential to cause high water turbidity and operational problems at water treatment facilities. Upgrading water treatment facilities' ability to respond to ash fall events can help reduce the disruption to services that an ash fall event may cause.

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 and infrastructure [201.6(c)(3)(ii)]. Upgrading treatment facilities to deal with the high turbidity of the water caused by ash fall events will help the county mitigate its risk to ash falls, and reduce the disruption in services that an ash fall event may cause.

Ideas for Implementation:

Examine the current capabilities of water treatment plants to deal with high turbidity from ash fall events.

Identify ways to upgrade the capabilities of the water treatment plants to respond to ash fall events.

Determine feasibility and costs associated with implementing identified improvements and upgrades.

Seek alternative sources of water supply not vulnerable to ash falls

Coordinating Organization:	**Eugene Water and Electric Board, Springfield Utility Board**

Internal Partners:	**External Partners:**
Eugene/Springfield Public Works	**DOGAMI, DEQ, Oregon Department of Human Services (Oregon Healthy Drinking Water Program)**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued action item from 2004 plan.

Dam Safety #1

Proposed Action Item:	**Alignment with Plan Goals:**
Prepare high resolution, digitalized maps of dam failure inundation areas.	***Goals 1, 2, 4***

Rationale for Proposed Action Item:

By mapping the dam failure inundation areas, Eugene and Springfield can take mitigation steps to reduce the impact of flooding from dam failure.

Ideas for Implementation:

Coordinate with appropriate organizations to evaluate the need for more data;

Distribute information regarding flooding to the general public efficiently

Utilize to preplan regarding emergency notification systems (CENS and EAS).

Receive the latest dam inundation maps from the Army Corps of Engineers.

Coordinating Organization:	**U.S. Army Corps of Engineers**

Internal Partners:	**External Partners:**
Eugene/Springfield Emergency Management, Eugene/Springfield GIS, Central Lane Communications	**OEM, Lane Council of Governments, Lane County Emergency Management**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan but reworded to delete response-oriented parts from the action item

Dam Safety #2

Proposed Action Item:	**Alignment with Plan Goals:**
Actively encourage the Army Corps of Engineers to complete seismic vulnerability assessments for dams upstream of the Eugene/Springfield Metro Area and to make seismic improvements as necessary	***Goals 2, 6***

Rationale for Proposed Action Item:

Eugene and Springfield currently do not have information regarding the probability of a dam failure event. Gathering such information for the dams in Lane County would assist in knowing the probability of a dam failure event and in identifying methods for preparing for and responding to such a scenario.

Ideas for Implementation:

Have an annual meeting with the Army Corps to determine the status of this action item.

Receive the latest Dam Risk Assessment from the Army Corps of Engineers.

Coordinating Organization:	**U.S. Army Corps of Engineers**

Internal Partners:	**External Partners:**
Eugene/Springfield Emergency Management, Police Depts., Fire Depts.	**Eugene/Springfield Public Works, DOGAMI, USGS, CREW**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan

Hazardous Materials #1

Proposed Action Item:	**Alignment with Plan Goals:**
Ensure that first responders have readily available site-specific knowledge of hazardous chemical inventories in the Eugene/Springfield Metro Area	***Goal 1, 5***

Rationale for Proposed Action Item:

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:

Maintain present efforts and inventories of hazardous materials sites.

Coordinate efforts between the Eugene/Springfield Fire Departments, Emergency Management Departments, and Police Departments.

Incorporate data into computer aided dispatch system for public safety communications

Coordinating Organization:	**Eugene Fire Department, Springfield Fire Department**

Internal Partners:		**External Partners:**
Eugene/Springfield Emergency Management, Dispatch Centers, Toxics Right to Know		**OEM, Oregon State Fire Marshal and DEQ, Northwest Haz Mat,**
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan

Hazardous Materials #2

Proposed Action Item:	**Alignment with Plan Goals:**
Enhance emergency planning, emergency response training and equipment to address hazardous materials incidents.	***Goals 1, 2, 5***

Rationale for Proposed Action Item:

To properly respond to hazardous materials incidents, and to maintain the safety of first responders, the cities of Eugene and Springfield should enhance emergency planning, response training, and equipment. This will allow the police and fire departments who may respond to an incident to respond in an effective manner.

The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. By training personnel how to address hazardous materials incidents, Eugene and Springfield can help minimize secondary hazards following a disaster.

Ideas for Implementation:

Maintain present training regimen that includes trainings related to addressing hazardous materials incidents.

Enhance emergency planning, emergency response training and equipment to address potential hazardous material /terrorist incidents.

Incorporate emergency planning and training information in the Eugene and Springfield emergency response plans.

Continue to combine hazardous materials training and terrorism training for Eugene and Springfield.

Coordinating Organization:	**Eugene Fire Department, Springfield Fire Department**

Internal Partners:	**External Partners:**
Eugene/Springfield Emergency Management, Eugene/Springfield Police Departments, Central Lane Communications	**Oregon State Fire Marshal and DEQ, Northwest Haz Mat,**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan.

Terrorism #1

Proposed Action Item:	**Alignment with Plan Goals:**
Upgrade physical security detection and response capability for critical facilities, including water systems.	***Goals 2, 4***

Rationale for Proposed Action Item:

Physical security detection and response capabilities for critical facilities, such as water systems, can help to prevent terrorism actions on the Eugene/Springfield metropolitan area. Upgrading the physical security detection and response capability for critical facilities can assist in responding to terrorism events.

The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. By training personnel how to address terrorism, Eugene and Springfield can help minimize it as a concern.

Ideas for Implementation:

Maintain physical security detection capabilities for critical facilities. These facilities could include the water and wastewater treatment systems, fuel storage facilities, and power infrastructure.

Coordinating Organization:	**Eugene Police Department, Springfield Police Department**

Internal Partners:	**External Partners:**
Eugene/Springfield Emergency Management	**State Police, EWEB and SUB, USACE, Oregon Military Dept. (OMD)**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Continued from 2004 plan

Appendix B:
Previous Action Item Forms

Multi-Hazard Action # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Establish a formal role for the Eugene/Springfield Hazard Mitigation Planning Committees to develop a sustainable process to encourage, implement, monitor, and evaluate citywide mitigation actions.	***Public Awareness, Partnerships & Implementation***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Hazard Mitigation Planning Committees**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: This action item has been completed for Eugene but has not been completed for Springfield. Springfield never adopted a formal mitigation planning committee to implement actions. Action Item deleted for the 2009 update and integrated into the Plan and Implementation Section.

Multi-Hazard Action # 2

<table>
<tr><td colspan="3">Proposed Action Item:</td><td>Alignment with Plan Goals:</td></tr>
<tr><td colspan="3">Identify and pursue funding opportunities to implement mitigation actions</td><td>Public Awareness
Life Safety
Protect Property & Minimize Losses
Partnerships & Implementation
Emergency Services
Protect Environment</td></tr>
<tr><td colspan="4">Rationale for Proposed Action Item:</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Ideas for Implementation:</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="2">Coordinating Organization:</td><td colspan="2">Hazard Mitigation Planning Committees</td></tr>
<tr><td colspan="3">Internal Partners:</td><td>External Partners:</td></tr>
<tr><td colspan="3"></td><td></td></tr>
<tr><td colspan="3">Timeline:</td><td>If available, estimated cost:</td></tr>
<tr><td><u>Short Term</u> (0-2 years)</td><td><u>Long Term</u> (2-4 or more years)</td><td></td><td rowspan="2"></td></tr>
<tr><td><u>Ongoing</u></td><td></td><td></td></tr>
<tr><td colspan="2">Form Submitted by:</td><td colspan="2">Eugene and Springfield Steering Committees</td></tr>
<tr><td colspan="4"><u>Action Item Status</u>: Action Item has been <u>completed</u> by both Eugene and Springfield who have sought funding for implementation of actions. For the 2009 update, this action has been <u>deleted</u> and information incorporated into the Plan Maintenance and Implementation Section.</td></tr>
</table>

Multi-Hazard # 3

Proposed Action Item:	**Alignment with Plan Goals:**
Develop public and private sector partnerships to foster hazard mitigation activities	***Public Awareness*** ***Partnerships & Implementation***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Hazard Mitigation Planning Committees**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Action item has been completed by the Eugene and Springfield steering committees. Both Eugene and Springfield have fostered partnerships between the private and public sector through emergency training exercises that included public institutions, private businesses, and neighborhood associations, development CERTS, establishment of Team Springfield, and through the training exercises surrounding the US Olympic Track Trials which involved the Lane Preparedness Coalition. This action item is being continued in the 2009 update, has been reworded (see Multi-Hazard Action # 1 in Appendix A).

Multi-Hazard # 4

Proposed Action Item:	**Alignment with Plan Goals:**
Develop education programs aimed at mitigating the risk posed by hazards.	***Public Awareness*** ***Life Safety*** ***Protect Property and Minimize Losses***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Hazard Mitigation Planning Committees**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) Long Term (2-4 or more years) Ongoing	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: This action item has been completed by Eugene and Springfield. Eugene has accomplished this action through the development and maintenance of CERT classes, the Red Cross has certified Community Disaster Educators to give presentations to groups regarding natural hazards, and Fire and Police departments are interacting with schools. Springfield has accomplished this action through education and outreach programs surrounding bird flu preparedness, development of 72 hour kits, and through wildfire prevention. This action is being continued for the 2009 updated, and has been reworded (see Multi-Hazard Action # 2 in Appendix A).	

Multi-Hazard Action # 5

Proposed Action Item:	**Alignment with Plan Goals:**
Integrate the Mitigation Plan findings into planning and regulatory documents and programs.	***Public Awareness*** ***Partnerships & Implementation*** ***Protect Environment***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Eugene & Springfield Plannind Departments**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Action item has been completed by Eugene in that findings of the Mitigation Plan have been incorporated into the Eugene Emergency Response Plan, but not completed by Springfield due to the vague wording of the action item and the lack of specific findings that need to be incorporated into planning and regulatory documents. For the 2009 update, this action item will be deleted.

Multi-Hazard # 6

<table>
<tr><td colspan="3">Proposed Action Item:</td><td>Alignment with Plan Goals:</td></tr>
<tr><td colspan="3">Integrate hazard, vulnerability, and risk Mitigation Plan findings into enhanced Emergency Operations planning.</td><td>Public Awareness
Emergency Services</td></tr>
<tr><td colspan="4">Rationale for Proposed Action Item:</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Ideas for Implementation:</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="2">Coordinating Organization:</td><td colspan="2">Emergency Management</td></tr>
<tr><td colspan="3">Internal Partners:</td><td>External Partners:</td></tr>
<tr><td colspan="3"></td><td></td></tr>
<tr><td colspan="3">Timeline:</td><td>If available, estimated cost:</td></tr>
<tr><td>Short Term (0-2 years)</td><td colspan="2">Long Term (2-4 or more years)</td><td rowspan="2"></td></tr>
<tr><td></td><td colspan="2">Ongoing</td></tr>
<tr><td colspan="2">Form Submitted by:</td><td colspan="2">Eugene and Springfield Steering Committees</td></tr>
<tr><td colspan="4"><u>Action Item Status</u>: Action item has been <u>completed</u> by Eugene and Springfield and findings have been incorporated into their Emergency Operations Plans. For the 2009 update, this action item has been <u>deleted</u>.</td></tr>
</table>

Flood # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Compile data and prepare GIS maps for structures within the 100-year floodplains.	***Public Awareness*** ***Protect Property and Minimize Losses*** ***Partnerships & Implementation***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Lane Council of Governments**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
Ongoing	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: This action has been completed by Eugene and Springfield. For the 2009 update, this action item will be deleted in the plan. Eugene and Springfield are also currently obtaining LIDAR data that will help to identify structures within the 100-year floodplain.	

Flood # 2

Proposed Action Item:	**Alignment with Plan Goals:**
Consult with property owners and explore mitigation actions for the 4 properties on FEMA's national repetitive loss list.	***Public Awareness*** ***Protect Property & Minimize Losses*** ***Partnerships & Implementation***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Cities of Eugene and Springfield**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: This action has not been completed by Eugene and Springfield due a lack of resources and time to address the issue. Since this is an ongoing issue, this action will be continued in the 2009 update (see Flood Action # 1 in Appendix A).

Flood # 3

Proposed Action Item:	**Alignment with Plan Goals:**
Encourage FEMA to update Flood Insurance Study, in selected areas, including Amazon and Cedar Creeks and McKenzie River.	***Public Awareness*** ***Partnerships & Implementation***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**City of Eugene/Lane Council of Governments**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: This action item is currently being implemented by FEMA, so has been completed by Eugene and Springfield. For the 2009 update, this action will be continued and reworded because the flood insurance study is ongoing, especially in developing new digital maps (see Flood Action # 2 in Appendix A).

Flood # 4

Proposed Action Item:	**Alignment with Plan Goals:**
Survey elevation data for structures within the 100-year floodplain.	***Public Awareness***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Cities of Eugene and Springfield**

Internal Partners:	**External Partners:**

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
	1-2 years	

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: This action has not been completed by Eugene and Springfield due to a lack of GIS data on elevation data and the significant amount of time it would take to complete this action item to survey all buildings in the floodplain. Both the Eugene and Springfield steering committees considered this an infeasible action item. For the 2009 update, this action will be continued but reworded to track elevation data for new construction (see Flood # 3 in Appendix A).

Flood # 5

Proposed Action Item:	**Alignment with Plan Goals:**
For structures within the 100-year floodplain and especially for structures deep in the floodplain, explore mitigation options with property owners.	***Public Awareness*** ***Life Safety*** ***Protect Property and Minimize Losses*** ***Partnerships & Implementation*** ***Protect Environment***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Cities of Eugene and Springfield**

Internal Partners:	**External Partners:**

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
	1-2 years	

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: This action has not been completed by Eugene and Springfield due to the significant amount of resources it would take to explore mitigation options with all structures and property owners in the floodplain. In addition, this action is vague because it does not define what "deep in the floodplain" means. For the 2009 update, this action will be continued but reworded to address mitigation on an as-needed basis (see Flood #4 in Appendix A).

Flood # 6

Proposed Action Item:	**Alignment with Plan Goals:**
Complete the inventory of locations in the Eugene/Springfield Metro Area subject to frequent storm water flooding.	***Public Awareness***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Cities of Eugene and Springfield Public Works Departments**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Eugene and Springfield have completed this action item. For the 2009 update, this action item will be continued but reworded to say "Maintain and update" rather than "complete" to ensure that the inventory will be continued. Maintaining and updating the inventory is supported by the Springfield Storm water Management Plan (see Flood # 5 in Appendix A).

Flood # 8

Proposed Action Item:	**Alignment with Plan Goals:**
For locations with repetitive flooding and significant damages or road closures, determine and implement mitigation measures such as upsizing culverts or storm water drainage ditches.	***Public Awareness*** ***Life Safety*** ***Protect Property & Minimize Losses*** ***Partnerships & Implementation*** ***Protect Environment***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Cities of Eugene and Springfield Public Works Departments**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years) / Ongoing	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: This action has been partially completed by Eugene and Springfield. Both cities have identified locations with repetitive flooding. Springfield has upsized culverts and Eugene has relined some mains to reduce infiltration. In addition, both cities have a vegetation removal and leaf pickup program to reduce flooding events. However, both cities have faced funding issues to complete all the projects they have identified. For the 2009 update, this action item will be continued with the same language to address the ongoing problem (see Flood # 6 in Appendix A).	

Winter Storm # 1

Proposed Action Item:	**Alignment with Plan Goals:**
Enhance tree trimming efforts especially for transmission lines and trunk distribution lines.	***Life Safety*** ***Protect Property and Minimize Losses*** ***Emergency Services***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Eugene Water & Electric Board/Springfield Utility Board**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
Ongoing	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: This action item has been completed by both Eugene and Springfield. Since tree trimming is an ongoing issue, this action item will be continued in the 2009 update but reworded (see Wind Storm # 1 in Appendix A).	

Winter Storm # 2

Proposed Action Item:	**Alignment with Plan Goals:**
Educate private property owners about dangers of vegetation near distribution lines and service drops	***Public Awareness*** ***Life Safety*** ***Protect Property and Minimize Losses*** ***Emergency Services***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Eugene Water & Electric Board/Springfield Utility Board**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
Ongoing	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: Eugene and Springfield both completed this action item. If there is a problem with vegetation near lines, letters are sent to property owners. A "vegetation cop" helps with enforcement of vegetation near power lines. However, because this is an ongoing issue with power lines, this action item is being continued in the 2009 update, and reworded to say "Continue to educate..." (see Winter Storm # 2 in Appendix A).	

Winter Storm # 3

Proposed Action Item:	**Alignment with Plan Goals:**
Encourage critical facilities in the Eugene/Springfield Metro Area to have backup power and emergency operations plans to deal with power outages.	***Life Safety*** ***Protect Property and Minimize Losses*** ***Emergency Services***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Facilities Management**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
1-2 years	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: This action has been partially completed by Eugene and Springfield. The Eugene Water and Electric Board and Springfield Utility Board have backup power in several of their facilities, but backup power has not been extended to all critical facilities. For the 2009 update, this action item will be continued because emergency backup power is not yet at all critical facilities (see Winter Storm # 3 in Appendix A).	

Winter Storm # 4

Proposed Action Item:	**Alignment with Plan Goals:**
Consider upgrading lines and poles to improve wind/ice loading, undergrounding critical lines, and adding interconnect switches to allow alternative feed paths and disconnect switches to minimize outage areas.	***Life safety*** ***Protect Property and Minimize Losses*** ***Emergency Services***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Eugene Water & Electric Board/Springfield Utility Board**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
5 years	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status:	

Winter Storm # 5

Proposed Action Item:		**Alignment with Plan Goals:**
Encourage the cities of Eugene and Springfield to underground key power lines and new developments to include underground power lines		***Life Safety*** ***Protect Property and Minimize Losses*** ***Emergency Services***
Rationale for Proposed Action Item:		
Ideas for Implementation:		
Coordinating Organization:	**Eugene Water & Electric Board**	
Internal Partners:		**External Partners:**
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
	ongoing	
Form Submitted by:	**Eugene and Springfield Steering Committees**	
Action Item Status: This action item has been completed by Eugene and Springfield. However, because this is an ongoing issue, this action item will be continued in the 2009 update, and has been reworded to say "Continue to encourage..." (see Winter Storm # 5 in Appendix A).		

Landslide #1

Proposed Action Item:		**Alignment with Plan Goals:**
Encourage the State to complete the inventory of locations where buildings or infrastructure are subject to landslides.		***Public Awareness***
Rationale for Proposed Action Item:		
Ideas for Implementation:		
Coordinating Organization:	**Lane Council of Governments.**	
Internal Partners:		**External Partners:**
Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
2 years		
Form Submitted by:	**Eugene and Springfield Steering Committees**	
Action Item Status: Completed. Reworded in the 2009 update (see Landslide Action Item #1 in Appendix A).		

Landslide #2

Proposed Action Item:	**Alignment with Plan Goals:**
Consider landslide mitigation actions for slides seriously threatening buildings or infrastructure	***Life Safety*** ***Protect Property and Minimize Losses*** ***Emergency Services***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Cities of Eugene and Springfield.**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
5 years	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: Completed by both cities. Whenever there is a landslide by infrastructure or buildings, mitigation activities are examined and often put in place. Reworded in the 2009 update to be less reactive and response oriented (see Landslide Action Item #2 in Appendix A).	

Landslide #3

Proposed Action Item:	**Alignment with Plan Goals:**
Continue to maintain appropriate regulation of steep slope development	***Public Awareness,*** ***Life Safety,*** ***Protect Property and Minimize Losses,*** ***Emergency Services***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Cities of Eugene and Springfield.**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) Long Term (2-4 or more years) Ongoing	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: Completed. Deleted in the 2009 update due to its lack of measurability and replaced with a new action item in the 2009 update (see Landslide Action Item #3 in Appendix A).	

Wildland/Urban Interface Fire #1

Proposed Action Item:	**Alignment with Plan Goals:**
Identify specific parts of the Eugene/Springfield Metro Area at high risk for urban/wildland urban interface fires because of fuel loading, topography and prevailing construction practices	***Public Awareness***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Fire Marshal Offices**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
1-2 years	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: Completed by both cities' Fire Departments. This action will be continued in the 2009 update and has been reworded (see Wildland/Urban Interface Fire #1 in Appendix A).	

Wildland/Urban Interface Fire #2

Proposed Action Item:	**Alignment with Plan Goals:**
Identify evacuation routes and procedures for high risk areas and educate the public	***Public Awareness,***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Police and Emergency Management**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Not been completed due to a lack of time and resources. Continued in the 2009 updated plan and reworded to review and update the evacuation routes (see Wildland/Urban Interface Fire #2 in Appendix A).

Wildland/Urban Interface Fire #3

<table>
<tr><td colspan="3">Proposed Action Item:</td><td>Alignment with Plan Goals:</td></tr>
<tr><td colspan="3">Encourage fire-safe construction practices for existing and new construction in high risk areas</td><td>Public Awareness,
Life Safety
Protect Property and Minimize Damages,
Emergency Services</td></tr>
<tr><td colspan="4">Rationale for Proposed Action Item:</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Ideas for Implementation:</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="2">Coordinating Organization:</td><td colspan="2">Fire Marshals offices, Building Officials and Development Offices responsible for building codes</td></tr>
<tr><td colspan="3">Internal Partners:</td><td>External Partners:</td></tr>
<tr><td colspan="3"></td><td></td></tr>
<tr><td colspan="2">Timeline:</td><td colspan="2">If available, estimated cost:</td></tr>
<tr><td>Short Term (0-2 years)</td><td>Long Term (2-4 or more years)</td><td colspan="2" rowspan="2"></td></tr>
<tr><td></td><td>Ongoing</td></tr>
<tr><td colspan="2">Form Submitted by:</td><td colspan="2">Eugene and Springfield Steering Committees</td></tr>
<tr><td colspan="4">Action Item Status: Springfield has <u>completed</u> this action item while Eugene has <u>not completed</u> it due to time and resource constraints. It has been <u>reworded</u> in the 2009 updated plan to focus more on education of homeowners rather than encouraging a specific type of building practices. (see Wildland/Urban Interface Fire # 3 in Appendix A).</td></tr>
</table>

Earthquake #1

Proposed Action Item:	**Alignment with Plan Goals:**
Continue to inventory public and commercial buildings that may be particularly vulnerable to earthquake damage	***Public Awareness***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Cities of Eugene/Springfield**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
1-2 Years	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: This action has not been completed by either city because creating an inventory of public and commercial buildings vulnerable to earthquake damage couldn't be done within the time and resource constraints. This has been deleted in the 2009 updated plan because the Steering Committees didn't think the time and resource limits would change.	

Earthquake #2

Proposed Action Item:	**Alignment with Plan Goals:**
Complete inventory of wood-frame residential buildings that may be particularly vulnerable to earthquake damage, including pre-1940s homes and homes with cripple wall foundations.	***Public Awareness***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Cities of Eugene/Springfield**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
1-2 Years	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: This has not been completed by either city because of time and resources. This has been deleted in the 2009 updated plan due to the relatively small number of pre-1940s homes in both cities and the amount of time and money any such inventory would take.	

Earthquake #3

Proposed Action Item:	**Alignment with Plan Goals:**
Disseminate FEMA pamphlets to educate homeowners about structural and non-structural retrofitting of vulnerable homes and encourage retrofit	***Public Awareness,*** ***Life Safety,*** ***Protect Property and Minimize Losses,*** ***Partnerships and Implementation***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Emergency Management**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: This action has <u>not been completed</u> by either city. No effort was documented to obtain and disseminate specifically FEMA produced pamphlets regarding structural and non-structural retrofits. This action is being <u>continued</u> in the 2009 updated plan and reworded to focus more on broadly educating homeowners regarding structural and non-structural retrofits. (see Earthquake # 1 in Appendix A)

Earthquake #4

Proposed Action Item:	**Alignment with Plan Goals:**
Consider seismic vulnerability assessments, and develop mitigation strategies for seismic retrofit of critical public buildings and critical utility infrastructure identified as particularly vulnerable	***Public Awareness***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Cities of Eugene/Springfield**

Internal Partners:	**External Partners:**

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
1-2 Years		

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Completed. Eugene and Springfield have conducted seismic vulnerability assessments on many of their buildings, including City Halls and fire stations. Bridges in the area are inspected every other year and new facilities are built to a high seismic standard. This action will be continued in the 2009 updated plan to address the continued need for seismic vulnerability assessments (see Earthquake # 2 in Appendix A).

Earthquake #5

Proposed Action Item:	**Alignment with Plan Goals:**
Obtain funding and retrofit important public facilities with significant seismic vulnerabilities, including utility systems, bridges and dams and special hazard private facilities such as bulk fuel storage and hazmat facilities	***Life Safety,*** ***Protect Property and Minimize Losses,*** ***Partnerships and Implementation,*** ***Emergency Services***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Cities of Eugene/Springfield**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
10 years	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: Completed. Springfield has obtaining funding and built all new Fire Stations to a high seismic code and Eugene retrofitted critical facilities. This action will be continued in the 2009 update and reworded to focus on conducting benefit-cost analysis to fund mitigation projects (see Earthquake # 3 in Appendix A).	

Volcano #1

Proposed Action Item:	**Alignment with Plan Goals:**
Update public emergency notification procedures for ash fall events	***Life Safety,*** ***Emergency Services***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Emergency management**

Internal Partners:	**External Partners:**

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
1-2 Years		

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Completed. While not specifically for ash-fall events, the public emergency notification procedures and resources have improved over the past 5 years. This action will be continued in the 2009 update due to the continued need for ensuring notification systems address ash-fall events (see Volcano # 1 in Appendix A).

Volcano #2

Proposed Action Item:	**Alignment with Plan Goals:**
Update emergency response planning for ash fall events and the possibility of major flooding along the McKenzie River	***Life Safety,*** ***Emergency Services***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Emergency Management**

Internal Partners:	**External Partners:**

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
1-2 Years		

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Not completed due to time and resource constraints. This will be deleted in the 2009 update because it is a response action item.

Volcano #3

Proposed Action Item:	**Alignment with Plan Goals:**
Evaluate capability of water treatment plants, including wells, to deal with high turbidity from ash falls and upgrade treatment facilities and emergency response plans to deal with ash falls	***Emergency Services***
Rationale for Proposed Action Item:	
Ideas for Implementation:	
Coordinating Organization:	**Eugene Water & Electric Board, Springfield Utility Board**
Internal Partners:	**External Partners:**
Timeline:	**If available, estimated cost:**
Short Term (0-2 years) / Long Term (2-4 or more years)	
1-2 Years	
Form Submitted by:	**Eugene and Springfield Steering Committees**
Action Item Status: Status is currently undetermined. To address this action in the future, it will be continued in the 2009 update (see Volcano#2 in Appendix A).	

Volcano #4

Proposed Action Item:	**Alignment with Plan Goals:**
Seek alternative sources of water supply not vulnerable to ash falls	***Emergency Services***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Eugene Water & Electric Board, Springfield Utility Board**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: Eugene and Springfield already have multiple sources of water to draw from, including wells. This action will be deleted in the 2009 update as it similar to Volcano #3, though it will be included in that action as an Idea for Implementation.

Dam Safety #1

Proposed Action Item:	**Alignment with Plan Goals:**
Prepare high resolution, digitalized maps of dam failure inundation areas and update emergency response plan, including public notification and evacuation routes	***Public Awareness,*** ***Life Safety,*** ***Emergency Services***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Lane Council of Governments**

Internal Partners:	**External Partners:**

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
1-2 Years		

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: This action was <u>not completed</u> as the dam inundation areas weren't shared among agencies in a timely manner. Now that this information is being shared, this action will be <u>continued</u> and reworded for the 2009 update to focus just on the creation of the maps (see Dam Safety # 1 in Appendix A).

Dam Safety #2

Proposed Action Item:	**Alignment with Plan Goals:**
Actively encourage the Corps of Engineers to complete seismic vulnerability assessments for dams upstream of the Eugene/Springfield Metro Area and to make seismic improvements as necessary	***Public Awareness, Life Safety, Protect Property and Minimize Losses, Emergency Services***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Lane Council of Governments and U.S. Army Corps of Engineers**

Internal Partners:	**External Partners:**

Timeline:		**If available, estimated cost:**
Short Term (0-2 years)	Long Term (2-4 or more years)	
1-2 Years		

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: This action has been completed. The Army Corps has been conducting these assessments periodically, with the last one happening in 2005. This action is being continued in the 2009 update (see Dam Safety # 2 in Appendix A).

Hazardous Materials #1

<table>
<tr><td colspan="3">Proposed Action Item:</td><td colspan="2">Alignment with Plan Goals:</td></tr>
<tr><td colspan="3">Ensure that first responders have readily available site-specific knowledge of hazardous chemical inventories in the Eugene/Springfield Metro Area</td><td colspan="2">Emergency Services</td></tr>
<tr><td colspan="5">Rationale for Proposed Action Item:</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td colspan="5">Ideas for Implementation:</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td colspan="2">Coordinating Organization:</td><td colspan="3">Eugene and Springfield Fire Departments</td></tr>
<tr><td colspan="3">Internal Partners:</td><td colspan="2">External Partners:</td></tr>
<tr><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="3">Timeline:</td><td colspan="2">If available, estimated cost:</td></tr>
<tr><td>Short Term (0-2 years)</td><td colspan="2">Long Term (2-4 or more years)</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>1 year</td><td colspan="2"></td></tr>
<tr><td colspan="2">Form Submitted by:</td><td colspan="3">Eugene and Springfield Steering Committees</td></tr>
<tr><td colspan="5">Action Item Status: This action was <u>completed</u>. Firefighters and first responders now have site-specific knowledge regarding hazardous materials. However, because getting hazardous materials information to the right departments is an ongoing issue, this action will be <u>continued</u> in the 2009 update (see Hazardous Materials # 1 in Appendix A).</td></tr>
</table>

Hazardous Materials #2

Proposed Action Item:	**Alignment with Plan Goals:**
Enhance emergency planning, emergency response training and equipment to address hazardous materials incidents.	***Life Safety,*** ***Emergency Services***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Emergency Management, Regional Hazmat Team**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: This action was completed by Springfield but not completed for Eugene. Springfield Public Works has developed a hazardous materials plan and spill kits are carried in city vehicles. This action item will be continued in the 2009 update (see Hazardous Materials # 2 in Appendix A).

Terrorism #1

Proposed Action Item:	**Alignment with Plan Goals:**
Enhance emergency planning, emergency response training and equipment to address potential terrorism incidents.	***Life Safety,*** ***Emergency Services***

Rationale for Proposed Action Item:

Ideas for Implementation:

Coordinating Organization:	**Eugene and Springfield Police Departments, FBI**

Internal Partners:	**External Partners:**

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

Form Submitted by:	**Eugene and Springfield Steering Committees**

Action Item Status: This action was <u>completed</u>. Both cities use the similar Emergency Operations Plans which address this, and both cities have conducted exercises surrounding terrorism events. However, since planning for terrorism events occurs together with hazardous materials incidents training, and since this action is similar to Hazardous Materials # 2, this action will be <u>deleted</u> in the 2009 update and combined with Hazardous Materials # 2 (see Hazardous Materials # 2 in Appendix A).

Terrorism #2

<table>
<tr><td colspan="2">Proposed Action Item:</td><td colspan="2">Alignment with Plan Goals:</td></tr>
<tr><td colspan="2">Upgrade physical security detection and response capability for critical facilities, including water systems</td><td colspan="2">Life Safety,
Protect Property and Minimize Losses,
Partnerships and Implementation,
Emergency Services</td></tr>
<tr><td colspan="4">Rationale for Proposed Action Item:</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Ideas for Implementation:</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>Coordinating Organization:</td><td colspan="3">Facilities Management</td></tr>
<tr><td colspan="2">Internal Partners:</td><td colspan="2">External Partners:</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2">Timeline:</td><td colspan="2">If available, estimated cost:</td></tr>
<tr><td>Short Term (0-2 years)</td><td>Long Term (2-4 or more years)</td><td colspan="2" rowspan="2"></td></tr>
<tr><td></td><td>5 Years</td></tr>
<tr><td>Form Submitted by:</td><td colspan="3">Eugene and Springfield Steering Committees</td></tr>
<tr><td colspan="4">Action Item Status: This action was <u>completed</u>. Springfield has a security camera system as the new Justice Center and response training occurs at schools. This action will be <u>continued</u> in the 2009 update because upgrading physical detection systems is an ongoing need in both communities (see Terrorism # 1 in Appendix A).</td></tr>
</table>

Appendix C:
Public Process

Memo

To: Federal Emergency Management Agency (FEMA)

From: Oregon Partnership for Disaster Resilience

Date: October 16, 2009

Re: **List of changes to the 2004 Eugene/Springfield NHMP for the 2009 Plan Update**

Purpose

This memo describes the changes made to the 2004 Eugene/Springfield Natural Hazards Mitigation Plan (NHMP) during the 2009 plan update process. Major changes are documented by section.

Project Background

In July 2009, the cities of Eugene and Springfield contracted with the Oregon Partnership for Disaster Resilience (the Partnership) to update the 2004 Eugene/Springfield Natural Hazards Mitigation Plan. The Disaster Mitigation Act of 2000 requires communities to update their mitigation plans every five years to remain eligible for Pre-Disaster Mitigation (PDM) program funding, Flood Mitigation Assistance (FMA) program funding, and Hazard Grant Mitigation Program (HGMP) funding. Though this is a joint plan, the cities of Eugene and Springfield decided to form their own individual Steering Committees. The Partnership met with members of the Eugene/Springfield Natural Hazards Mitigation Committees (the Committees) three times between July and October to update the cities' risk assessment, discuss the plan goals and action items in the 2004 NHMP, develop new goals and action items for the 2009 update, and review all changes made for the 2009 update prior to submittal to FEMA.

The Partnership and the Committees made several major changes to the 2004 NHMP. The major changes are documented and summarized in this memo for each section of the mitigation plan

2009 Update Changes

The sections below only discuss *major* changes made to the 2004 Eugene/Springfield Natural Hazards Mitigation Plan for the 2009 plan update. Major changes include replacement or deletions of large portions of text, changes to the plan's organization, and new additions to the plan. If a section is not that addressed within this memo, then it can be assumed that no significant changes occurred.

Overall, the plan's format and organization have changed to fit within the Partnership's plan templates. The table below lists the 2004 plan section names and the corresponding 2009 update section names. This memo will use the 2009 plan update section names to reference any changes, additions or deletions within the plan.

Table 1 2004 and 2009 Section Names

2004 Eugene/Springfield NHMP	2009 Eugene Springfield NHMP
Chapter 1: Introduction	Section 1: Introduction
Chapter 2: Community Profile	Section 2: Community Profile
Chapter 3: Community Involvement and Public Process	Section 1: Introduction, Planning Process and Appendix C: Planning and Public Process
Chapter 4: Mitigation Goals, Strategies, Action Items	Section 3: Mission, Goals and Action Items
Chapter 5: Plan Adoption, Implementation and Maintenance	Section 4: Plan Implementation and Maintenance
Chapter 6: Floods	Hazard Annex: Flood
Chapter 7: Winter Storms	Hazard Annex: Winter Storm
Chapter 8: Landslides	Hazard Annex: Landslide
Chapter 9: Wildland/Urban Interface Fires	Hazard Annex: Wildfire
Chapter 10: Earthquakes	Hazard Annex: Earthquake
Chapter 11: Volcanic Hazards	Hazard Annex: Volcano
Chapter 12: Dam Safety	Hazard Annex: Dam Safety
Chapter 13: Disruption of Utility and Transportation Systems	Deleted
Chapter 14: HAZMAT Incidents	Hazard Annex: Hazardous Materials
Chapter 15: Terrorism	Hazard Annex: Terrorism
Appendix :Example Mitigation Projects	Deleted
	Appendix A: New Action Item Forms
	Appendix B: Previous Action Item Forms
	Appendix D: Economic Analysis of Natural Hazard Mitigation Projects
	Appendix E: Grant Programs

Chapter 13, 'Disruption of Utility and Transportation Systems' and the 'Example Mitigation Projects' Appendix were deleted by the Committees during the 2009 plan update. Chapter 13was deleted because the Committees felt that utility and transportation disruptions weren't hazards in and of themselves, but rather complications of other hazards. The Example Mitigation Projects Appendix was deleted, and replaced by the updated NHMP's Appendices D and E.

Cover Page and Acknowledgments

1. The Cover Page for the Eugene/Springfield NHMP has been revised to include 2009 update information and the agencies involved in developing the plan update.

2. The Acknowledgments section now lists 2009 participants, rather than 2004 participants.

Volume I Plan Framework

Volume I provides the structure for the rest of the 2009 update. Included are the following sections: 1) introduction; 2) community profile; 3)mission, goals and action items; and 4) plan implementation and maintenance.

Section 1 Introduction

Section 1 includes an introduction and purpose for the plan, summarizes the process for developing the 2004 NHMP and the 2009 update, and provides an overview of the entire plan. The major changes in Section 1 include the following:

1. Most of Section 1 includes new information added by the Partnership and replaces out of date text found in the 2004 NHMP. The new text defines mitigation, gives examples of mitigation strategies, and lists federal programs that communities with mitigation plans are eligible for. These programs include the Pre-Disaster Mitigation (PDM) Program, the Flood Mitigation Assistance (FMA) Program, and the Hazard Mitigation Grant Program (HMGP).

2. New text was added detailing the history of the 2004 NHMP and the development of the 2009 update.

3. What was Chapter 3 in the 2004 NHMP was included in Section 1 of the 2009 update in the Planning Process subsection.

4. Most of the information regarding benefit cost analysis was deleted from this section and moved to Appendix D.

Section 2 Community Profile
Section 2 gives a description of the two communities in a variety of ways. This section highlights demographic, employment, housing, transportation, and land use characteristics.

1. All demographic, employment, housing, transportation and land use information was updated to incorporate the latest possible information.

2. Text was added about the governmental structures of both cities. A list of existing plans that could be used in concert with the updated NHMP was also included.

3. A matrix of community organizations that may possibly be partners was added.

Section 3 Mission, Goals and Action Items
This section provides the basis and justification for the mitigation actions identified in the NHMP.

1. The 2004 NHMP did not have a mission statement. The 2009 update included a mission statement; "To create disaster resilient and sustainable cities."

2. The 2004 NHMP listed all of the plan's action items in this section. For the 2009 update, the plan's current action items are located in Appendix A, and the original 2004 NHMP action items and their status are located in Appendix B.

3. The 2009 update has text defined characteristics of successful action items.

Section 4 Plan Implementation and Maintenance
This section details the formal process that will ensure that the Eugene/Springfield Natural Hazards Mitigation Plan remains an active and relevant document.

1. A project prioritization processes was added to this section.

2. A plan update framework for the 2014 update was included.

3. The 2009 update names the personnel in Eugene and Springfield responsible for emergency management duties as Co-Conveners and the Mitigation Sub-Committee of the Lane Preparedness Council as the Coordinating Body.

4. The 2009 update lists a series of actions that both Eugene and Springfield will pursue to encourage public participation.

5. The 2009 update also includes a draft meeting schedule.

Volume II Hazard Annexes
Volume II is comprised of an introduction and hazard annexes. This volume discusses flood, earthquake, landslide, severe weather, urban-wildland interface fire, volcano, drought, and hazardous materials. For 2009 update, most of the changes involved adding new information relevant to the cities of Eugene/Springfield. For example, in all Hazard Annexes hazard history was reviewed and updated. In the 2004 NHMP, there was information regarding vulnerability and probability as they related to specific hazards, but the 2009 update includes both more defined vulnerability and probability assessments as well as other pertinent vulnerability or probability information. Also in many annexes, new studies or reports were included. The changes made to each section include the following:

Hazard Annex: Earthquake

1. For the 2009 update, additional information was added to this section to discuss how earthquake hazards affect the cities of Eugene and Springfield.

2. The 2004 NHMP included a great deal of geological data that, while interesting from a scientific point of view, wasn't pertinent to a working mitigation plan as it wasn't information that could be used to help mitigate natural disasters or meet any FEMA requirements. It was deleted.

Hazard Annex: Flood

1. For the 2009 update, additional information was added to this section to discuss how flood hazards affect Eugene and Springfield. Additionally, the updated plan now includes information regarding the Community Rating System.

2. The 2009 update includes detailed information regarding the cities' participation in the National Flood Insurance Program.

Hazard Annex: Landslide

1. For the 2009 update, information gathered from the hazard identification meeting was added to the landslide hazard section. This information included specific areas in Eugene and Springfield that were of special concern when considering landslides.

2. Added a definition, diagram, and information regarding debris flows.

Hazard Annex: Volcano

1. The updated plan now includes information about volcanic eruptions from the Three Sisters and their potential impacts on the cities of Eugene/Springfield included in this section.

2. An expanded history of volcanic eruptions from the Cascades was included.

3. The updated plan no longer includes detailed information for all volcanoes in Oregon. Instead, the plan focuses on those most likely to impact Eugene and Springfield.

Hazard Annex: Wildfire

1. The 2009 plan removed information regarding national statistics on the number of fire departments, Oregon forest land ownership, and human-caused structure fires in Eugene and Springfield because it wasn't

Hazard Annex: Winter Storm

1. Added probability and vulnerability sections.

Hazard Annex: Dam Safety

1. Deleted excessive information regarding the National Inventory of Dams.

2. Included Probability and Vulnerability sections.

Hazard Annex: Terrorism

1. Created a Hazard History section which included dates, responsible parties and damage estimates where available.

2. Included Probability and Vulnerability sections.

Hazard Annex: Hazardous Materials

1. Included Probability and Vulnerability sections.

2. Included information regarding the number of hazardous materials spills over the past 5 years.

Volume III Resource Appendices
All appendices are new to the 2009 update and were included as resources for those maintaining and implementing the plan.

Appendix A Mitigation Action Items
Appendix A lists the action items operative for the 2009 update. Included are rationale, ideas for implementation, coordinating organization, and what goal or goals that action item addresses.

Appendix B Past Mitigation Action Items
This appendix lists all of the action items from the 2004 NHMP and whether they were completed, not completed or ongoing.

Appendix C Planning and Public Process
This appendix contains meeting agendas and sign-in sheets from the Steering Committee meetings.

Appendix D Economic Analysis of Natural Hazard Mitigation Projects
This appendix documents how differing ways of prioritizing actions with a special emphasis on the process of benefit-cost analysis.

Appendix E Grant Programs
Appendix E lists grant programs that could be used to fund mitigation projects as well as some response-oriented action items.

Meeting: Eugene/Springfield NHMP Kickoff
Date: August 10th, 2009
Time: 1:00 pm – 5:00 pm
Location: 1705 W 2nd Avenue (Police & Fire Training Building), Eugene OR

AGENDA

1. Welcome & Introductions ***(15 minutes)***

2. Overview of Plan Update Needs ***(30 minutes)***

3. Roles and Responsibilities ***(15 minutes)***

4. Community Involvement ***(30 minutes)***
   - Steering Committee & Stakeholder Selection Discussion

Break (15 minutes)

5. Overview of Vulnerability/Probability Assessments ***(30 minutes)***

6. Work Session ***(90 minutes)***

7. Next Steps: Goals and Action Items ***(15 minutes)***

PDM 8/10 Kickoff

Please Sign-in

	Name	Org
1.	Patence Winningham	COE
2.	Joe Rizzi	COE
3.	Mark Walker	SPRINGFIELD
4.	Niel Laudati	Springfield
5.	Kenneth McCoy	American Red Cross
6.	Craig Sorsets	COE
7.	Naomi Shirtcliff	Williams NW Pipeline
8.	Adam Crawford	OPDR
9.	Josh Bruce	OPDR
10.	Steve McGuire	COE - PDD/EPS
11.	Todd Simmons	EWEB

Meeting: Eugene/Springfield NHMP Kickoff
Date: August 24th, 2009
Time: 1:00 pm – 4:00 pm
Location: Springfield City Hall, Springfield, OR

AGENDA

1. Welcome & Introductions ***(15 minutes)***

2. Overview of Plan Update Needs ***(15 minutes)***

3. Roles and Responsibilities ***(15 minutes)***

4. Community Involvement ***(15 minutes)***
   - Steering Committee & Stakeholder Selection Discussion

Break (15 minutes)

5. Overview of Vulnerability/Probability Assessments ***(30 minutes)***

6. Work Session ***(60 minutes)***

7. Next Steps: Goals and Action Items ***(15 minutes)***

Meeting Sign-In

Eugene/Springfield 'Kickoff' Work Session. August 24th, 2009; 1-5pm
Springfield City Hall. 225 5th St, Springfield, OR 97477-4675

Name	Representing	Email
MARK GORHAM	McKenzie Willamette Medical Center	MARGOR@ mcweb.com
Chuck Gottfried	Springfield- ETD	cgottfried@ci.springfield.or.us
Joe Zaludek	EUGENE FIRE + EMS	Joe.s.zaludek@ci.eugene.or.us
Annamarie Tiniakos	City of Springfield, Tech Services	atiniakos@ci.springfield.or.u
Ken Vogeney	City of Springfield, City Engineer	kvogeney@ci.springfield.or.us
Mark Walker	City of Spr. FIRE	mwalker@ci.springfield.or.us
Katie Blair	City of Eugene PWM	katie.a.blair@ci.eugene.or.us

Name	Representing	Email
RICHARD LEWIS	SPD	rllewis@ci.springfield.or.us
TIM HANLEY	RAINBOW WATER DISTRICT	hanleyt@junno.com

Meeting: Goals & Action Item Work Session
Date: September 10, 2009
Time: 1:00 – 5:00 PM
Location: Bascom/Tykeson Room 1st Floor Eugene Public Library, Eugene, OR

AGENDA

1. Overview of Day (***15 minutes***)

2. Actions Item Overview (***15 minutes***)

3. Action Item Selection (***1.5 hours***)

Break, 15 minutes

4. Action Item Selection (con't) (***1.5 hours***)

5. Conclusion & Next Steps (***15 minutes***)

Meeting Sign-In

Eugene/Springfield Natural Hazard Mitigation Plan Update Meeting. September 10, 2009. 1-5 pm
Eugene Public Library, 100 W 10th Ave Eugene, OR

Name	Representing	Email
ROGER KLINE	US Army Corps of Engineers Willamette Valley Project	roger.m.kline@usace.army.mil (541) 937-2131
Mike Bennett	American Red Cross Oregon Pacific Chapter	esspecialist@oregonpacific.redcross.org
JOE RIZZI	COE-EM	Joseph.D.rizzi@ci.eugene.or.us
Patrice Winningham	COE- EM	cepmpmw@ci.eugene.or.us
Naomi Shirtcliff	Williams NW Pipeline.	naomi.h.shirtcliff@williams.com
Joe Rizzi	City of Eugene Em	
STEVE MCGUIRE	CITY OF EUG. PDD/ BPS	
Bill Clingman	Lane Council of Govt's	bclingman@lcog.org

Name	Representing	Email	Roundtrip mileage (if applicable)
Craig Smith	COE - Risk/Safety	craig.r.smith@ci.eugene.or.us	
Mark Walker	Springfield	mwalker@ci.springfield.or.us	
Katie Blair	COE - PROM	katie.a.blair@ci.eugene.or.us	
Joe Zaludek	COE - Fire/EMS	joe.s.zaludek@ci.eugene.or.us	

Meeting: Goals & Action Item Work Session
Date: September 15, 2009
Time: 1:00 – 5:00 PM
Location: Springfield City Hall, Springfield, OR

AGENDA

1. Overview of Day (***15 minutes***)

2. Actions Item Overview (***15 minutes***)

3. Action Item Selection (***1.5 hours***)

Break, 15 minutes

4. Action Item Selection (con't) (***1.5 hours***)

5. Conclusion & Next Steps (***15 minutes***)

Meeting Sign-In

Eugene/Springfield Natural Hazard Mitigation Plan Update Meeting September 15, 2009. 1-5 pm
Springfield City Hall, 225 5th St, Springfield, OR 97477-4675

Name	Representing	Email
Niel Laudati	Springfield	nlaudati@ci.springfield.or.us
Linda Pauly	SPPD	lpauly@ci.springfield.or.us
Annamarie Tiniakos	SPR.	atiniakos@ci.springfield.or.us
Mark Walker	SPR	mwalker@ Same as above.
Chuck Gottfried	Spfld-PW-ESD	cgottfried@ci.springfield.or.us
Richard Lewis	SPD	rllewis@ci.springfield.or.us
Marcy Parker	SPPD	Mparker@ci.Springfield.or.us
Ken Vogeney	Spfld-PW-Engineering	kavogeney@ci.springfield.or.us

Name	Representing	Email
BRIAN CONLON	SPFD - PW/MAINT.	bconlon@ci.springfield.or.us

Meeting: Eugene/Springfield NHMP Plan Implementation and Maintenance
Date: October 6th, 2009
Time: 2:00 pm – 5:00 pm
Location: 1705 W 2nd Avenue (Police & Fire Training Building), Eugene OR

AGENDA

1. Welcome ***(15 minutes)***

2. Grant Resources and Opportunities ***(15 minutes)***

3. Moving Projects Forward ***(15 minutes)***

4. Maintenance and Implementation ***(30 minutes)***

Break (15 minutes)

5. Continued Public Involvement ***(30 minutes)***
   - ***Brainstorm Possible Ideas for Continued Public Involvement***

6. Project Prioritization ***(15 minutes)***

7. Comments or Edits for the Plan ***(45 minutes)***

Oregon Partnership for Disaster Resilience
Community Service Center • 1209 University of Oregon
Eugene • Oregon • 97403-1209
Phone: 541.346.2305 • Fax: 541.346.2040

Meeting Sign-In

Eugene/Springfield Natural Hazard Mitigation Plan Update Meeting. October 6, 2009. 2-5 pm
Eugene Fire and Police Training Facility, 1705 W 2nd Avenue Eugene, OR

Name	Representing	Email
Bill Clingman	LCOG	bclingman @ lcog. org
Roger Kline	USACE	roger.m.kline@usace.army.mil
Joe Rizzi	City of Eugene	
Fetch Lundgren for Mark Walker	Springfield Fire & Life Safety	flundgrene@ci.springfield.or.us
Kristi Wilde	Eugene Police/Central Lane 911	kristi.j.wilde@ci.eugene.or.us
Annamarie Tiniakos	Springfield GIS	atiniakos@ci.springfield.or.us
Katie Blair	City of Eugene Public Works Maint.	katie.a.blair@ci.eugene.or.us
Robin W	COE	

Name	Representing	Email
Craig Sovig	CEO - RNK	craj.r.sovick@ci.eugene.or.us
JOE ZALUDEK	EUGENE FIRE AND EMS DEPT.	joe.s.zaludek@ci.eugene.or.us
STEVE MCGUIRE	CEO - PDD	stevewmcguire@ci.eugene.or.us

Meeting: Eugene/Springfield NHMP Plan Implementation and Maintenance
Date: October 8th, 2009
Time: 1:00 pm – 5:00 pm
Location: Springfield City Hall, Springfield, OR

AGENDA

1. Welcome ***(15 minutes)***

2. Grant Resources and Opportunities ***(15 minutes)***

3. Moving Projects Forward ***(15 minutes)***

4. Maintenance and Implementation ***(30 minutes)***

Break (15 minutes)

5. Continued Public Involvement ***(30 minutes)***
   - ***Brainstorm Possible Ideas for Continued Public Involvement***

6. Project Prioritization ***(15 minutes)***

7. Comments or Edits for the Plan ***(45 minutes)***

Oregon Partnership for Disaster Resilience
Community Service Center • 1209 University of Oregon
Eugene • Oregon • 97403-1209
Phone: 541.346.2509 • Fax: 541.346.2040

Meeting Sign-In

Eugene/Springfield Natural Hazard Mitigation Plan Update Meeting. October 8, 2009.1-5 pm
Springfield City Hall, 225 5th St., Springfield, OR

Name	Representing	Email
Mark Walker	SPRINGFIELD	MWALKER@ci.springfield.or.us
Annamarie Tiniakos	Springfield GIS	atiniakos@ci.springfield.or.us
Mark Gorham	McKenzie Willamette Med Center	MARGOR@Mckweb.com
Richard Lewis	SPFLD Police	rlewis@ci.or.us
Troy McAllister (sub for Chuck G.)	Springfield Public Works	tmcallister@ci.springfield.or.us
Ken Vogeney	Spfld. Public Work	kvogeney@ci.springfield.or.us
Brian Conlon	SPFLD PW - MAINT	bconlon@ci.springfield.or.us
Stacey Kintigh	SPFLD PW. MAINT	SKINTIGH "

Appendix D: Economic Analysis of Natural Hazard Mitigation Projects

This appendix was developed by the Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center. It has been reviewed and accepted by the Federal Emergency Management Agency as a means of documenting how the prioritization of actions shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

The appendix outlines three approaches for conducting economic analyses of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon State Police – Office of Emergency Management, 2000), and Federal Emergency Management Agency Publication 331, *Report on Costs and Benefits of Natural Hazard Mitigation*. This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred. Evaluating possible natural hazard mitigation activities provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools. Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce "ripple-effects" throughout the community, greatly increasing the disaster's social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

What are some Economic Analysis Approaches for Evaluating Mitigation Strategies?

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into three general categories: benefit/cost analysis, cost-effectiveness analysis and the STAPLE/E approach. The distinction between the three methods is outlined below:

Benefit/Cost Analysis

Benefit/cost analysis is a key mechanism used by the state Office of Emergency Management (OEM), the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

Benefit/cost analysis is used in natural hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoiding future damages, and risk. In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented. A project must have a benefit/cost ratio greater than 1 (i.e., the net benefits will exceed the net costs) to be eligible for FEMA funding.

Cost-Effectiveness Analysis

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in Public Sector Mitigation Activities

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions which involve a diverse set of beneficiaries and non-market benefits.

Investing in Private Sector Mitigation Activities

Private sector mitigation projects may occur on the basis of one or two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies;

2. Dispose of the building or land either by sale or demolition;
3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
4. Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchases. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

STAPLE/E Approach

Considering detailed benefit/cost or cost-effectiveness analysis for every possible mitigation activity could be very time consuming and may not be practical. There are some alternate approaches for conducting a quick evaluation of the proposed mitigation activities which could be used to identify those mitigation activities that merit more detailed assessment. One of those methods is the STAPLE/E approach.

Using STAPLE/E criteria, mitigation activities can be evaluated quickly by steering committees in a synthetic fashion. This set of criteria requires the committee to assess the mitigation activities based on the Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLE/E) constraints and opportunities of implementing the particular mitigation item in your community. The second chapter in FEMA's How-To Guide "Developing the Mitigation Plan – Identifying Mitigation Actions and Implementation Strategies" as well as the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process" outline some specific considerations in analyzing each aspect. The following are suggestions for how to examine each aspect of the STAPLE/E approach from the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process."

Social: Community development staff, local non-profit organizations, or a local planning board can help answer these questions.

- Is the proposed action socially acceptable to the community?
- Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Will the action cause social disruption?

Technical: The city or county public works staff, and building department staff can help answer these questions.

- Will the proposed action work?
- Will it create more problems than it solves?

- Does it solve a problem or only a symptom?
- Is it the most useful action in light of other community goals?

Administrative: Elected officials or the city or county administrator, can help answer these questions.

- Can the community implement the action?
- Is there someone to coordinate and lead the effort?
- Is there sufficient funding, staff, and technical support available?
- Are there ongoing administrative requirements that need to be met?

Political: Consult the mayor, city council or county planning commission, city or county administrator, and local planning commissions to help answer these questions.

- Is the action politically acceptable?
- Is there public support both to implement and to maintain the project?

Legal: Include legal counsel, land use planners, risk managers, and city council or county planning commission members, among others, in this discussion.

- Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity?
- Are there legal side effects? Could the activity be construed as a taking?
- Is the proposed action allowed by the comprehensive plan, or must the comprehensive plan be amended to allow the proposed action?
- Will the community be liable for action or lack of action?
- Will the activity be challenged?

Economic: Community economic development staff, civil engineers, building department staff, and the assessor's office can help answer these questions.

- What are the costs and benefits of this action?
- Do the benefits exceed the costs?
- Are initial, maintenance, and administrative costs taken into account?
- Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private?)
- How will this action affect the fiscal capability of the community?
- What burden will this action place on the tax base or local economy?
- What are the budget and revenue effects of this activity?
- Does the action contribute to other community goals, such as capital improvements or economic development?

- What benefits will the action provide? (This can include dollar amount of damages prevented, number of homes protected, credit under the CRS, potential for funding under the HMGP or the FMA program, etc.)

Environmental: Watershed councils, environmental groups, land use planners and natural resource managers can help answer these questions.

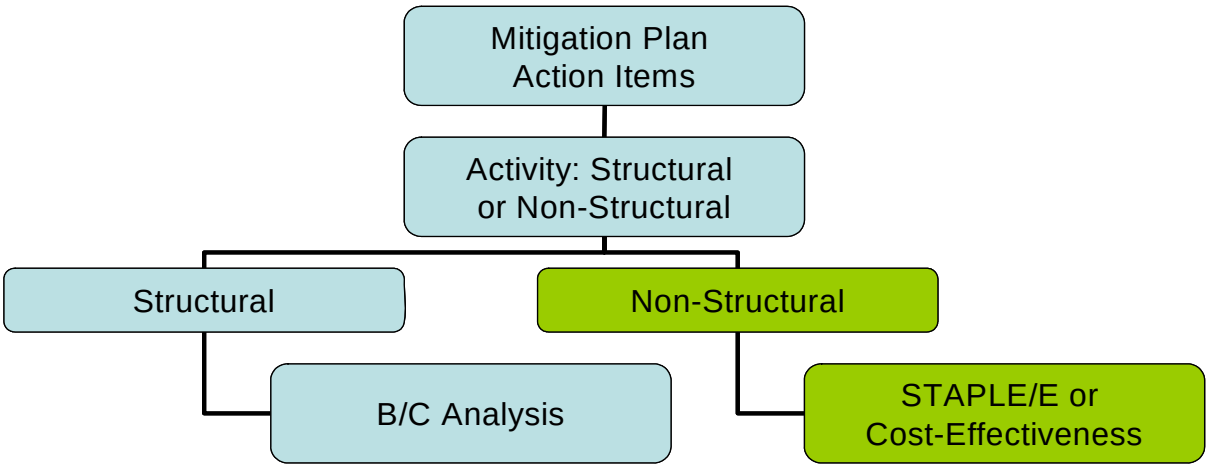
- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

The STAPLE/E approach is helpful for doing a quick analysis of mitigation projects. Most projects that seek federal funding and others often require more detailed benefit/cost analyses.

When to use the Various Approaches

It is important to realize that various funding sources require different types of economic analyses. The following figure is to serve as a guideline for when to use the various approaches.

Figure A.1: Economic Analysis Flowchart



Source: Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center, 2005

Implementing the Approaches

Benefit/cost analysis, cost-effectiveness analysis, and the STAPLE/E are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating mitigation activities is outlined below. This framework should be used in further analyzing the feasibility of prioritized mitigation activities.

1. Identify the Activities

Activities for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation projects can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits

Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate activities. Potential economic criteria to evaluate alternatives include:

- ***Determine the project cost***. This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- ***Estimate the benefits***. Projecting the benefits, or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be

projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

- ***Consider costs and benefits to society and the environment***. These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.
- ***Determine the correct discount rate***. Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Activities

Once costs and benefits have been quantified, economic analysis tools can rank the possible mitigation activities. Two methods for determining the best activities given varying costs and benefits include net present value and internal rate of return.

- ***Net present value***. Net present value is the value of the expected future returns of an investment minus the value of the expected future cost expressed in today's dollars. If the net present value is greater than the projected costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.
- ***Internal rate of return***. Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project. Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk, project effectiveness, and economic, environmental, and social returns in choosing the appropriate project for implementation.

Economic Returns of Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or land owners as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided

- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Natural Hazards

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and

resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

Resources

CUREe Kajima Project, *Methodologies for Evaluating the Socio-Economic Consequences of Large Earthquakes*, Task 7.2 Economic Impact Analysis, Prepared by University of California, Berkeley Team, Robert A. Olson, VSP Associates, Team Leader; John M. Eidinger, G&E Engineering Systems; Kenneth A. Goettel, Goettel and Associates, Inc.; and Gerald L. Horner, Hazard Mitigation Economics Inc., 1997

Federal Emergency Management Agency, *Benefit/Cost Analysis of Hazard Mitigation Projects*, Riverine Flood, Version 1.05, Hazard Mitigation Economics, Inc., 1996

Federal Emergency Management Agency, *Report on the Costs and Benefits of Natural Hazard Mitigation*. Publication 331, 1996.

Goettel & Horner Inc., *Earthquake Risk Analysis Volume III: The Economic Feasibility of Seismic Rehabilitation of Buildings in the City of Portland*, Submitted to the Bureau of Buildings, City of Portland, August 30, 1995.

Goettel & Horner Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects* Volume V, Earthquakes, Prepared for FEMA's Hazard Mitigation Branch, Ocbober 25, 1995.

Horner, Gerald, *Benefit/Cost Methodologies for Use in Evaluating the Cost Effectiveness of Proposed Hazard Mitigation Measures*, Robert Olsen Associates, Prepared for Oregon State Police, Office of Emergency Management, July 1999.

Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon State Police – Office of Emergency Management, 2000.)

Risk Management Solutions, Inc., *Development of a Standardized Earthquake Loss Estimation Methodology*, National Institute of Building Sciences, Volume I and II, 1994.

VSP Associates, Inc., *A Benefit/Cost Model for the Seismic Rehabilitation of Buildings*, Volumes 1 & 2, Federal Emergency management Agency, FEMA Publication Numbers 227 and 228, 1991.

VSP Associates, Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects: Section 404 Hazard Mitigation Program and Section 406 Public Assistance Program, Volume 3: Seismic Hazard Mitigation Projects*, 1993.

VSP Associates, Inc., *Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model*, Volume 1, Federal Emergency Management Agency, FEMA Publication Number 255, 1994.

Appendix E: Grant Programs

Hazard Mitigation Programs

Post-Disaster Federal Programs

- Hazard Mitigation Grant Program
  - The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.
  - http://www.fema.gov/government/grant/hmgp/
- Physical Disaster Loan Program
  - When physical disaster loans are made to homeowners and businesses following disaster declarations by the U.S. Small Business Administration (SBA), up to 20% of the loan amount can go towards specific measures taken to protect against recurring damage in similar future disasters.
  - http://www.sba.gov/services/disasterassistance/index.html

Pre-Disaster Federal Programs

- Pre-Disaster Mitigation Grant Program
  - The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.
  - http://www.fema.gov/government/grant/pdm/index.shtm
- Flood Mitigation Assistance Program
  - The overall goal of the Flood Mitigation Assistance (FMA) Program is to fund cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other National Flood Insurance Program (NFIP) insurable structures. This specifically includes:
    - Reducing the number of repetitively or substantially damaged structures and the associated flood insurance claims;
    - Encouraging long-term, comprehensive hazard mitigation planning;
    - Responding to the needs of communities participating in the NFIP to expand their mitigation activities beyond floodplain development activities; and
    - Complementing other federal and state mitigation programs with similar, long-term mitigation goals.
  - http://www.fema.gov/government/grant/fma/index.shtm

Detailed program and application information for federal post-disaster and pre-disaster programs can be found in the FY10 Hazard Mitigation Assistance Unified Guidance, available at http://www.fema.gov/library/viewRecord.do?id=3649

For Oregon Emergency Management grant guidance on Federal Hazard Mitigation Assistance, visit: http://www.oregon.gov/OMD/OEM/plans_train/grant_info/hma.pdf

OEM contact: Dennis Sigrist, dsigrist@oem.state.or.us

State Programs

- Community Development Block Grant Program
  - Promotes viable communities by providing: 1) decent housing; 2) quality living environments; and 3) economic opportunities, especially for low and moderate income persons. Eligible Activities Most Relevant to Hazard Mitigation include: acquisition of property for public purposes; construction/reconstruction of public infrastructure; community planning activities. Under special circumstances, CDBG funds also can be used to meet urgent community development needs arising in the last 18 months which pose immediate threats to health and welfare.
  - http://www.hud.gov/offices/cpd/communitydevelopment/programs/
- Oregon Watershed Enhancement Board
  - While OWEB's primary responsibilities are implementing projects addressing coastal salmon restoration and improving water quality statewide, these projects can sometimes also benefit efforts to reduce flood and landslide hazards. In addition, OWEB conducts watershed workshops for landowners, watershed councils, educators, and others, and conducts a biennial conference highlighting watershed efforts statewide. Funding for OWEB programs comes from the general fund, state lottery, timber tax revenues, license plate revenues, angling license fees, and other sources. OWEB awards approximately $20 million in funding annually.
  - http://www.oweb.state.or.us/

Federal Mitigation Programs, Activities & Initiatives

Basic & Applied Research/Development

- National Earthquake Hazard Reduction Program (NEHRP), National Science Foundation. Through broad based participation, the NEHRP attempts to mitigate the effects of earthquakes. Member agencies in NEHRP are the US Geological Survey (USGS), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the National Institute for Standards and Technology (NIST). The agencies focus on research and development in areas such as the science of earthquakes, earthquake performance of buildings and other structures, societal impacts, and emergency response and recovery. http://www.nehrp.gov/

- Decision, Risk, and Management Science Program, National Science Foundation. Supports scientific research directed at increasing the understanding and effectiveness of decision making by individuals, groups, organizations, and society. Disciplinary and interdisciplinary research, doctoral dissertation research, and workshops are funded in the areas of judgment and decision making; decision analysis and decision aids; risk analysis, perception, and communication; societal and public policy decision making; management science and organizational design. The program also supports small grants for exploratory research of a time-critical or high-risk, potentially transformative nature.
  http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423&org=SES

Hazard ID and Mapping

- National Flood Insurance Program: Flood Mapping; FEMA. Flood insurance rate maps and flood plain management maps for all NFIP communities. http://www.fema.gov/plan/prevent/fhm/index.shtm
- National Digital Orthophoto Program, DOI – USGS. Develops topographic quadrangles for use in mapping of flood and other hazards. http://www.ndop.gov/
- Mapping Standards Support, DOI-USGS. Expertise in mapping and digital data standards to support the National Flood Insurance Program. http://ncgmp.usgs.gov/ncgmpstandards/
- Soil Survey, USDA-NRCS. Maintains soil surveys of counties or other areas to assist with farming, conservation, mitigation or related purposes. http://soils.usda.gov/survey/

Project Support

- Coastal Zone Management Program, NOAA. Provides grants for planning and implementation of non-structural coastal flood and hurricane hazard mitigation projects and coastal wetlands restoration. http://coastalmanagement.noaa.gov/
- Community Development Block Grant Entitlement Communities Program, HUD. Provides grants to entitled cities and urban counties to develop viable communities (e.g., decent housing, a suitable living environment, expanded economic opportunities), principally for low- and moderate- in come persons. http://www.hud.gov/offices/cpd/communitydevelopment/programs/entitlement/
- National Fire Plan (DOI – USDA) Provides technical, financial, and resource guidance and support for wildland fire management across the United States. Addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability. http://www.forestsandrangelands.gov/NFP/index.shtml
- Assistance to Firefighters Grant Program, FEMA. Grants are awarded to fire departments to enhance their ability to protect the public and fire service personnel from fire and related hazards. Three types of grants are available: Assistance to Firefighters Grant (AFG), Fire Prevention and Safety (FP&S), and Staffing for Adequate Fire and Emergency Response (SAFER). http://www.firegrantsupport.com/
- Emergency Watershed Protection Program, USDA-NRCS. Provides technical and financial assistance for relief from imminent hazards in small watersheds, and to reduce vulnerability of life and property in small watershed areas damaged by severe natural hazard events. http://www.nrcs.usda.gov/programs/EWP/
- Rural Development Assistance – Utilities, USDA. Direct and guaranteed rural economic loans and business enterprise grants to address utility issues and development needs. http://www.usda.gov/rus/
- Rural Development Assistance – Housing, USDA. Grants, loans, and technical assistance in addressing rehabilitation, health and safety needs in primarily low-income rural areas. Declaration of major disaster necessary. http://www.rurdev.usda.gov/rhs/
- Public Assistance Grant Program, FEMA. The objective of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President. http://www.fema.gov/government/grant/pa/index.shtm

- National Flood Insurance Program, FEMA. Makes available flood insurance to residents of communities that adopt and enforce minimum floodplain management requirements. http://www.fema.gov/business/nfip/
- HOME Investments Partnerships Program, HUD. Grants to states, local government and consortia for permanent and transitional housing (including support for property acquisition and rehabilitation) for low-income persons. http://www.hud.gov/offices/cpd/affordablehousing/programs/home/
- Disaster Recovery Initiative, HUD. Grants to fund gaps in available recovery assistance after disasters (including mitigation). http://www.hud.gov/offices/cpd/communitydevelopment/programs/dri/driquickfacts.cfm
- Emergency Management Performance Grants, FEMA. Helps state and local governments to sustain and enhance their all-hazards emergency management programs. http://www.fema.gov/government/grant/empg/index.shtm#0
- Partners for Fish and Wildlife, DOI – FWS. Financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats. http://www.fws.gov/partners/
- North American Wetland Conservation Fund, DOI-FWS. Cost-share grants to stimulate public/private partnerships for the protection, restoration, and management of wetland habitats. http://www.doi.gov/partnerships/wetlands.html
- Federal Land Transfer / Federal Land to Parks Program, DOI-NPS. Identifies, assesses, and transfers available Federal real property for acquisition for State and local parks and recreation, such as open space. http://www.nps.gov/ncrc/programs/flp/flp_questions.html
- Wetlands Reserve program, USDA-NCRS. Financial and technical assistance to protect and restore wetlands through easements and restoration agreements. http://www.nrcs.usda.gov/Programs/WRP/

More resources at: http://www.oregonshowcase.org/stateplan/part4
(Click on Appendix 5 of the State's Enhanced Natural Hazard Mitigation Plan: Hazard Mitigation Funding Programs)