

PLANNING FOR NATURAL HAZARDS:

Flood TRG

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Oregon Department of Land Conservation & Development

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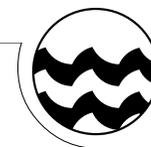
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**Section 1:
Introduction to the Flood Technical Resource
Guide**

Many Oregon communities have areas that are subject to flooding. Communities commonly allow development within flood prone areas; however, such development is subject to certain regulations. This guide is intended to serve as a resource and planning tool for local governments in developing land use strategies that reduce the risks posed by flood hazards. This guide provides background information on flood hazards, information on state and federal laws that address flooding in Oregon, and technical information and data sources on reducing the risk of flooding. The guide is designed to help your local government address flood hazard issues through effective comprehensive plan inventories, policies and implementing measures.



1.1 The Threat of Flood Hazards to Oregon Communities

Floods occur throughout the United States causing loss of life and property, and disrupting families and communities. Communities particularly at risk are those located in low-lying areas, near water.¹ A single flood event can cause millions of dollars in property damage, and pose a significant threat to human life and safety.² The economic impacts of flooding on businesses, private citizens, the public sector, and infrastructure (e.g., roads and bridges) can be significant, and Oregon's largest economic loss from natural disasters has resulted from flooding. Businesses are often forced to close or curtail their operations, some are unable to reopen for weeks or months, and many never reopen. Business owners and employees lose money in sales, damaged inventory, and wages. Individual property owners experience both property and structural losses.³ Understanding flood hazards and how they occur will help reduce the risk these threats pose to Oregon communities.

Flood damage to infrastructure has a devastating effect on local recovery efforts. Damage to federal, state, county and local roads and bridges can leave communities stranded and without access to critical services such as police, fire, and hospitals. Damage to water and sewage treatment plants can result in serious pollution and drinking water contamination when raw sewage or other pollutants are released and carried by floodwaters. Erosion, mudslides, and the carrying of large debris by floodwaters create dangerous or unstable ground conditions, which may pose serious threats to development.⁴

Flash floods represent even greater safety risks than riverine floods because of the rapid onset, the high velocity of water, and the huge debris load carried by floodwaters. Multiple flood crests can occur from a series of fast moving storms. The rapid rise in water level and force may cause motorists to underestimate the depth and velocity of floodwaters, causing stalled and flooded vehicles and loss of life by drowning.

Sidebar



Organization of the Natural Hazards Technical Resource Guide

The Natural Hazard Technical Resource Guide consists of eight chapters. The three preliminary *Planning for Natural Hazards* chapters include hazard-related information on reviewing your comprehensive plan, the elements of a comprehensive plan, and legal issues. Reviewing your comprehensive plan gives your community an opportunity to assess the adequacy of its existing natural hazard inventories and policies. The five hazard-specific chapters then provide detailed information on flood, landslide, coastal, wildfire, and seismic hazards. Appendices include information on Goals 2, 7, 17 and 18, a resource directory and land use tools matrix for hazard mitigation.

1.2 How to Use the Flood Technical Resource Guide:

The Flood Technical Resource Guide provides information to help communities in Oregon plan for flood hazards. Each section heading asks a specific question to help direct you through information related to strengthening your comprehensive plan's factual base, policies and implementing measures. This guide also contains numerous references and contacts for obtaining additional information about flood hazards.

Section 2:

Is Your Community Threatened by Flood Hazards?

Section 2 presents an overview of the causes and characteristics of floods, and provides information to assist communities in flood hazard identification.

Section 3:

What are the Laws in Oregon for Flood Hazards?

Section 3 summarizes current laws that Oregon communities are required to address for flood hazards.

Section 4:

How can Your Community Reduce Risk from Flood Hazards?

Section 4 describes evaluation techniques for the development review process and hazard mitigation methods to help communities reduce risk from flood hazards.

Section 5:

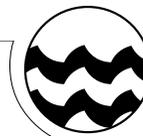
How are Oregon Communities Addressing Flood Hazards?

Section 5 examines how several communities are implementing programs to reduce risk from flood hazards. These examples illustrate plan policies and implementing measures for floods.

Section 6:

Where can Your Community find Resources to Plan for Flood Hazards?

Section 6 is a resource directory listing contacts, programs, and documents that planners, local governments and citizens can use to access additional information on flood hazards.



Section 2: Is Your Community Threatened by Flood Hazards?

Flood hazards can cause severe property damage and loss of life. Identifying hazard areas is a key step in developing effective plan policies and implementing measures. This section assists local planners and decision makers in understanding how floods may affect current and future development. An overview of the causes and characteristics of floods is included, along with information on identifying flood hazards in your community.

2.1 A Brief History of Flooding in Oregon

Oregon has a detailed history of flooding. Flood records date back to the 1860s. Oregon's deadliest recorded flood occurred in Heppner in 1903. A June 15th storm dropped 1.5 inches of rain within a 20-minute period. The storm was centered in the headwater area of Willow Creek near Heppner in Northeastern Oregon. Within minutes, a 5-foot wall of water and debris poured through Heppner with enough velocity to rip homes off of their foundations. These floodwaters claimed 247 lives.⁵

The 1948 flood destroyed the entire city of Vanport (now Delta Park). Record flow levels on the Columbia River caused the structural failure of a dike. Vanport was destroyed in minutes and was never rebuilt. Over 19,000 people lost their homes and 18 people lost their lives.⁶

Many of Oregon's flood records were set during the December 1964 and January 1965 "Christmas Flood." Damage from this flood event totaled over \$157 million dollars and twenty Oregonians lost their lives. From December 20th through the 24th of 1964, the most severe rainstorm to occur in Central Oregon, and one of the most severe west of the Cascades, left many areas with two-thirds their normal annual rainfall in five days. This was augmented by snowmelt in the mountains and valleys. The ensuing floods destroyed hundreds of homes and businesses, forced the evacuation of thousands of people, destroyed at least 30 bridges and washed out hundreds of miles of roads and highways.⁷

A similar flood event occurred in February 1996. Following an extended period of unseasonably cold weather and heavy snowfall in the Pacific Northwest, warming temperatures and rain began thawing the snowpack and frozen rivers throughout Oregon. On February 6, a strong subtropical jet stream hit Oregon. This warm, humid air mass brought record rainfall amounts, quickly melting the snowpack. At least 25 rivers reached flood stage. Many reached flood levels comparable to those of the 1964 flood. Twenty-seven of Oregon's 36 counties were declared a presidential disaster due to this event. Statewide, damages totaled over \$285 million.⁸

Tip Box



Hazard Inventories

Oregon Statewide Planning Goal 2

requires cities and counties to develop a factual base (including inventories) as part of their comprehensive plans. Statewide Planning Goal 7 requires communities to inventory known hazards. Inventories contain facts about land use, natural resources, public facilities, and development trends within the planning area, and provide the basis for comprehensive plan policies. Inventories must be periodically updated to reflect the best current information about resources, trends and local conditions that would affect plan decisions.

Table 1. Historic Flooding in Oregon

DATE	LOCATION (RIVER)	COMMENTS
September 1861	Klamath, Willamette and Umpqua	
March 1876	Columbia	
June 1880	Columbia	
January 1881	Willamette Basin	
December 1882	Umatilla	
June 1884	John Day	
January - February 1890	Willamette Basin	
May - June 1894	Columbia River Basin	Rain on snow pack; highest flood stage ever recorded at Vancouver, WA (33.6 feet)
June 1903	Willow Creek	Flash flood in Heppner; 247 people killed
April 1904	Silvies and Klamath	
March 1906	Umatilla	
February 1907	Western Oregon and John Day	
November 1909	Deschutes, Willamette, Santiam, Umpqua, Coquille and Rogue	
March 1910	Powder and Malheur	
June 1913	Columbia	
January 1923	Clackamas, Santiam, Sandy, Deschutes, Hood and McKenzie	Record flood levels
February 1925	Malheur	
February 1927	Klamath, Willamette, Umpqua, Rogue and Illinois	Major flooding
May 1928	Columbia	
March 1931	Umatilla, Sandy, Clackamas and Santiam	
March 1932	Malheur, Grande Ronde, John Day and Umpqua	
January 1933	Coquille	
November - December 1942	Willamette Basin	10 deaths; \$34 million in damages
December 1945	Coquille, Santiam, Rogue and McKenzie	9 deaths; many homes destroyed in Eugene area

Table 1. Historic Flooding in Oregon, continued

DATE	LOCATION (RIVER)	COMMENTS
December 1946	Willamette, Clackamas, Luckiamite, and Santiam	
May June 1948	Columbia River	Rain on snow pack; destroyed city of Vanport
March 1952	Malheur, Grand Ronde, and John Day	Highest flood stages on these rivers in 40 years
December 1955	Rogue, Umpqua, Coquille	11 deaths; major property damage
July 1956	Central Oregon	Flash floods
February 1957	Southeastern Oregon	\$3.2 million in flood damages
December 1961	Willamette Basin	\$3.8 million in flood damages
March 1964	Oregon Coast	Tsunami claims four lives
December 1964 - January 1965	Pacific Northwest	Rain on snow; record flood on many rivers
December 1967	Central Oregon Coast	Storm surge
January 1972	Western Oregon	Record flows on coastal rivers
January 1974	Western Oregon	\$65 million in damages
November - December 1977	Western Oregon	Rain on snow event; \$16.5 million in damages
December 1981	Umpqua and Coquille	
January 1982	Tillamook County	
February 1982	Malheur and Owyhee Basins	Cyclical playa floods on Malheur & Harney Lakes
1979 to present	Harney County Lakes	Damages totaling \$280 million
February 1996	Nearly statewide	High velocity flows, damage from erosion and undermining of structures
January 1997	Jackson, Josephine and Douglas Counties	
May June 1998	Crook County and Prineville	Heavy rainfall and high tides
December 1998	Tillamook County	
November 1999	Tillamook and Lincoln Counties	

Source: State Hazard Mitigation Plan, Oregon State Police – Office of Emergency Management

2.2 What are the Types of Flood Hazards?

Many types of flooding occur in Oregon. They include riverine flooding, flash flooding, urban flooding, coastal flooding, and playa flooding.

2.2.1 Riverine Floods

Riverine floods - overbank flooding of rivers and streams - are the most common of all natural disasters. Most communities in the United States have the potential to experience this type of flooding after spring rains, heavy thunderstorms, or snowmelt. These floods can be slow or fast-rising, but generally develop over a period of days.⁹

Flooding in large river systems typically results from large-scale weather systems that generate prolonged rainfall over wide geographic areas, causing flooding in hundreds of smaller streams, which then drain into the major rivers.¹⁰ The most severe flooding conditions generally occur when direct rainfall is augmented by snowmelt. If the soil is saturated or frozen, stream flow may increase due to the inability of the soil to absorb additional precipitation.¹¹

Almost every county in Oregon experiences riverine flooding. In fact, Oregon has over 250 flood-prone communities. The danger of riverine flooding occurs mainly during the winter months, with the onset of persistent, heavy rainfall, and during the spring, with the melting of snow in the Cascade and Coast Ranges. Most of Western Oregon is highly susceptible to riverine flooding, especially Coos, Tillamook and Columbia Counties, as well as the western drainages of the Cascade Range.¹² Examples of riverine flood events occurred in February of 1996, and the "Christmas Floods" that occurred during December of 1964 and January of 1965.¹³

2.2.2 Flash Floods

Flash floods are a major cause of weather-related deaths in the United States. Flash floods usually result from intense storms dropping large amounts of rain within a brief period. Flash floods occur with little or no warning and can reach full peak in only a few minutes.¹⁴

Topography, soil conditions and ground cover are all important factors that contribute to flash flooding.¹⁵ Flash floods are most common in arid and semi-arid areas where there is steep topography, little vegetation and intense but short-duration rainfall. Flash floods occur in both urban and rural settings, principally along smaller rivers and drainage ways. Flash floods occur quickly in smaller waterways, or drainage streams that do not typically carry large amounts of water.¹⁶ Flash floods usually occur in the summer during the thunderstorm season.¹⁷

In flash flood situations, waters not only rise rapidly, but also generally move at high velocities and often contain large amounts of debris. In some situations, a flash flood may arrive as a fast moving wall of debris, mud and water. Occasionally,

floating debris or ice can accumulate at a natural or man-made obstruction and restrict the flow of water. Water held back by the ice jam or debris dam can cause flooding upstream. Subsequent flash flooding can occur downstream if the obstruction suddenly releases. Areas subject to flash floods are often less obvious than those located on a typical riverine floodplain. Flash floods, however, may be associated with recognizable locations such as canyons or arroyos.¹⁸

Central and Eastern Oregon are the areas of the state most susceptible to flash flooding, particularly due to the arid climate, steep topography and low vegetative cover found there.¹⁹ The most notorious flash flood in Oregon was the June 1903 event in Heppner.²⁰

2.2.3 Shallow Area Flooding

Shallow area flooding is a special type of riverine flooding. FEMA defines shallow flood hazards as areas that are inundated by the 100-year flood with flood depths of only 1 to 3 feet. These areas are generally flooded by low velocity sheet flows of water.²¹

2.2.4 Urban Flooding

As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. This transition from pervious to impervious surfaces results in more water running off instead of filtering into the ground. Thus, water moves faster to watercourses, with resulting water levels rising above historic, pre-development levels. During periods of urban flooding, streets can become swift moving rivers and basements can fill with water. Storm drains often back up with yard waste causing additional, localized flooding.²²

Another cause of urban flooding is grading associated with development. Grading may cause changes in drainage direction from one property to another. Although this is a small, isolated impact of development, it may be significant to the adjacent property owner.

2.2.5 Coastal Flooding

Coastal flooding occurs in low-lying coastal areas, and is caused by heavy rain, large waves, or even tsunamis triggered by underwater seismic events. The areas susceptible to this intense wave action are termed high velocity zones, or “V-zones”. Special regulations apply for development in these areas. For more details, refer to the discussion on “V-zones” later in this section.

2.2.6 Playa Flooding

Playa flooding results from greater than normal runoff into a closed basin. Closed basin systems are those areas that have one or more rivers emptying into one or more lakes that have no outlet. In these situations, water leaves the system primarily through evaporation. Thus, if annual precipitation in the basin increases significantly, evaporation is not enough to



TRG Key

For more comprehensive information on coastal flooding hazards, see the Coastal Technical Resource Guide.

reduce water levels. Lake levels rise and inundate the surrounding properties.

The best-known example of playa-basin flooding in Oregon occurs at Malheur and Harney Lakes in Harney County. In higher than average precipitation years, the lakes flood adjacent ranches and public roads. Malheur and Harney Lakes flooded during the years 1979 to 1986, and then gradually receded. During the wetter years of 1997 to 1999, these lakes again flooded.²³

2.3 What are some Terms Related to Flooding?

2.3.1 Floodplain

A floodplain is a land area adjacent to a river, stream, lake, estuary or other water body that is subject to flooding. These areas, if left undisturbed, act to store excess flood water. The floodplain is made up of two sections: the flood fringe and the floodway (See Figure 1).²⁴

2.3.2 Floodway

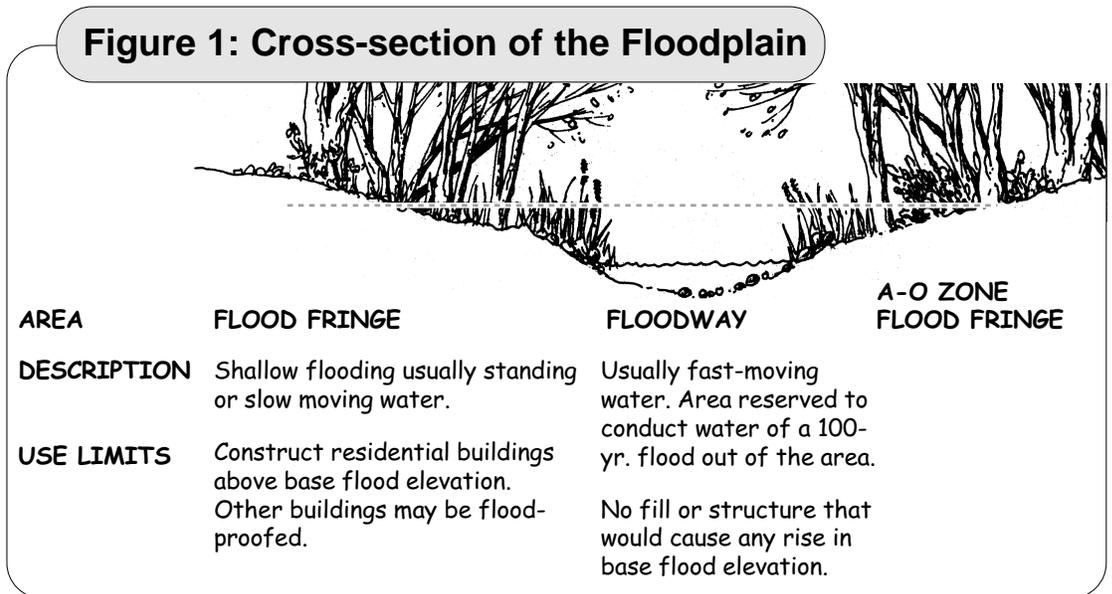
The floodway is one of two main sections that make up the floodplain. Floodways are defined for regulatory purposes. Unlike floodplains, floodways do not reflect a recognizable geologic feature. For National Flood Insurance Program (NFIP) purposes, floodways are defined as the channel of a river or stream, and the overbank areas adjacent to the channel. The floodway carries the bulk of the floodwater downstream and is usually the area where water velocities and forces are the greatest. NFIP regulations require that the floodway be kept open and free from development or other structures, so that flood flows are not obstructed or diverted onto other properties.²⁵ The NFIP floodway definition is “the channel of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot (See Figure 1).”²⁶ Floodways are not mapped for all rivers and streams but are generally mapped in developed areas.

2.3.3 Development

For floodplain ordinance purposes, development is broadly defined to mean “any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.”²⁷ The definition of development for floodplain purposes is generally broader and includes more activities than the definition of development used in other sections of local land use ordinances.

2.3.4 The Flood Fringe

The flood fringe refers to the outer portions of the floodplain, beginning at the edge of the floodway and continuing outward. This is the area where development is most likely to occur, and where precautions to protect life and property need to be taken (See Figure 1).



Source: Department of Land Conservation and Development. *A Citizen's Guide to the Oregon Coastal Management Program*. Salem, Ore.: Oregon Department of Land Conservation and Development (1997) p. 15.

2.3.5 Base Floods and Base Flood Elevations

Flooding occurs for different reasons and at varying levels. "Base Flood" is defined by the NFIP regulations (44 CFR 59) as "the flood having a 1 percent chance of being equaled or exceeded in any given year." This flood is referred to as the 100-year flood. Determination of the 100-year flood is based on a statistical analysis of record flood flows, some dating back to the 1860's.

The term "Base Flood Elevation" refers to the elevation (normally measured in feet above sea level), which the base flood is expected to reach. Base flood elevations can be set at levels other than the 100-year flood. Some communities choose to use higher frequency flood events as their base flood elevation for certain activities, using lower frequency events for others.²⁸ For example, for the purpose of stormwater management, a 25-year flood event might serve as the base flood elevation, while the 500-year flood event may serve as base flood elevation for the tie down of mobile homes.²⁹ The regulations of the National Flood Insurance Program focus on development in the 100-year flood plain.



Flood Key

See Section 4 of this guide for information on stormwater management.



Sidebar

Mapleton, Oregon and the 1996 Flood Event

Mapleton, a small community in Oregon's Coast Range, was one of the many communities affected by the 1996 Oregon Floods. Like many communities, most of Mapleton's development historically occurred in the floodplain. The Mapleton flood is an example of the intense chain of destruction that can be caused by flooding events when a community is built within the boundaries of the 100-year floodplain: "... (A) number of docks, outbuildings and mobile homes were washed away. Mud slides and floodwaters cut off the community completely. Several feet of floodwaters filled the floors of many homes and businesses. Mapleton's water system was completely knocked out by the flood. This not only raised health concerns, but hampered response and recovery operations until service was restored. Wells were also contaminated. At least one or two homes were completely destroyed by mudslides and over 30 homes and a number of businesses suffered serious water damage..."³²

2.4 What is the Effect of Development on Floods?

When development is located in the floodplain, it may cause flood waters to rise higher than before development, particularly if that development is located within the floodway. When structures or fill are placed in the floodway, water is displaced. Development raises the base-flood elevation by forcing the river to compensate for the flow space obstructed by the inserted structures. Over time, when structures or materials are added to the floodway and no fill is removed to compensate, serious problems can arise. Floodway development is currently regulated and local governments must require engineer certification that proposed developments will not cause the base flood (100-year flood) elevation to rise.³⁰ Displacement of only a few inches of water can mean the difference between no structural damage occurring in a given flood event, and the inundation of many homes, businesses and other facilities. Careful attention must be paid to development that occurs within the floodway to ensure that structures are prepared to withstand base flood events.

In highly urbanized areas increased paving can lead to an increase in volume and velocity of runoff after a rainfall event, exacerbating the potential flood hazards. Care should be taken in the development and implementation of stormwater management systems to ensure that these runoff waters are dealt with effectively.³¹

2.5 How are Flood-Prone Areas Identified?

Flood insurance studies and Flood Insurance Rate Maps (FIRMs) are often used in characterizing and identifying flood prone areas.

2.5.1 Floodplain Maps and Flood Insurance Studies

Floodplain maps are the basis for implementing floodplain regulations and for delineating flood insurance purchase requirements. A Flood Insurance Rate Map (FIRM) is the official map produced by the Federal Emergency Management Agency (FEMA), which delineates Special Flood Hazard Areas or floodplains where National Flood Insurance Program regulations apply. FIRMs are also used by insurance agents and mortgage lenders to determine if flood insurance is required and what insurance rates should apply.³⁴

Water surface elevations are combined with topographic data to develop FIRMs. FIRMs illustrate areas that would be inundated during a 100-year flood and floodway areas. In some cases they may include 100-year base flood elevations (BFEs) and areas located within the 500-year floodplain.³⁵

Flood Insurance Studies and FIRMs produced for the National Flood Insurance Program (NFIP) provide assessments of the probability of flooding at a given location. FEMA conducted many Flood Insurance Studies in the late 1970s and early 1980s. These studies and maps represent flood risk at the point in time when FEMA completed the studies. *They do not reflect changes within the study area that might affect flooding since*



the studies. For example, many of Oregon's metropolitan areas have had significant population increases resulting in increased development during the past 20 years. Development changes the hydrology of urban streams as an increase in impervious surfaces results in greater runoff volumes and velocities. In order to address changing conditions, some communities have adopted higher regulatory standards such as Metro's balanced cut and fill requirements and Tillamook County's requirement that new homes and substantial improvements to existing homes be elevated at least 3 feet above the base-flood elevation.³⁶

Although many communities rely exclusively on FIRMs to characterize the risk of flooding in their area, some jurisdictions develop their own flood hazard maps. They use high-water marks from flood events or aerial photos, in conjunction with the FEMA maps to better reflect the true flood risk for their communities (See case study on Talent in Section 5 of this guide).³⁷

Geographic Information Systems (GIS) are increasingly becoming an important tool for flood hazard mapping. FIRMs can be imported directly into GIS, which then allows for GIS analysis of flood hazard areas. Communities find it particularly useful to overlay flood hazard areas on tax assessment parcel maps.³⁸ This allows a community to evaluate the flood hazard risk for a specific parcel during review of a development request. Coordination between FEMA and local technical experts is the key to making a strong connection with GIS technology for the purpose of flood hazard mapping.

FEMA and the Environmental Systems Research Institute (ESRI) have formed a partnership to provide multi-hazard maps and information to the public via the internet. ESRI produces GIS software, including ArcView© and ArcInfo©. The ESRI web site has information on GIS technology, as well as downloadable maps and other resources. The hazards maps provided on the ESRI site will assist communities in evaluating geographic information about natural hazards. Flood information for most Oregon communities is available on the ESRI web site. Visit <http://www.esri.com> for more information.

Sidebar



The 100-Year Flood Myth

This long-standing myth actually has two parts, and neither is true. The first is that every flood is a 100-year flood. The second is that the 100-year flood occurs only once every 100 years.

Often, floods that crest at a level well below that of the 100-year flood are incorrectly termed "100-year floods." This common misuse in flood designation leads people to the conclusion that an event that is supposed to happen only every 100 years is happening every time flood waters spill over the river bank. The reality is that the majority of floods consist of lesser frequency events such as the one-year, five-year or ten-year floods. The 100-year flood is not a frequent event and has only a one percent chance of being equaled or exceeded during any given year.³³

Recent decades have seen an increase in 100-year flood events. For example, the Mississippi River Basin and parts of Southern Louisiana have had at least two 100-year events in the last decade. Because flooding depends on variables that cannot be accurately predicted, determination of exactly where the 100-year flood levels are is not an exact science. Factors such as climate change and changes to the built environment can have dramatic effects and communities should periodically review flood plain boundaries.



Tip Box

Evaluating Development in Flood Hazard Areas

When an individual walks into a local planning office with a proposed development, there are several steps that must be taken in order to identify the floodplain designation for that property and evaluate whether or not development can occur. A detailed description of this process can be found in Section 4 of this guide.

2.5.2 How to Read Flood Maps

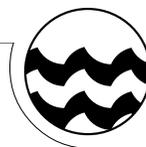
Flood Insurance Rate Maps (FIRMs) are presented in a variety of formats. Many of the flood maps produced since January 1985 include floodway and floodplain management information that was not shown on older versions of flood maps. Many new Flood Maps also present simplified flood insurance risk zone designations. The most common scales are one inch = 500 feet, one inch = 1,000 feet, and one inch = 2,000 feet. The jurisdictions covered may include partial or entire counties or individual cities.

When a flood map cannot be presented on one page, it is produced on several pages. Those pages are known as panels. Panels depict flood hazards in a community. Each panel includes a title box that contains the name of the community, the panel number, and other information. All panels include seven items that also appear on the index. They are:

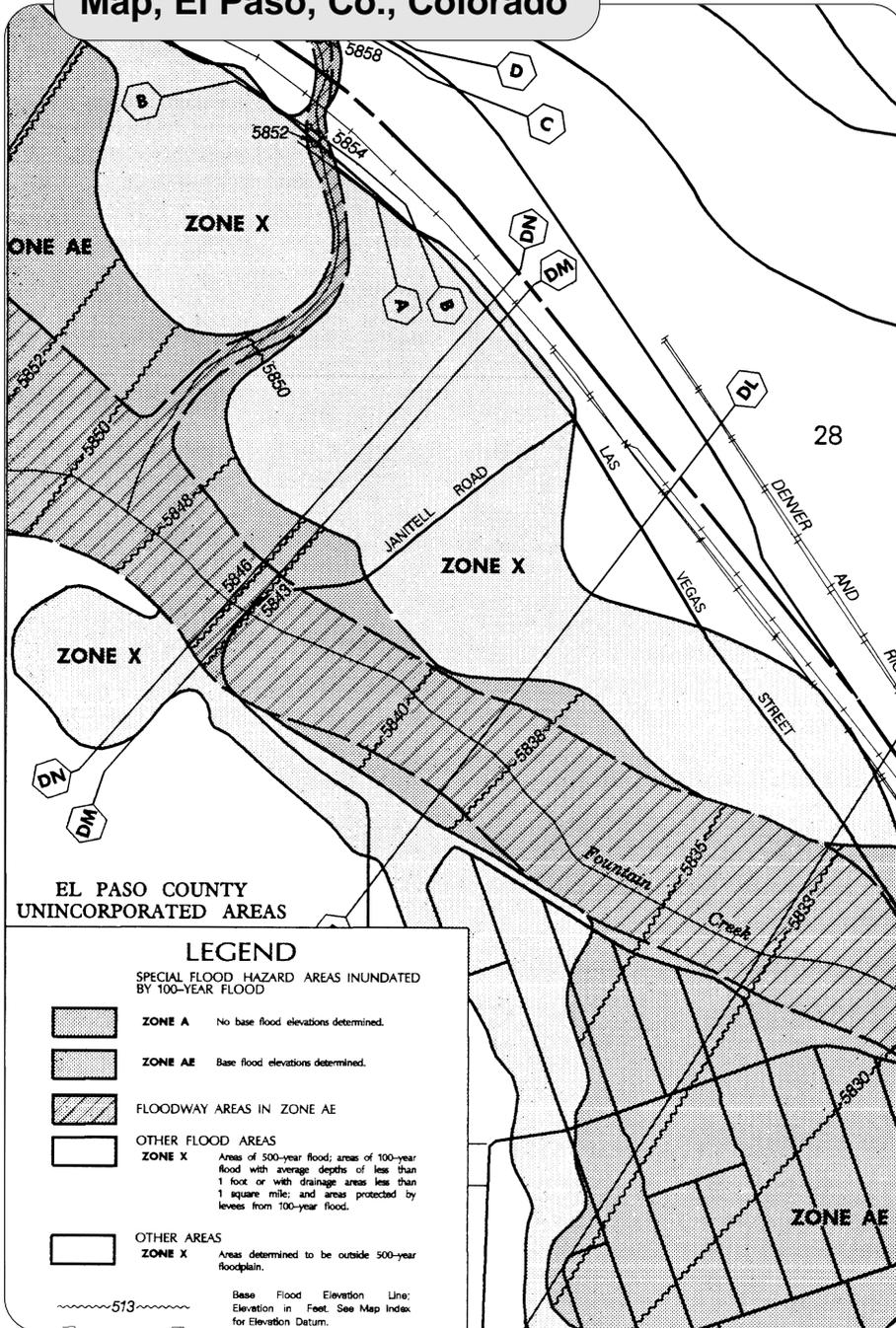
- Community name
- Community number
- Panel number/community panel number/map number
- Corporate limit or county boundary line
- North arrow
- Effective or revised date
- Map scale

Elevation reference marks are found on flood maps. These marks identify points where a ground elevation is established by survey. Elevations are usually expressed in feet; for some communities, however, the elevations are shown in meters. Descriptions of the marks, including their elevations are provided. These surveyed elevations are used to determine the base flood elevation.

Flood Hazard Area designations appear as dark and light tints. Dark tints indicate areas of increased flood hazards; light tints indicate areas of lesser flood hazards. Floodplain boundaries show the limits of the 100- and 500-year floodplains. Most flood maps cover only one community.³⁹



Digital Flood Insurance Rate Map, El Paso, Co., Colorado



Source: Federal Emergency Management Agency. *Multi-Hazard Identification and Risk Assessment*. Washington, D.C.: FEMA (1997) p. 141.

Sidebar



Questions to ask about Floodplain Mapping

- How do I know if my flood map is up to date?
- Where can my community get more flood maps?
- Is the floodway mapped in my community?

FEMA's map distribution center can answer questions and provide additional copies of flood maps. They can be contacted at (800)358-9616.

- How do I get my map updated?

FEMA establishes priorities for remapping. Contact FEMA Region X's mitigation division at (425)487-4678 for information.

Individual property owners who wish to demonstrate that their property or structures are not located in a special flood hazard areas should submit a Letter of Map Amendment or a Letter of Map Revision for land that is out of the floodplain because of the placement of fill. Forms for Letters of Map Amendment and Map Revision are available on FEMA's website (www.fema.gov/nfip/forms.htm) or from the Oregon Floodplain Program coordinator (503)373-0050.

2.6 Summary of Flood Hazards in Oregon

Many different types of flood hazards exist in Oregon, and their effects can be devastating. By understanding flood hazards, communities will be better prepared and equipped to plan for floods in the future.

Once flood hazards are identified, communities can review functional plans such as those for natural resources, open space, and master plans to integrate flood hazard information. To identify flood hazards in your community and to develop an inventory of flood hazards, use the following resources:



TRG Key

Chapter 2: Elements of a Comprehensive Plan provides information on three phases of hazard assessment: hazard identification, vulnerability assessment and risk analysis.

- Existing flood maps* and information, including FIRMs, Flood Boundary-Floodway Maps, and FEMA Flood Insurance Studies (digital flood maps on FEMA or ESRI web sites)
- FEMA Region 10* for information about recent map revisions or amendments. Contact information can be found in Section 6 of this guide.
- Historical documents* such as “official” high water marks, aerial photos taken during flood events, newspaper articles or interview with local officials and residents on storm events and hazards over the past decade.
- Soil maps* can show whether there are wet or “hydric” soils in your community. Wet soils may be indicative of historic flooding.
- Other organizations* such as USGS or local watershed councils may have relevant flood data for your community.

Planning for Natural Hazards: Reviewing your Comprehensive Plan



The factual base of your community’s comprehensive plan should reflect a current inventory of all natural hazards and a vulnerability assessment. The inventory should include a history of natural disasters, maps, current conditions and trends. A vulnerability assessment will examine identified hazards and the existing or planned property development, current population, and the types of development at risk. A vulnerability assessment will set the foundation for plan policies.

Your community should ask the following in determining whether or not its comprehensive plan has adequately inventoried flood hazards.

- Are there flood hazards in your community?
- Does your comprehensive plan hazard inventory describe floods in terms of the geographical extent, the severity and the frequency of occurrence?
- Has your community conducted a community wide vulnerability assessment?

Section 3: What are the Laws in Oregon for Flood Hazards?

Oregon communities have a statutory mandate to develop comprehensive plans and implementing ordinances. As a part of the comprehensive planning process, cities and counties must address areas with “known” natural hazards. This section of the Flood Technical Resource Guide presents current laws that Oregon communities are required to address.

3.1 Oregon Laws Related to Flood Hazards

3.1.1 Goal 7: Areas Subject to Natural Disasters and Hazards

Goal 7 is the Statewide Planning goal that directs local governments to address natural hazards in their comprehensive plans. Goal 7 states that “Developments subject to damage or that could result in loss of life shall not be planned or located in known areas of natural disasters and hazards without appropriate safeguards. Plans shall be based on an inventory of known areas of natural disasters and hazards...”

In addition to the requirement “To protect life and property from natural disasters and hazards,” Statewide Planning Goal 7 includes specific guidelines for local governments to address in responding to flood hazards. For example, Goal 7 guidelines include a specific preference for the use of non-structural techniques to minimize flood hazards. The guidelines state, “In planning for floodplain areas, uses that will not require protection through dams, dikes and levies should be preferred over uses that will require such protection.” The guidelines also suggest that land uses that are least subject to loss of life and property damage, such as parks and open spaces should be encouraged in the floodplain. Finally, to avoid obstructing floodwater flow, no development should occur in the floodway portion of the floodplain.⁴⁰

3.1.2 Goal 17: Coastal Shorelands

Goal 17 is concerned with conservation and protection, as well as appropriate development of Oregon’s coastal shorelands. It aims to reduce the hazard to human life and property, and the adverse effects upon water quality and fish and wildlife habitat resulting from the use and enjoyment of Oregon’s coastal shorelands.

3.1.3 Goal 18: Beaches and Dunes

The purpose of Goal 18 is to conserve, protect, and where appropriate, to either develop on or restore the resources and benefits of coastal beach and dune areas. It is also concerned with reducing the hazard to human life and property from natural or man-induced actions associated with these areas.⁴¹



TRG Key

Information on Goal 7 and additional floodplain development guidelines can be found in Appendix A of the Natural Hazard Technical Resource Guide.



TRG Key

Additional development standards related to flooding apply in coastal areas where velocity zones, or V-zones, have been mapped. Refer to Section 3 of the Coastal Hazards Technical Resource Guide for additional information on V-zone requirements, coastal shorelands and beaches and dunes.



Tip Box

Division of State Land Permits

When reviewing applications for development in floodplains, local governments should determine whether or not Oregon Division of State Lands (DSL) permits are required. These permits generally go through a joint review by DSL and the Army Corps of Engineers. In the case of an application for a floodway development permit, the DSL should always be contacted. Also, local governments will be asked to sign-off on DSL permits to ensure that the proposed activity is consistent with the local comprehensive plan and implementing ordinances.⁴³ Division of State Lands contact information is included in Section 6.

3.1.4 Division of State Lands (DSL) Fill and Removal Permit Program

Oregon's Removal-Fill Law (ORS 196.800-990) requires individuals who remove or fill 50 cubic yards or more in "waters of the state" to obtain a permit from the DSL. "Waters of the state" are defined as "natural waterways including all tidal and non-tidal bays, intermittent streams, constantly flowing streams, lakes, wetlands and other bodies of water in this state, navigable and non-navigable, including that portion of the Pacific Ocean which is in the boundaries of this state." In State Scenic Waterways or areas designated by DSL as essential indigenous anadromous salmonid habitat, most removal-fill activities require a permit, regardless of the number of cubic yards affected.⁴² In addition, the Oregon Department of Environmental Quality is responsible for water quality certification under section 401(a) of the Clean Water Act. This certification is required as part of the DSL permitting process.

3.1.5 Oregon State Building Codes

The Oregon Building Codes Division adopts statewide standards for building construction that are administered by the state and local municipalities throughout Oregon. The One- and Two- Family Dwelling Code and the Structural Specialty Code contain requirements to elevate a building at least one foot above the base flood elevation. These codes also contain provisions for flood proofing, underfloor drainage, and directing stormwater away from buildings. The building department that has jurisdiction generally coordinates with others to ensure that permit applications for new construction meet these requirements. Verification of the floor elevation is obtained during the permitting and inspection process. ORS 455.447 and the State Structural Code establish restrictions on the location of essential facilities in tsunami inundation zones along the coast subject to flooding following an earthquake. Essential facilities include hospitals, fire and police stations, emergency response facilities, and special occupancy structures, such as large schools. State building codes do not cover facilities constructed in public right-of-ways or waterways used to control flooding.⁴⁴

Sidebar**The Oregon Plan for Salmon and Watersheds**

“The Oregon Plan” is the state’s program to restore native salmon and trout populations and to improve water quality. The overall goal of the Oregon Plan is to restore fish populations to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits. The plan consists of four essential elements:

- Coordinated federal and state agency programs,
- Community based actions,
- Monitoring of program accomplishments, and
- Application of appropriate corrective changes based on monitoring results.

Many efforts under the Oregon Plan will benefit local floodplain management efforts. Protection of wetlands for clean water and improved habitat will also result in more flood storage. Riparian area protection and setbacks from shorelines provide a greater floodplain area and reduce streambank erosion. Designation of floodplain areas as open space will help improve water quality and habitat conditions but will also keep structures out of hazardous areas. For more information on the Oregon Plan, contact (503)378-3589 or see <http://www.oregon-plan.org>.

3.2 Federal Policies and Programs Related to Flooding**3.2.1 The National Flood Insurance Program (NFIP)**

The function of the NFIP is to provide flood insurance to homes and businesses located in floodplains at a reasonable cost, and to encourage the location of new development away from the floodplain. The program is based upon mapping areas of flood risk, and requiring local implementation to reduce that risk, primarily through restrictions on new development in floodplains.

Congress created the NFIP in 1968 to minimize response and recovery costs and to reduce the loss of life and damage to property caused by flooding. The NFIP is administered by the Federal Emergency Management Agency (FEMA). The two fundamental objectives of the NFIP are to:

1. Ensure that new buildings will be free from flood damage; and
2. Prevent new developments from increasing flood damage to existing properties.⁴⁵

Tip Box**Benefits of the National Flood Insurance Program**

The primary benefits of the NFIP are to:

1. Provide flood insurance coverage not generally available in the private market;
2. Stimulate local floodplain management to guide future development;
3. Emphasize less costly nonstructural flood control regulatory measures over structural measures; and
4. Reduce costs to the federal government by shifting the burden from the general taxpayer to floodplain occupants.

Tip Box



Good Record Keeping

FEMA and the Oregon NFIP Coordinator periodically review community enforcement of their floodplain ordinance to ensure compliance with federal NFIP regulations. Keeping good records is essential to this process. Some record keeping tips for communities are:

1. Keep two copies of all floodplain development permits. One in the tax assessor's property file (by parcel number or street address) and one in a chronological file with all other floodplain development permits.
2. Set up a tracking system to ensure that a copy of the final, as-built elevation certificate is returned for your files. Establish a system that works for you and your building inspector.
3. Consider requiring a specific floodplain development permit.

Community Participation in the NFIP

Community participation in the NFIP requires the adoption and enforcement of a floodplain management ordinance that controls development in the floodplain. This type of ordinance has been accepted by Land Conservation and Development Commission (LCDC) as sufficient to comply with Statewide Planning Goal 7 for flood hazards. To ensure that a community is in compliance with the NFIP and Oregon state law, a jurisdiction is required to do the following:

1. Require development permits for all proposed construction and other development within the community's designated 100-year floodplain;
2. Review permits to be sure that sites are reasonably safe from flooding;
3. Review subdivision proposals to determine whether the project is safe from flooding and provides adequate drainage;
4. Require residential structures to have the lowest floor (including basement) elevated to at least one foot above Base Flood Elevation (BFE);
5. Require non-residential structures to have the first floor elevated or flood proofed to one foot above BFE;
6. Require manufactured homes to be elevated and anchored;
7. Require water supply systems to be designed to eliminate infiltration of flood waters;
8. Require new replacement sanitary sewage systems be designed to minimize or eliminate infiltration of flood waters;
9. Ensure flood carrying capacity of altered or relocated watercourses is maintained;
10. Maintain records of all development permits;
11. Verify and document elevations of new or substantially improved structures; and
12. Properly address development in coastal "Velocity Zones."⁴⁶

General NFIP Flood Insurance Information

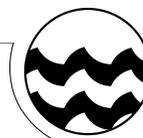
Important points for cities and counties to understand about the flood insurance provided through the NFIP are:

1. Federal flood insurance is only available in those communities that participate in the NFIP. In Oregon, all communities with federally mapped flood hazards are eligible to participate.
2. Flood insurance is required for federally backed mortgages to purchase or build structures located in any Special Flood Hazard Area.
3. Communities must participate in, and be in good standing with the NFIP, to receive federal disaster assistance in identified floodplains.
4. Flood insurance can be purchased from any insurance agency.
5. Flood insurance can be purchased for any building, regardless of where the structure is located, if the community participates in the NFIP.

TRG Key



Refer to Section 3 of the Coastal Technical Resource Guide for more information on Velocity Zones.



6. The NFIP does not cover basement contents or finished portions of a basement.
7. Rates are subsidized for pre-FIRM buildings; actuarial rates apply to post-FIRM structures.
8. There is a waiting period of 30 days before insurance coverage takes effect.
9. There is no waiting period when transferring titles of properties to new owners.⁴⁷



Flood Key

Refer to the sidebar on elevation certificates in this section.

NFIP Community Assistance Visit (CAV)

Once a jurisdiction is successfully participating in the NFIP, FEMA or the Oregon Floodplain Coordinator will, every two to four years, conduct a Community Assistance Visit (CAV) to assess how well the community is administering its local floodplain ordinance. The visit ensures compliance with NFIP requirements. In addition, by meeting with local officials, checking building permits and elevation documentation, and touring the flood hazard areas, a CAV evaluates the community's floodplain management program relative to the provisions, stipulations and recommendations of the NFIP. Following the CAV, a follow-up letter is sent to the chief elected official, and a report is filed with FEMA regarding the findings of the visit and any necessary follow-up activities.⁴⁸

3.2.2 FEMA Region X's Policy on Fish Enhancement Structures in the Floodway

The Federal Emergency Management Agency (FEMA) regulates development in the floodway. The regulations require that a community prohibit encroachments (including fill, new construction, and other development) within the floodway unless it is demonstrated by engineering analysis that the proposed encroachment will not result in any increase in flood levels during the occurrence of a 100 year flood event.

The recent designation of several northwest salmon and steel-head runs as threatened or endangered has resulted in an increased effort to restore fish habitat. Restoring habitat often involves placing structures in stream. These structures, including fish weirs, log drops, root wads and small rock deflectors are "encroachments" when placed in mapped floodways. A literal interpretation of the FEMA floodway standard may require a relatively expensive "no-rise" analysis that might exceed the cost of the habitat enhancement project.

In order to encourage habitat enhancement projects while still providing communities with information needed to make appropriate floodplain management decisions, FEMA Region X will allow communities to rely on the judgment of a qualified professional regarding the impact of fish enhancement structures on flood elevations. Qualified professionals include hydrologists and hydraulics professionals and staff of fisheries, natural resource or water resource agencies. This will minimize the cost of getting a "no-rise" analysis. However, the community, while making use of the professionals' advice, must still



Tip Box

Community Rating System

The Community Rating System (CRS) is a program operated by the NFIP that recognizes communities who go beyond the minimum requirements of the National Flood Insurance Program (NFIP). CRS offers reduced flood insurance premiums for communities who adopt higher standards and encourages community activities that reduce flood losses, facilitate accurate insurance rating, and promote flood insurance awareness. Detailed information on the CRS program can be found in Section 4 of this guide.

Sidebar



Elevation Certificates

The Elevation Certificate is a form published by the Federal Emergency Management Agency required to be maintained by communities participating in the National Flood Insurance Program (NFIP). The NFIP requires local governments to obtain certificates for all new construction in floodplains and to keep the certificates on file.

Elevation certificates are used to:

1. Record the elevation of the lowest floor of all newly constructed buildings located in the floodplain.
2. Determine the proper flood insurance rate for floodplain structures.

Local governments must insure that elevation certificates are filled out correctly for structures built in floodplains.

Certificates must include:

1. The location of the structure (tax parcel number, legal description) and use of the building.
2. The Flood Insurance Rate Map panel number and date, community name and source of base flood elevation date.
3. Information on the building's elevation.
4. Signature of a licensed surveyor or engineer.

make the ultimate decision on whether to allow the habitat enhancement structure.

For more information on the policy on fish enhancement structures in the floodway, contact FEMA Region X at (425)487-4682.

3.2.3 Army Corps of Engineers Permit Program

The U.S. Army Corps of Engineers is responsible for the protection and development of the nation's water resources, including navigation, flood control, energy production through hydro-power management, water supply storage and recreation. The Corps administers a permit program to ensure that the nation's waters are used in the public interest, and requires any person, firm, or agency planning work in the waters of the United States to first obtain a permit from the Corps. Permits are required even when land next to or under the water is privately owned. It is a violation of federal law to begin work before a permit is obtained and penalties of fines and/or imprisonment may apply. Examples of activities in waters that may require a permit include: construction of a pier, placement of intake and outfall pipes, dredging, excavation and depositing of fill. Permits are generally issued only if the activity is found to be in the public interest. In Oregon, permits for development of these activities are issued jointly by the Oregon Division of State Lands (DSL) and the U.S. Army Corps of Engineers. As mentioned in the discussion of DSL permits, local planning agencies are required to sign off on any permits issued by DSL and the U.S. Army Corps of Engineers and water quality certification is required by the Department of Environmental Quality.⁵⁰ Contact information for the U.S. Army Corps of Engineers is provided in Section 6.

3.3 Summary of State and Federal Flood Laws and Programs

State Laws

- Oregon Statewide Planning Goal 7
- Oregon Statewide Planning Goal 17
- Oregon Statewide Planning Goal 18
- Division of State Lands Fill and Removal Permit Program
- Oregon State Building Codes

Federal Policies

- National Flood Insurance Program
- FEMA Region X's Policy on Fish Enhancement Structures in the Floodway
- Army Corps of Engineers Permit Program

A number of state and federal agencies are involved in regulating land use in and near floodplains. Local planning departments are the main point of contact for development permits issued by cities and counties. Communities also need to coordinate their review of floodplain development permits with other agencies. For example:

1. Permits for new structures in the floodplain should be coordinated with the building inspection program having authority;
2. Floodway development permits should be coordinated with Division of State Lands and the Army Corps of Engineers;
3. Development on the coast needs to comply with local land use requirements to implement State Planning Goals 17 and 18.⁵¹

Planning for Natural Hazards: Reviewing your Comprehensive Plan



Statewide Planning Goal 2 requires that comprehensive plan policies be supported by an adequate factual base. Section 3 of the Flood Technical Resource Guide describes laws that communities are required to address in their comprehensive plans.

Your community should ask the following questions after identifying flood hazards in your area:

- Does your community's comprehensive plan contain an inventory of flood hazards, a vulnerability assessment and policies addressing flood hazards?
- Has your community's comprehensive plan been updated to reflect the latest information on flood hazards in your community and the current laws for flood hazards?
- Does your comprehensive plan have policies and implementing measures to reduce risk to existing and future development in flood hazard areas?



Flood Key

Section 2 of this Guide provides information that can assist your community in identifying flood hazards.

**Section 4:
How can Your Community Reduce Risk from Flood Hazards?**

Avoiding development in hazard areas is the most effective way to reduce risk. There are, however, many areas in Oregon where some degree of hazard is unavoidable. Communities in vulnerable areas should manage and reduce their risk from flood hazards if the risk cannot be completely eliminated. Section 4 describes methods to evaluate site-specific development and other implementing measures to reduce risk from flood hazards. Implementing measures are the ordinances and programs used to carry out decisions made in the comprehensive plan. They include zoning ordinances, and other land use regulations, which directly regulate land use activities.

4.1 How can Your Community Plan for Flood Hazards?

It is possible to plan, at least to some degree, for flood hazards. The nature of your community's response will depend on severity of the hazard. Avoiding, or significantly limiting development in flood areas through zoning and careful planning lessens the need for other types of mitigation measures, and is the safest strategy for reducing risks to development in the most dangerous locations.

To successfully plan for a flood hazard, consider the following steps:

- ✓ **Identify the hazard**
Hazard identification is the first phase of hazard assessment and is part of the foundation for developing plan policies and implementing measures for natural hazards.
- ✓ **Avoid the hazard**
Restrict development in flood prone areas. For areas with high density and potential for severe property damage or loss of life, this option should be followed.
- ✓ **Evaluate site-specific development**
Communities can require evaluation of site-specific development in flood hazard areas. Section 4 describes techniques for evaluating development.
- ✓ **Implement risk reduction measures through land use planning**
Minimizing development in flood hazard areas through low density and regulated development can reduce risk of property damage and loss of life. Section 4.3 provides information on specific land use planning and zoning measures.
- ✓ **Implement additional non-regulatory measures**
Additional mitigation strategies and non-regulatory measures can further reduce risk from flood hazards. Section 4.5 provides information on additional mitigation activities.



TRG Key

Chapter 2: Elements of a Comprehensive Plan provides information on hazard identification, vulnerability assessment and risk analysis that can be used for site-specific development.



4.2 What is the Process for Evaluating Development in Flood Hazard Areas?

After a proposed development is submitted to the local planning office, the first step is to identify the floodplain designation for the property. This review includes the following steps:

1. The planner examines the FIRM or other flood area maps to determine where the property is in relation to the flood hazard areas. If the property is in the floodplain or floodway, the planner will give instructions on the permitting procedure and requirements for these areas. Most development in the floodway is usually prohibited.
2. Permits are required for any development in the floodplain. Development, as defined by the NFIP regulations, includes residential, non-residential, fill/grading/excavation, and other non-structural development. Permits must be issued before any development occurs.
3. The local government must determine whether an elevation certificate is required. Elevation certificates are required for new residential construction.
4. Local governments must review floodplain development permits for compliance with their comprehensive plan and other land use requirements.
5. The local government can issue a floodplain development permit like a zoning permit without opportunity for public comment. Alternatively, a local government could process such a permit review as a conditional use with opportunity for public comment.
6. Local governments must offer opportunity for other interested local agencies to comment (e.g., emergency managers and natural resource program managers).

4.3 What Land Use Tools are used for Floodplain Management?

Land use planning and zoning are powerful tools that communities can use to further reduce flood risks. The following are land use tools communities can use to reduce risk from flood hazards.

4.3.1 Overlay Zones

Most Oregon communities use floodplain overlay zones to implement their flood ordinances.⁵² Overlay zones are independent zones that co-exist with the base-zoning district. Development is usually in accordance with the uses allowed by the base-zoning district. Parcels that fall within the overlay zone are subject to the regulations of the base zone and the additional regulations of the overlay zone. For example, a community could create an overlay zone for high flood hazard districts and establish additional requirements for those districts. Such requirements might include rules for new development, or limit reconstruction in the hazard area.⁵³ The city of Talent in southern Oregon is using a floodplain, parks and greenway overlay to achieve its floodplain management goals.

Tip Box



NFIP Development Standards

The National Flood Insurance Program (NFIP) does not prohibit floodplain development, but rather guides development in floodplain areas to lessen the economic loss and social disruption caused by flood events. The NFIP establishes minimum standards for floodplain development that are implemented and enforced through local floodplain development ordinances.

Sidebar



Transfer of Development Credits

Deschutes County had significant population growth in the late 1980s and 1990s. Much new development occurred in southern Deschutes County including new housing in areas like the SunRiver resort community. The area is characterized by numerous small (less than two acre) lots that were created prior to adoption of Oregon's Statewide Land Use laws. These rural areas are not served by community water or sewer systems. Pollution of the area's groundwater with nitrates from septic systems is a major issue and a constraint on new development. Approximately 1800 of the undeveloped residential lots have water tables at 2 feet or less so installing additional septic tanks is unlikely.

In order to promote development in other areas (areas not constrained by polluted groundwater), Deschutes County is exploring the possibility of a "Transfer of Development Credits" program. Owners of each of the 1800 lots would be granted a development credit that they could then sell for development at another location. The original lot would be left undeveloped although the owner could use it for recreational or other purposes. For more information on the Deschutes County project, see: <http://newberry.deschutes.org/CDDW> and look for information on the Regional Problem Solving Program or contact the Deschutes County Planning Department at (541)388-6575.

4.3.2 Incentive Zoning

Incentive zoning allows developers to exceed limitations imposed upon them by regulations, in exchange for specific concessions. For example, if developers avoid developing in the floodplain, the local government might allow them to build on other portions of their land at a higher density than is allowed by the current zoning designation.⁵⁴ Transfer of Development Rights (TDRs) and Transfer of Development Credits are examples of powerful incentives to curb development in floodplains. TDRs are enabled by Oregon State Law, but have not yet been used for floodplain management in Oregon.

4.3.3 Performance Zoning

Performance zoning sets standards for the allowable impact of development. The standards usually specify limits to certain environmental conditions, like the amount of traffic or pollution generated. Usually this technique is used in conjunction with standard zoning. For example, a performance standard may limit the number of times a structure can be rebuilt after multiple flood events.⁵⁵

4.3.4 Incorporating Flood Mitigation Requirements into Subdivision Regulations

These types of regulations govern the division of land for sale or development. Sometimes certain fees may be incorporated into these types of regulations. For example, developers who wanted to subdivide a property located in a high flood-risk area could be required to pay developer exactions, impact fees or other system development charges.⁵⁶ Subdivision regulations combined with a fee extraction can serve to discourage development in the floodplain. In Polk County, Oregon no subdivisions are allowed in the floodplain. If a developer proposes to subdivide to a high density, as is characteristic of a subdivision, that developer must generate maps to prove that his property does not lie within the boundaries of the floodplain.⁵⁷ Three mitigation approaches that can be included in subdivision regulations include:

1. *Cluster Development* is the concentration of structures on one part of a lot to preserve the remainder of the property for open space. Cluster development usually is permitted only under planned unit development procedures. Clustering offers the potential for savings in some areas: the sewer and water lines and streets needed to serve a cluster may be much shorter than those necessary for a traditional subdivision of comparable density.⁵⁸ Cluster development provides the opportunity to avoid developing in hazard areas by maximizing development in non-hazard areas.
2. *Performance Bonds* are bonds required of a subdivider or developer to ensure that specified improvements be carried out after approval for the development is given by the local government. Performance bonds are widely used for a broad range of improvements sidewalks, streets, curbs,

storm sewers, street lighting, etc. They are one type in a broader category known as surety bonds.⁵⁹ Performance bonds could be used to improve drainage practices or implement other mitigation techniques.

3. A *Site Plan* is a detailed map of a proposed development site. Many subdivision and zoning ordinances require that a site plan accompany any application for a partition, variance, conditional use, zone change, or other quasi-judicial action. The standards for the drafting of such maps are usually defined in the community's zoning and subdivision ordinances. At a minimum, site plans should have a consistent scale (described on the plan), a north arrow, and a title or legend, and should show property lines, the locations of buildings, and the presence of roads, streams, and other major features of the landscape.⁶⁰ If a flood hazard is present, you can use the site plan to determine the location of the permitted development in relation to the hazard area.

4.4 What can Your Community do to Strengthen its Flood Ordinance?

All Oregon communities participating in the National Flood Insurance Program (NFIP) have adopted floodplain development ordinances. Many communities have adopted the Oregon Model Floodplain Development Ordinance prepared by the Federal Emergency Management Agency (FEMA). This model ordinance meets the minimum requirements for local jurisdictions to participate in NFIP. The model ordinance is available from FEMA Region X, the Oregon Floodplain Coordinator, or online at: www.lcd.state.or.us/issues/rural.htm.

Communities are encouraged by FEMA and DLCD to adopt floodplain management standards in addition to those required by the NFIP to address local concerns and flood conditions. Communities may benefit from these higher standards through participation in the Community Rating System. Residents in these communities may enjoy reduced insurance premiums due to their community's enactment of ordinances that go beyond the minimum NFIP requirements.

The following are examples of some of the regulations that Oregon communities are adopting, as well as some examples of language being used by communities as they try to strengthen their flood management ordinances.

4.4.1 Adopt Stricter Elevation Requirements

The NFIP requires that new structures in the floodplain be elevated to or above base flood elevation. Oregon State Building Codes require such structures to be elevated to one foot above base flood elevation. Based on historic flood levels or other information, some communities have chosen to adopt a more protective standard, to safeguard the lives and property of their citizens.



Flood Key

Refer to Section 6 of this guide for contact information for FEMA and the NFIP.

For example, Tillamook County, along Oregon's north coast, requires residential structures to be elevated three feet above the base flood elevation. Marion County, Oregon requires elevation to two feet above the base flood elevation. This extra "margin of safety" provides added protection to new development, particularly in situations where maps may be incomplete or outdated.

4.4.2 Prohibit Development in Floodways

Floodways include the normal stream channel and those areas closest to the stream channel. A floodway's function is to move water out of a community as quickly as possible. Therefore, the NFIP regulations require that development will not encroach on the mapped floodway areas. Current federal regulations require engineer certification that development in the floodway area will cause no rise in the base flood elevation. Some Oregon communities have gone beyond this general requirement to prohibit any development or "encroachment" in the floodway area. For example, a local government could adopt ordinance language stating:

"Above ground structures are not allowed in the (jurisdiction) floodway as delineated by the Federal Emergency Management Agency on (date of floodway map)."

In some cases, local governments allow no new development in floodways with the exception of local public works activities (e.g., utilities, bridges, etc.). For example:

"Floodways are established in Special Flood Hazard Areas to transport the waters of a 100-year flood out of the community as quickly as possible with minimal flood damage. Floodways are most often mapped in urban areas, including in small cities. Encroachments on the floodway generally produce a rise in base flood elevation and contribute to other hydraulic problems. Accordingly _____ (city/county) prohibits encroachment on designated floodways except for public works projects pursuant to section xx (below)."

"_____ (city/county) recognizes that utilities, flood prevention structures and improvement projects that are in the public's best interest must sometimes encroach on designated floodways. In compliance with Federal Emergency Management Agency requirements, (44 CFR s. 65.12), _____ (city/county) will permit floodway encroachments under the following conditions: The city/county finds that the proposed public works project is in the public interest; and FEMA has approved the proposed project."

In some cases, certain types of activities or uses are prohibited in floodways. For example:

"No filling operations of any kind shall be allowed in the floodway."

Washington State prohibits any and all new construction or substantial improvements in floodways. County and city flood management ordinances must be approved by the state. Any ordinance that does not restrict land uses within designated floodways, including the prohibition of construction or reconstruction, repair, or replacement of residential structures, may be disapproved by the state.⁶¹

4.4.3 Adopt Hazardous Material Provisions

Hazardous materials when inundated by a flood event can be released into the environment and harm community members as well as wildlife. Local governments may want to include a provision banning storage of hazardous materials in the 100-year floodplain. Hazardous material can be defined as a combustible, flammable, corrosive, explosive, toxic or radioactive substance that is potentially harmful to humans and the environment.

4.4.4 Adopt Water Quality Provisions

Floodplain development ordinances can be used to address community concerns such as protection of water quality and the preservation of open space. When addressing these concerns in their floodplain ordinance, communities need be sure that the concern is identified up front, in the discussion of the intent and purpose section of the ordinance.

It may be appropriate for local governments to address water quality issues through their floodplain development ordinance since floodplain development impacts water quality in several ways. The filling of floodplains and increased impervious surface results in the loss of infiltration capacity and increased velocity of stormwater runoff. Use of fill may also disturb riparian areas. Although floodplain development ordinances are primarily designed to reduce flood insurance claims through site development standards, local floodplain management can be done in a manner that protects and enhances water quality.

There are a number of options available to help local governments address water quality concerns through their floodplain development ordinances. Adding language to the purpose section of a floodplain ordinance specific to the water quality is one option:

“To protect and enhance water quality by restricting or prohibiting uses which cause increased flood heights or velocity or lead to increased erosion on site or downstream.”

Water quality issues associated with floodplain management can also be addressed through performance standards required for floodplain development (e.g., balanced cut and fill requirements). Information relating to watershed management and water quality issues can be found through local

Tip Box



Water Quality Model Code

Oregon's Departments of Land Conservation and Development and Environmental Quality will issue a Water Quality Model Code and Guidebook in fall 2000. For more information, contact DLCD at (503)373-0050.

watershed councils or through the Oregon Watershed Enhancement Board (OWEB). See Section 4.5.1 for more information on how OWEB and watershed councils can provide assistance in flood mitigation.

4.4.5 Improve Maps of the Flood Hazard Area

In order to participate in the National Flood Insurance Program, local governments must include a reference to the Flood Insurance Administration's (FIA's) Flood Insurance Study and the Flood Insurance Rate Maps in their flood development ordinance. However, many of these maps are almost twenty years old and do not reflect flood hazards associated with new development. A community might include a broader area for floodplain management based on historic flood records, including aerial photos to better protect its residents from flooding. Oregon's Marion County has done this, and it has improved their maps significantly. An example of the possible ordinance language that can be used is:

"The Ordinance shall apply to all areas of special flood hazard areas within the jurisdiction of _____. The areas of special flood hazard identified by the Federal Insurance Administration in a scientific and engineering report entitled "The Flood Insurance Study for the _____" dated _____, 19____, and as amended, with accompanying Flood Insurance Maps, as amended are hereby adopted by reference and declared to be a part of this ordinance. The flood hazard areas also include areas identified and mapped by (jurisdiction) that were not studied by the Flood Insurance Administration. The report and maps are incorporated in the overlay zone by this reference and are on file _____."

4.4.6 Strengthen Setback Requirements

The National Flood Insurance program does not require a specific setback requirement for new development along waterbodies. Statewide Planning Goal 17 requires a setback from coastal shorelands. Local governments may apply Statewide Planning Goal 5 provisions for "safe harbor" riparian area protection in their ordinances as a means to enhance floodplain management and reduce flood damages. See Section 6 for information on Goals 17 and 5 and how to contact the Department of Land Conservation and Development.

Under a typical setback ordinance, new development is required to be set back from the top of the bank of a stream or river or from a mapped floodway line. Setback distances will vary depending upon the site conditions (again, see the safe harbor for Goal 5). The following are some of the benefits of maintaining a riparian buffer area:

- Setbacks provide an added margin of safety by keeping structures away from the higher velocity flood forces that are closest to the main stream channel;
- Setbacks reduce flood losses caused by stream bank failure (erosion damage) when stream channels migrate; and

- Setbacks provide the benefits of a riparian buffer along stream channels to protect fish and wildlife habitats and improve water quality.

4.4.7 Consider the Effect of Proposed Development on Existing Development

The NFIP program regulations do not specifically require local governments to consider the impact of proposed floodplain development on existing development (although this is required for development in a floodway). Some jurisdictions evaluate the effects of floodplain development on existing development and stream velocity. For example, “Any proposal for development within the Flood Plain Special Purpose District shall be accompanied by documentation prepared by a registered civil engineer demonstrating to the satisfaction of the manager that the development:

- Will not result in an increase in floodplain area on other properties; and
- Will not result in an increase in erosive velocity of the stream that may cause channel scouring or reduced slope stability downstream of the development.”

Communities may want to consider this type of ordinance if they expect a large amount of new development in their flood hazard areas.

4.4.8 Regulation of Fill in the Floodplain

The current NFIP regulations allow local governments to permit the placement of fill material in the mapped floodplain. Placement of fill results in a net loss of floodplain storage. Water can no longer infiltrate and instead runs off at a higher velocity while carrying pollutants. One option for local governments to reduce the loss of floodplain storage and slow down the movement of pollutants to waterways is to limit fill in the floodplain. Ordinance language could:

- Prohibit all new fill in floodplain areas. (This could be limited to those areas with water quality limits or areas with prime habitat);
- Limit new fill in floodplain areas by requiring “compensatory storage.” One option is to require balanced “cut and fill.” That is, for every, x cubic yards of material you put in the floodplain, x cubic yards must be removed. METRO, the Portland metropolitan-area planning agency, has required this.

For example, a local code could require developers to compensate for the loss of conveyance storage caused by filling in the floodplain by removing an equal amount of material in the floodplain near the development. Some jurisdictions require balanced cut and fill on the property seeking the development permit. Others require that balanced cut and fill be accomplished on a watershed level.

Sidebar



Stormwater Management Program

In 1987, the U.S. Environmental Protection Agency's (EPA) Clean Water Act was amended to require implementation of a comprehensive national program to address non-agricultural sources of stormwater discharges. Stormwater discharges are the runoff of water from industrial sites, construction activities and through municipal storm sewer systems that drain directly into lakes, streams and coastal waters. Measures used to address water quality problems associated with stormwater should also minimize the impact of uncontrolled stormwater runoff on flood levels and landslides.

Implementation of EPA's stormwater regulations is through the existing NPDES (National Pollutant Discharge Elimination System) water quality permitting program. EPA has adopted the program in two phases. The first phase required permits for industrial stormwater discharges, runoff from construction sites disturbing five acres or more of land and large municipal systems.

4.4.9 Improve Stormwater Management

Most communities are already engaging in some type of stormwater management. Communities can conveniently incorporate their flood mitigation goals into the stormwater management design process. They can do this through the design of water retention and detention facilities and by setting performance standards.

4.4.10 Protection of Natural and Beneficial Floodplain Functions

One of the goals of the National Flood Insurance Program is to protect the natural and beneficial functions of floodplains. Natural and beneficial floodplain functions include both the natural infiltration capacities of floodplains, as well as minimizing the pollutants that can enter waters from floodplain development activities. Though nothing in the model ordinance specifically addresses this issue, a variety of options are available to local governments;

- Prohibit all activities in the floodplain that may be hazardous to public health or water quality (e.g., septic systems, storage of hazardous materials, location of landfills, etc.).
- Require new floodplain developments to avoid or minimize disruption to shorelines, stream channels and stream banks (e.g., setback requirements).
- Adopt regulations pursuant to a Habitat Conservation Plan approved by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.⁶²

4.4.11 Discourage Placement of Critical Facilities in Floodplains

Jurisdictions can prohibit certain types of critical uses in floodplains (e.g., hospitals, fire stations, etc). This is important to ensure that these vital services are not lost in the event of a flood. Careful planning should occur to ensure that these facilities are not sited in floodplains. If your critical facilities are already located in a floodplain, pre-disaster planning before a flood event is crucial to ensuring that these services are not incapacitated. It is also important to consider and evaluate factors such as:

- Are police or ambulance vehicles going to be cut off from sections of the community?
- Will critical services be able to access the entire population in the event of a disaster?
- What possible routes of travel might be incapacitated?

Communities might need to determine if alternate routes are available and how that will effect service delivery.

TRG Key



Additional information on critical facilities planning can be found in Chapter 2 of this guide: Elements of a Comprehensive Plan.

4.5 What are Some Additional Flood Mitigation Activities?

4.5.1 Build Partnerships with Watershed Councils

Watershed councils are locally organized, voluntary groups established to improve the condition of watersheds. Watershed councils are a source of data and technical assistance for communities as they develop their inventories and flood mitigation plans. Council members can serve as technical advisors to local planners attempting to deal with watershed and flood processes. Watershed councils can also help communities seek funding for mitigation projects.

Councils offer local residents the opportunity to independently evaluate watershed conditions and identify opportunities to restore or enhance conditions in their riparian areas. They bring varied interests together in a non-regulatory setting to form a common vision for the ecological and economic sustainability, and livability of their watershed. The councils provide a voice for local people in natural resource management decisions, including floodplain management.⁶³

Watershed councils offer a view of the watershed as a natural system. They are resources for communities as they develop their flood mitigation plans. Making connections between the natural environment, floodplain processes, and floodplain mitigation can lead to dramatic improvements in floodplain management. For a list of all the watershed councils in Oregon visit: http://www.4sos.org/group/gweb_wscs.htm on the Internet.

4.5.2 Develop Flood Mitigation Plans

A flood mitigation plan addresses the hazard risk to communities located partially or entirely in a floodplain. These plans help communities to address the flood hazard by developing goals and strategies for flood hazard mitigation within the community.⁶⁴ Talent, Oregon has developed such a plan. It includes an assessment of the flood hazard in their community, goals for how to better manage flood hazards, a discussion of existing mitigation activities and a list of recommended activities for the future. One of their mitigation activities includes a long-term effort to acquire flood prone properties through purchase, donation, or other mechanisms.⁶⁵

In developing these plans it is important to remember that floodplains are natural phenomena. As such, they are best addressed in ways that preserve their natural function in the ecosystem. For example, as floodplain boundaries rarely fall within a single jurisdiction, these types of plans are likely to be addressed most effectively through regional government bodies.

4.5.3 Participate in NFIP's Community Rating System

The Community Rating System (CRS) is operated under the National Flood Insurance Program (NFIP). The NFIP provides flood insurance to homes and businesses located in floodplains at a reasonable cost, and encourages the movement of develop-

ment away from the floodplain. The program is based upon mapping areas of flood risk, and requiring local implementation to reduce that risk, primarily through restrictions on new development in floodplains. For more detailed information on the NFIP, turn to Section 2 of this guide.

CRS recognizes community efforts that go beyond the minimum standards of the NFIP. This recognition is in the form of reduced flood insurance premiums for communities that adopt such standards. CRS encourages community activities that reduce flood losses, facilitate accurate insurance rating, and promote flood insurance awareness. There are over 900 communities participating in CRS nationwide. Some of the benefits of CRS are listed below.

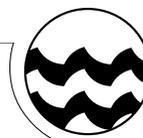
CRS Benefits

- Flood insurance premium reductions, ranging from 5% to 45%. The higher the CRS rating a community achieves, the greater the premium discount.
- Floodplain management activities enhance public safety and reduce damages to private property and public infrastructure.
- Communities can evaluate the effectiveness of their floodplain management program against a national benchmark.
- Implementation of some CRS activities makes communities eligible for other funding sources (See the end of this section for information on funding sources).

Participation in the CRS is voluntary. There are minimum requirements in order to participate.

- Your community must be in compliance with the rules and regulations of the NFIP.
- The community's chief executive (mayor, County Board of Commissioners) must appoint a CRS coordinator.
- Communities must require and keep all NFIP elevation certificates on file.
- Communities with repetitive losses must develop and implement a floodplain mitigation plan.

The CRS rating system is based on the ranking of community activities within four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness. Communities engaging in these types of activities receive points according to a schedule developed for the CRS. CRS ratings are assigned based upon the number of points earned. The majority of CRS communities are in Class 8 or Class 9. A Class 8 rating earns about a \$40 savings in flood insurance premiums per insurance policy, per year. Only three communities out of 900 have achieved Class 5 status. The system is summarized in Table 2, below. CRS handbooks are available from your local FEMA representative or by calling (800)427-4661. See Section 6 for information on how to obtain this document.



Tip Box



Benefits of the Community Rating System's Methodology

Even if a jurisdiction is not ready to officially apply to be a part of CRS, the CRS flood mitigation planning standards are very useful for assessing local needs with regard to floodplain management and hazards planning in general. In addition, if a community begins to use CRS methodologies now, it will only expedite the process later when a CRS application is filed.⁶⁷ For more information on CRS, refer to Section 6 of this guide for contact information for the Oregon Floodplain Coordinator at DLCD.

Table 2. Summary of Points and Insurance Rate Discounts under CRS

Credit Points	Class	Premium Reductions
0-499	10	0
500-999	9	5%
1000-1499	8	10%
1500-1999	7	15%
2000-2499	6	20%
2500-2999	5	25%
3000-3499	4	30%
3500-3999	3	35%
4000-4599	2	40%
4500+	1	45%

Sidebar



Oregon CRS Communities

As of January 2000, 16 Oregon jurisdictions are participating in the CRS program.⁶⁶ The requirements of Statewide Planning Goal 7 and the State Building Codes make it relatively easy to achieve a Class 9 CRS rating. Communities are required to create and implement policies that address flood hazards. Achieving a higher CRS rating, however, requires a greater effort from communities. Local communities, particularly smaller communities with limited resources, must weigh the costs and benefits of putting forth this effort. It is important to consider the realities of available resources, the number of structures at risk, and number of insurance policies in the community, when deciding whether or not to participate in voluntary flood mitigation programs such as the CRS.

Oregon Communities CRS Rating

Oregon Communities	CRS Rating
Albany	8
Ashland	8
Cannon Beach	7
Central Point	8
Corvallis	8
Douglas County	8
Eugene	8
Grants Pass	9
Jackson County	8
Medford	9
Polk County	9
Rogue River	8
Roseburg	8
Scappoose	8
Stanfield	9
Talent	8

4.5.4 Fee Simple Acquisition of Land and Buyouts

Though this is usually the most expensive method of mitigation, it is also the most effective in terms of a flood mitigation strategy. Once the land in the floodplain is purchased outright by a local government entity, all development can be prohibited, and the land can be officially designated as open space. There are four types of buyouts:

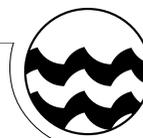
1. Basic buyouts, which have no relocation element;
2. Buyout and infill programs which encourage the relocation of structures outside of the floodplain;
3. Buyout and reorganization plans which create new subdivisions where the moved structures are relocated; and
4. Buyout and complete relocation, which involves the construction of an entire new town, using new or relocated old buildings.⁶⁸

FEMA's Hazard Mitigation Grant Program, administered in Oregon by the Oregon State Police (OSP) - Office of Emergency Management (OEM), is one funding source for such buyouts. In Oregon the HMGP has funded the acquisition of two homes in Talent, a hotel in Tillamook, and two homes in Keizer. A number of homes along Johnson Creek in Portland have been bought out with funds provided by the city and FEMA. These areas are now free from development and are being held as open space in perpetuity.⁶⁹

4.5.5 Use of Easements

Easements restrict certain activities on properties. When an easement is granted, certain activities or land uses are no longer available to the property owner. They are usually given up in exchange for some type of compensation. Easements foregoing the right to develop a property can be either sold or granted to local jurisdictions or other organizations by property owners. This is described as "acquiring a negative easement against development." This can be extremely useful to local communities by providing a mechanism for de facto acquisition of undeveloped floodplain lands, and at a lower price than fee-simple acquisition.

When granting an easement, landowners sign a legal document giving up the right to some use of their property (for example, the ability to subdivide), and they are potentially eligible for certain financial benefits. Easements can be purchased by a community or donated by the property owner. A decrease in property value with a corresponding decrease in property taxes usually follows, as the property no longer has the legal ability to be used to its full development potential. So, the property owner gets some financial gain from his land, while the entire community benefits by having that land as protected open space.⁷⁰



4.5.6 Use of Tax Incentives

Differential tax assessment can be used to provide an incentive for landowners who own undeveloped land in the floodplain to keep it undeveloped. If taxes for floodplain lands are differentially low, the owner has a financial incentive to keep it as open space. Tax abatements can also be used in this fashion, as well as to encourage developers to integrate mitigation into their developments. For example, abatements, subsidies or other economic incentives have been used for floodproofing programs.⁷¹

4.6 What Funding Programs are Available to Communities?

4.6.1 Hazard Mitigation Grant Program (HMGP)

The HMGP administered by the Federal Emergency Management Agency (FEMA) provides grants to states and local governments to implement long-term hazard mitigation measures after a federal major disaster declaration. It is important to stress that the HMGP is available only after a federal disaster declaration has been made. When such an event occurs, and these monies become available, they can be used to implement important and innovative flood mitigation projects. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented immediately, during disaster recovery. FEMA can fund up to 75 percent of the eligible costs of each project. Eligible applicants are state and local governments, special districts, Native American nations and organizations, and certain private non-profit organizations. Individual homeowners and businesses may not apply directly to the program, but a community may apply on behalf of homeowners and businesses. An example of an HMGP project would be the purchasing of property located in the floodplain to prevent future damage.⁷²

The OSP - Office of Emergency Management (OEM) is the state agency responsible for administering the HMGP.

4.6.2 Flood Mitigation Assistance Program (FMA)

Flood Mitigation Assistance (FMA) program funds are made available by FEMA to states on an annual basis. The Oregon FMA program provides grants to communities for projects that reduce the risk of flood damage to structures that have flood insurance coverage. This funding is available for flood mitigation planning and implementation of mitigation measures only. The Oregon State Police - Office of Emergency Management (OEM) is the administrator of the FMA program and is responsible for selecting projects for funding. The State then forwards selected applications to FEMA for an eligibility determination. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.⁷³ Use the resource directory at the end of this guide to contact OEM for more information.

Flood Key



Refer to Section 6 of this guide for information on how to contact OEM.

Sidebar



Flood Mitigation Assistance Program

To be eligible for a Flood Mitigation Assistance Program project grant, a community must have a FEMA-approved mitigation plan. FEMA recommends a basic flood mitigation process consisting of the following activities:

1. Public Involvement
2. Coordination with other agencies or organizations
3. Flood hazard area inventory
4. Problem identification
5. Review of possible mitigation actions
6. State or local adoption following a public hearing

An example of a community engaging in such activities is Lincoln County. As a result of destructive flooding in November of 1999, Lincoln County applied for and was awarded, a Hazard Mitigation Grant from the OSP-OEM for elevating or relocating damaged structures and developing a flood mitigation plan.

4.6.3 Emergency Watershed Protection Program (EWP)

EWP is a Natural Resource Conservation Service (NRCS) program designed to relieve imminent hazards to life and property caused by floods, fires, windstorms and other natural occurrences. EWP provides funds for projects such as: removing debris from stream channels, reshaping and protecting eroded banks, correcting damaged drainage facilities, repairing levees and structures, and purchasing floodplain easements. If your community suffers severe damage from a natural disaster it may qualify for assistance under the EWP program. Public and private landowners are eligible for assistance but must be represented by a project sponsor. City and county governments, general improvement districts and conservation districts are the most common sponsors of EWP projects. Sponsors are responsible for providing land rights to do the repair work and securing permits, as well as furnishing the local cost share and accomplishing the installation of work.⁷⁴ See Section 6 of this guide for information on how to contact the NRCS to obtain more information on this program.

4.6.4 Oregon Watershed Enhancement Board (OWEB)

The Oregon Watershed Enhancement Board (OWEB) administers two grant programs that provide funds for mitigation and improvement projects that approach natural resources management from a whole-watershed perspective. Floodplain management fits that profile. OWEB encourages projects that foster interagency cooperation, include other sources of funding, provide for local stakeholder involvement, include youth and volunteers and promote learning about watershed concepts. OWEB's goal is to help Oregonians improve the state's watersheds. The primary functions of OWEB are to provide technical assistance, administer a grant program, promote education and public awareness about watershed enhancement benefits, concepts and techniques, and to support the work of local watershed councils.⁷⁵ For more information refer to Section 6 for contact information.

4.7 Summary: Reducing Your Community's Risk from Flood Hazards

Section 4 describes a range of methods and programs communities can use to reduce risk to life and property from flood hazards.

- ❑ *Land use tools for floodplain management* include performance zoning, overlay zones, incentive zoning and subdivision regulations. These tools can be used by communities to improve floodplain management and flood mitigation.
- ❑ *Flood Development Ordinances* can be constructed and several different standards can be adopted to improve floodplain management. Some of the examples are: 1) the adoption of stricter elevation requirements, 2) the prohibition of development within the floodway, and 3) the adoption of water quality provisions.
- ❑ *Additional methods for flood mitigation* include developing a flood mitigation plan, building partnerships with local watershed councils, participating in NFIP's Community Rating System (CRS), use of fee-simple land acquisition, easements and tax incentives.
- ❑ *Potential Funding Programs* include the Hazard Mitigation Grant Program (FEMA-Oregon OEM), Flood Mitigation Assistance Program (FEMA-Oregon OEM), Emergency Watershed Protection Program (NRCS) and Oregon Watershed Enhancement Board Grant Program (OWEB).

Planning for Natural Hazards: Reviewing your Comprehensive Plan



Implementing measures tied to specific actions are essential to carrying out plan policies in a comprehensive plan.

Your community should ask the following questions in assessing the adequacy of your comprehensive plan in addressing flood hazards.

- ❑ Do your comprehensive plan policies authorize lower density zoning provisions for areas of high vulnerability to flood hazards?
- ❑ Has your community implemented a process for evaluating site-specific development in flood hazard areas?

Section 5: How are Oregon Communities Addressing Flood Hazards?

This section provides information on the flood programs of two Oregon jurisdictions and describes implementation processes that were used for flood mitigation and addressing development in flood prone areas.

5.1 Innovative Approaches to Flood Mitigation in Umatilla County, Oregon

Umatilla County has taken an innovative approach in developing their flood mitigation plan. The county's mitigation plan addresses the variety of flood hazards in their community. Their efforts provide an example of how effective a community can be in developing flood mitigation strategies, and offers lessons for other jurisdictions to consider in developing their own flood hazard mitigation plans.

Background

Flooding in 1996 and 1997 caused widespread erosion of agricultural lands, road damage, and structural damage in Umatilla County. The severity of those events underscored a need for county-wide flood response planning and flood mitigation measures. The county has moved from the use of levees, dikes and reservoirs, which were the primary methods for flood control during the 1970's. In recent years, non-structural methods such as the use of floodplain development regulations have provided a viable alternative to costly structural flood controls.

Umatilla County is an interesting case study because of its susceptibility to a variety of flood types; riverine, flash, and, to some extent, urban. The county has observed that all of these types can occur as part of the same flood event. For example, the foothills of the Blue Mountains experience flash flooding that can contribute to typical riverine flooding of the Umatilla River, and in some instances cause urban flooding. Umatilla County has developed flood preparedness and mitigation strategies to address these types of flood events.

Umatilla County's Flood Mitigation Plan

The County's Flood Mitigation Plan was developed through the combined efforts of the Umatilla County Emergency Management staff, several local and state agencies, and the Umatilla County Planning Commission before adoption by the Umatilla County Board of Commissioners.

Some of the policies in the plan include:

- Review uses of floodplain/floodway as part of periodic review.
- Seek updated and improved floodplain mapping.
- Explore options for acquiring land or establishing easements.
- Provide additional information on elevation and floodproofing options.

- Promote streambank stabilization and bioengineering efforts countywide.
- Evaluate the county's river gauge network.
- Provide ground information to the National Weather Service to better predict risk.
- Adopt a county emergency flood response plan.

Some of the mitigation policies were initiated as the result of immediate need, such as the flooding along Mill Creek, some by regulatory requirements, as in the revised floodplain standards in the county's development code, and some by local initiative, such as new floodplain mapping for the city of Athena.

Implementation

Since the development of the Flood Mitigation Plan, Umatilla County has revised the county's floodplain zoning to conform to FEMA guidelines. The county purchased a former home site in the floodway of Mill Creek and facilitated the elevation of other homes along Mill Creek as well as funded the design and construction of a more flood resistant bridge. The county has been a supporter of the multi-agency bioengineering/streambank stabilization project along McKay Creek and the enhancement of the river gauge system. The county also worked with the National Weather Service Pendleton Office to promote the volunteer "Weather Watchers Network." FEMA and the Army Corps of Engineers have provided new or revised floodplain maps for Mill Creek and for the City of Athena's Urban Growth Area. In 1998, the county adopted an Emergency Flood Response Plan as an annex of the Emergency Operations Plan.

Umatilla County has not had any recent flood events to "test" these new policies. However, they are confident that when flooding occurs in the future, the county's efforts will prove worthwhile, particularly along Mill Creek where physical structures in the floodway have been removed, elevated, or redesigned and rebuilt. Despite their confidence, Umatilla County continues to work on other aspects of their Flood Mitigation Plan.

Through this process Umatilla County has come to realize the importance of fostering a close working relationship between local emergency managers and their local planning department counterparts. Mitigation has to be based upon these two agencies' cooperative efforts, which was easy in Umatilla County as the two are part of the same department. This is not true in many other cities and counties. It is imperative that close coordination occur in order to provide the links necessary between preparedness and response [emergency management] and mitigation [planning and land use regulation].⁷⁶

5.2 Going Beyond Minimum Requirements in Talent, Oregon

Talent offers an example of how a small town with minimal resources can be extremely effective in planning for flood hazards. Talent's flood ordinance exemplifies how a community can exceed regulatory standards to better protect itself from a flood disaster.

Background

After the 1997 New Year's Day flood struck Southern Oregon, the City of Talent went to work. They did a survey of the problem areas in the floodplain, based almost entirely upon field observation volunteers, to document areas damaged by floodwaters and record high water marks. Using FEMA Hazard Mitigation Grant Program (HMGP) funds, the city developed a Stormwater Master Plan and Stormwater Design Standards. As a condition of their HMGP grant, the city also adopted a Flood Hazard Mitigation Plan. Subsequently, they applied to participate in the Community Rating System and will be a Class 8 community when the approval process is complete.

The city also had GIS maps prepared by the county GIS office that overlaid FIRM areas on the tax lot map. This allows staff to make more accurate determinations of flood hazard areas, and makes it possible for citizens to see for themselves how the regulatory floodplain relates to their property. After the 1997 flood event, it became clear to the city that Wagner Creek, the creek that runs through the city, did not perform as the FEMA Flood Insurance Rate Map said it would. This prompted the city planner and engineer to increase their efforts to get FEMA to do a detailed study of Wagner Creek for new FIRM maps. A better model was needed of the hydrologic characteristics of the basin, as well as consideration of changes in the basin and determinations of base flood elevations for unmapped areas inside the city and three miles up Wagner Creek. Geology students from the nearby university did a preliminary survey of high water marks. The FEMA study is currently underway and will provide the City of Talent with the most current and accurate information possible regarding its flood area inventory, so that the city can continue to improve its floodplain management efforts.

City of Talent Flood Damage Prevention Ordinance

The city used the State of Oregon's model ordinance as a base for its Flood Damage Prevention Ordinance. It enhanced the model by increasing the elevation standards for development in the floodplain to two feet above base flood elevation. This allows the city to receive extra points in the NFIP Community Rating System program, which maintains lower insurance rates for their community.

Their ordinance goes beyond current standards by requiring tie downs for mobile homes inside the 500-year floodplain. The standard in the model ordinance applies only inside the 100-year floodplain. The city also continues to look for opportunities to achieve permanent open space designation along the creeks in their area, especially the opportunity to purchase land outright.

The Talent Zoning Ordinance includes special setbacks from streams. New construction must be set back 50 feet from inventoried “locally significant” wetlands and riparian areas. New construction must also be set back 35 feet from the floodway. The stricter standard is controlling. Structures that lie within those setback areas are nonconforming, and are subject to the same regulation of expansion and replacement of other nonconforming uses.

Some of Talent’s Flood Damage Prevention Ordinance includes:

Section 5.2.1 Residential Construction

- a) New construction and substantial improvement or any residential structure shall have the lowest floor, including basement, elevated *two feet above the base flood elevation*.

Section 5.2.2 Nonresidential Construction

New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor, including a basement floor, *elevated two feet above the base flood elevation*; or, together with requirements for utility and sanitary facilities set out below, shall: a) Be floodproofed so that below the flood protection level (*two feet above base flood level*), the structure is watertight with walls substantially impermeable to the passage of water.

Section 5.2.3 Manufactured Homes

- b) Manufactured homes to be placed or substantially improved on sites in an existing manufactured home park located in and A or B Zone on the community’s FIRM that are not subject to the above manufactured home provisions shall be elevated so that:
 - i) The lowest floor of the manufactured home is elevated *two feet above the base flood elevation*, and the chassis is securely anchored to an adequately designed foundation system to resist flotation, collapse, and lateral movement.

Section 5.0 Provisions for Flood Hazard Reduction

5.1 General Standards: In areas of special flood hazards, the following standards are required:

5.1.1 Anchoring is required for all substantial improvements, and new and replacement dwellings in the regulatory floodplain or in the *500-year floodplain*, as follows:

- a) All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure.
- b) All manufactured homes must likewise be anchored to prevent flotation, collapse, or lateral movement, and shall be installed using methods and practices that minimize flood damage. Anchoring methods may include, but are not limited to, use of over-the-top or frame ties to ground anchors (Reference FEMA’s “Manufactured Home Installation in Flood Hazard Areas” guidebook for additional techniques).

Section 5.3 Floodways

5.3.1 No new or replacement structures or substantial improvements are allowed within thirty-five feet of the floodway, as established in Article 12 of the Talent Zoning Ordinance.

Implementation of Talent's Flood Damage Prevention Ordinance

Currently, the moratorium on new construction in Talent due to water supply constraints has prevented implementation of new standards, except in the case of replacement manufactured homes in parks. The basic "on-the-ground" implementation procedure is simple. Developers must apply for a floodplain development permit. If the permit request is for development that meets or exceeds the city's standards as set forth in this ordinance, and complies with any other relevant regulation, the development will be approved. Talent also has made use of the Hazard Mitigation Grant Program to obtain the funding that allows them to implement their stormwater master plan and design standards. This small community has been able to utilize many resources in order to achieve great results in floodplain management.

5.3 Summary: Lessons from Oregon Communities Addressing Flood Hazards

- ❑ *Umatilla County's* flood mitigation plan reflects lessons the community learned that can benefit other jurisdictions including the following:
 - A shift from the community's reliance on structural flood controls to non-structural mitigation measures (updated local ordinances, elevations of existing structures).
 - A partnership between local emergency managers and planning department staff. Close coordination is the key to ensuring successful flood risk reduction.
- ❑ *Talent* offers an example of how a small town with minimal resources can be extremely effective in planning for flood hazards. Talent's flood ordinance exemplifies how a community can exceed regulatory standards to better protect itself from a flood disaster.

Planning for Natural Hazards: Reviewing your Comprehensive Plan



Your comprehensive plan should be coordinated with and reflect comprehensive plans and implementing measures of other communities within your region. Natural hazards do not respect community boundaries making it important to coordinate with other jurisdictions in your area. In reviewing your comprehensive plan, your community should ask the following questions in developing plan policies for flood hazards:

- ❑ What plan policies should be added or amended to assist your community in addressing flood hazards?
- ❑ Are there communities that face similar flood threats that have developed ordinances or non-regulatory programs that could be adopted by your community?
- ❑ Is your comprehensive plan consistent with plans or actions of other jurisdictions and regional plans and policies (such as school, utilities, fire, park and transportation districts)?

Section 6: Where can Your Community Find Resources to Plan for Flood Hazards?

This section is a resource directory including contacts, programs, documents and Internet resources available to communities as they plan for flood hazards.

Sidebar



The Governor's Interagency Hazard Mitigation Team (GIHMT) is an important organization for interagency coordination, formalized by Governor Kitzhaber after the 1996-97 flood and landslide events. One of the most important roles of the GIHMT is to provide a forum for resolving issues regarding hazard mitigation goals, policies and programs. The team's strategies to mitigate loss of life, property and natural resources are reflected in the state's *Natural Hazards Mitigation Plan*. This plan is dubbed the "409 plan" since it is required by section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (P.L. 93-288). The GIHMT reviews policies and plans and makes recommendations with an emphasis on mitigation and education. Representatives from Oregon Emergency Management staff the GIHMT.

6.1 State Agency Resources

Department of Land Conservation and Development (DLCD)

DLCD administers the State's Land Use Planning Program. The program is based on 19 Statewide Planning Goals, including Goal 7, related to natural hazards. DLCD also serves as Oregon's federally designated agency to coordinate floodplain management in Oregon. DLCD maintains contact with flood prone communities throughout the state in order to help them meet the requirements of the NFIP and to ensure that they are prepared in case of flood. DLCD offers information on the NFIP, CRS and other FEMA - related programs. They also offer training courses on various flood mitigation programs.

Contact: Department of Land Conservation and Development

Address: 635 Capitol St. NE, Suite 200,
Salem, OR 97301-2540

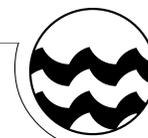
Phone: (503) 373-0050

Fax: (503) 378-6033

Website: <http://www.lcd.state.or.us>

Oregon Floodplain

Coordinator: (503) 373-0050 ext. 255



Oregon State Police (OSP)-Office of Emergency Management (OEM)

OEM administers FEMA's Hazard Mitigation Grant Program, which provides monies for acquisition, elevation, relocation, and demolition of structures located in the floodplain. OEM also administers FEMA's Flood Mitigation Assistance Program. This program provides assistance for NFIP insured structures only. OEM also helps local jurisdictions to develop local hazard mitigation plans. OEM is heavily involved in flood damage assessment and works mainly with disaster recovery and hazard mitigation programs. OEM provides training for local governments through workshops on recovery and mitigation. OEM also helps implement and manage federal disaster recovery programs.

Contact: Office of Emergency Management
Address: 595 Cottage Street NE,
Salem, OR 97310
Phone: (503) 378-2911
Fax: (503) 588-1378
Website: <http://www.osp.state.or.us/oem/>

OEM Hazard Mitigation Officer: (503) 378-2911 ext. 247

Recovery and Mitigation Specialist: (503) 378-2911 ext. 240

Division of State Lands (DSL)

DSL is a regulatory agency, responsible for administration of Oregon's Removal-Fill Law. This law is intended to protect, conserve and allow the best use of the state's water resources. It generally requires a permit from DSL to remove, fill or alter more than 50 cubic yards of material within the bed or banks of waters of the state. Exceptions are in State Scenic Waterways and areas designated essential salmon habitat, where a permit is required for all instream activity, regardless of size. These permits may be issued jointly by DSL and the U.S. Army Corps of Engineers. Contact the DSL with specific questions regarding this permit process.

Contact: Division of State Lands
Address: 775 Summer Street NE, Suite 100,
Salem, OR 97301-1279
Phone: (503) 378-3805
Fax: (503) 378-4844
Website: <http://statelands.dsl.state.or.us/>

Assistant Director: (503) 378-3805, ext. 279

Eastern Region Manager: (541) 388-6033

Western Region Manager: (503) 378-3805, ext. 244

Sidebar



**Project Impact:
Building Disaster
Resistant
Communities**

FEMA's Project Impact is a nationwide initiative that operates on a common sense damage reduction approach, basing its work and planning on three simple principles:

1. Preventive actions must be decided at the local level;
2. Private sector participation is vital; and
3. Long-term efforts and investments in prevention measures are essential.

Project Impact began in October of 1997 when FEMA formed partnerships with seven pilot communities across the country. FEMA offered expertise and technical assistance from the national and regional level and used all the available mechanisms to get the latest technology and mitigation practices into the hands of the local communities. FEMA has enlisted the partnership of all fifty states and U.S. Territories, including nearly 200 Project Impact communities, as well as over 1,100 businesses.⁷⁷

Benton, Deschutes, and Tillamook Counties, and Multnomah County with the City of Portland are the Oregon communities currently participating in this initiative to build disaster resistant communities. Application for participation in the program in Oregon is through the Oregon State Police - Office of Emergency Management in Salem.⁷⁸ For more information about Project Impact visit <http://www.fema.gov>

Oregon Watershed Enhancement Board (OWEB)

OWEB is a potential funding source for communities wanting to do flood mitigation projects and other watershed activities/improvements. The mission of the Oregon Watershed Enhancement Board is to promote and implement programs to restore, maintain and enhance watersheds in the State of Oregon in order to protect the economic and social well being of the state and its citizens. Contact OWEB directly for more information on its grant programs.

Contact: Oregon Watershed Enhancement Board
Address: 255 Capitol St. NE, Salem, Oregon 97310
Phone: (503) 378-3589
Fax: (503) 378-3225
Website: <http://www.4sos.org/group/gweb.html>

Program Manager: ext. 831

Program Representative: ext. 825

Program Representative: ext. 826

State Division of Building Codes, Department of Consumer and Business Services

The Oregon Building Codes Division (BCD) adopts statewide standards for building construction that are administered by the state and local municipalities throughout Oregon. To find out more information about codes that affect development in floodplains contact BCD or your local building department.

Contact: Building Codes Division
Address: 1535 Edgewater Street NW, P.O. Box 14470, Salem, OR 97309-0404
Phone: (503) 378-4133
Fax: (503) 378-2322
Website: <http://www.cbs.state.or.us/bed/>

Oregon Department of Environmental Quality

The Department of Environmental Quality (DEQ) is responsible for protecting and maintaining Oregon's environmental quality, predominately through programs delegated by the U.S. Environmental Protection Agency (USEPA) to the state. Of particular interest to local government for floodplain management purposes are regulations recently issued by USEPA and administered by DEQ for urban stormwater management. In addition to meeting water quality goals, proper stormwater management can help local governments address flood hazards. DEQ also may assist communities in watershed restoration efforts and other activities beneficial to floodplain management. Information on regional office location can be obtained through DEQ's Portland Office.

Contact: Water Quality Division
Address: 811 SW 6th Ave., Portland, OR 97204-1390
Phone: (503) 229-5279
Fax: (503) 229-6993
Website: <http://www.deq.state.or.us>

State of Oregon Water Resources Department (WRD)

WRD manages the state's Dam Safety Program. Dam failures, though uncommon, can result in catastrophic flooding. WRD can provide technical assistance to local governments on issues of dam safety.

Address: 1158 12th St. NE, Salem, OR 97301-4172
Phone: (503) 378-8455
Fax: (503) 378-2496
Website: <http://www.wrd.state.or.us>

Oregon Department of Fish and Wildlife (ODFW)

ODFW can provide assistance to local governments in evaluating the effects of floodplain and floodway development on fish and wildlife species and habitat. In particular, your community should contact area Fish and Wildlife staff to help review floodway development permits. To obtain information on area office location, use the following contact information.

Address: 2501 SW First Ave., Portland, OR 97207
Phone: (503) 872-5268
Website: <http://www.dfw.state.or.us>

6.2 Federal Agency Resources

Federal Emergency Management Agency (FEMA)

FEMA provides maps of flood hazard areas, various publications related to flood mitigation, funding for flood mitigation projects, technical assistance, and also operates the National Flood Insurance Program. FEMA's mission is "to reduce loss of life and property and protect our nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery". FEMA Region X serves the northwestern states of Alaska, Idaho, Oregon and Washington.

Contact: FEMA, Federal Regional Center, Region 10
Address: 130-228th St. SW, Bothell, WA 98021-9796
Phone: (425) 487-4678
Website: <http://www.fema.gov>

To obtain FEMA publications, Phone: (800) 480-2520

To obtain FEMA maps,

Contact: Map Service Center
Address: P.O. Box 1038, Jessup, Maryland 20794-1038
Phone: (800) 358-9616
Fax: (800) 358-9620

Army Corps of Engineers

The Army Corps of Engineers administers a permit program to ensure that the nation's waters are used in the public interest. Any person, firm, or agency planning to work in waters of the United States must first obtain a permit from the Army Corps of Engineers. In Oregon, joint permits may be issued with the Division of State Lands. The Corps is responsible for the protection and development of the nation's water resources, including navigation, flood control, energy production through hydro-power management, water supply storage and recreation. For more specific information on this permitting program and how it affects your community contact the Portland district office.

Contact: U.S. Army Corps of Engineers-Portland
District, Floodplain Information Branch
Address: P.O. Box 2946, Portland, OR 97208-2946
Phone: (503) 808-4874
Fax: (503) 808-4875
Website: <http://www.nwp.usace.army.mil/>

National Weather Service

National Oceanic and Atmospheric Administration, U.S. Department of Commerce

The National Weather Service mission is to provide weather and flood watches and warnings, and public forecasts and advisories primarily for the protection of life and property. The Weather Service collects, interprets and disseminates up-to-date hydro-logic data including information of the magnitude and frequency of past and expected water flows. The Weather Service website provides current forecasts and warnings as well as a link to the Emergency Managers Weather Information Network. Oregon has three weather service stations: Portland, Pendleton, and Medford. The Boise station serves southeastern Oregon.

Contact: National Weather Service - Portland
5241 NE 122nd Avenue
Portland, OR 97230
(503)326-2340
Website: <http://www.nws.noaa.gov>

Natural Resource Conservation Service (NRCS)

NRCS operates many programs dealing with the protection of floodplain resources. The two most closely related to flooding are the Watershed Surveys and Planning Program and the Flood Risk Reduction Program, administered through the Farm Service Agency. NRCS also provides technical assistance to property owners, including methods to reduce streambank erosion. NRCS is a federal agency whose mission is to “provide leadership in a partnership effort to help people conserve, improve, and sustain our natural resources and environment.”

Contact: Natural Resource Conservation Service,
Oregon State Branch
Address: 101 S.W. Main Street, Suite 1300, Port-
land, OR 97204-3221
Phone: (503) 414-3200
Fax: (503) 414-3103
Website: [http://www.or.nrcs.usda.gov/
Welcome.html](http://www.or.nrcs.usda.gov/Welcome.html)

United States Geological Survey (USGS)

The USGS provides hydrologic forecasts including flood warnings, watches, forecasts, and related information for regions of the Pacific Northwest. They provide flood risk maps showing flood potential, watches, and warnings in Oregon and nationwide. On their website they provide current streamflow conditions at USGS gauging stations in Oregon and throughout the Pacific Northwest, for up-to-the-minute information on water levels. The Oregon USGS office is responsible for water-resources investigations for Oregon and part of southern Washington. Their office cooperates with more than forty local, state, and federal agencies in Oregon. Cooperative activities include water-resources data collection and interpretive water-availability and water-quality studies.

Contact: USGS Oregon District Office
Address: 10615 S.E. Cherry Blossom Dr., Portland,
OR 97216
Phone: (503) 251-3200
Fax: (503) 251-3470
Website: <http://www.usgs.gov>

6.3 Recommended Flood Publications

The following list groups publications into three categories: primary, secondary, and technical. Documents listed as primary are those that every community should have in its resource library. Secondary documents are those that provide useful information to communities, but that may not be as easy to access. Technical documents are those that focus on a specialized aspect of flood hazard mitigation, and may require interpretation by a scientist or engineer.

Primary Resources

These documents represent the principal resources communities can use to better plan for flood hazards. They are key tools for reducing the risks associated with flood prone areas.

NFIP Community Rating System Coordinator's Manual. FEMA/NFIP. Indianapolis, IN: FEMA

This informative brochure explains how the Community Rating System works and what the benefits are to communities. It explains in detail the CRS point system, and what activities communities can do in order to earn points. These points then add up to the "rating" for the community, and flood insurance premium discounts are calculated based upon that "rating". The brochure also provides a table on the percent discount realized for each rating (1-10). Instructions on how to apply to be a CRS community are also included.

To obtain this resource: visit <http://www.fema.gov>, call 1-(800)480-2520, or call the CRS office in Indianapolis at (317) 848-2898.

Floodplain Management: A Local Floodplain Administrator's Guide to the NFIP. FEMA-Region 10. Bothell, WA: FEMA

This document discusses floodplain processes and terminology. It contains floodplain management and mitigation strategies, as well as information on the NFIP, CRS, CAVs and floodplain development standards.

To obtain this resource: call FEMA at (800)480-2520.

Flood Hazard Mitigation Planning: A Community Guide. Massachusetts Department of Environmental Management. (June 1997)

This informative guide offers a ten-step process for successful flood hazard mitigation. Steps include: map hazards, determine potential damage areas, take an inventory of facilities in the flood zone, determine what is or is not being done about flooding, identify gaps in protection, brainstorm alternatives and actions, determine feasible actions, coordinate with others who are doing this, prioritize actions, develop strategies for implementation, and adopt and monitor the plan.

To obtain this resource: You may download an electronic version at <http://www.magnet.state.ma.us/dem/programs/mitigate/guide.htm>. For a hard copy of this guidebook contact the Massachusetts Flood Hazard Management Program (FHMP) at (617) 626-1250.

Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials. FEMA-116. (Feb 1987)

This guidebook offers a table on actions that communities can take to reduce flood losses. It also offers a table with sources for floodplain mapping assistance for the various types of flooding hazards. There is information on various types of flood hazards with regard to existing mitigation efforts and options for action (policy and programs, mapping, regulatory, non-regulatory). Types of flooding which are covered include alluvial fan, areas behind levees, areas below unsafe dams, coastal flooding, flash floods, fluctuating lake level floods, ground failure-triggered by earthquakes areas, ice jam flooding and mudslides.

To obtain this document: call FEMA at 1-800-480-2520.

Oregon Model Flood Damage Prevention Ordinance. FEMA/DLCD. (Jan 1999)

This is an example of how to write an ordinance that complies with NFIP/ FEMA standards. Communities can simply adopt this ordinance, word for word, filling in the blanks specific to their community or jurisdiction.

To obtain this resource: A copy of this ordinance is on the DLCD's website: www.lcd.state.or.us or contact the Oregon DLCD for more information, (503) 373-0050.

Secondary Resources

These documents provide additional information and tools for reducing the risks associated with flood prone areas.

Answers to Questions About Substantially Damaged Buildings. FEMA-213. (May 1991)

Answers to Questions About the National Flood Insurance Program. FIA-2. (March 1992)

Community Flood Mitigation Planning Guidebook. Wisconsin Department of Natural Resources. (Nov 1995)



Tip Box

The Oregon Floodplain Coordinator has:

- FEMA elevation certificates and other forms
- Technical assistance and public outreach materials
- Data on the number of insurance policies in your community
- Oregon's model floodplain development ordinance and examples of other regulatory language

Cities Under Water. Raymond J. Burby. (1988) University of Colorado Institute of Behavioral Science.

Floodplain Management in Northern Illinois. Illinois Department of Natural Resources. (December 1996)

Homeowners Guide to Retrofitting. FEMA-312. (1998)

How to Use a Flood Map to Protect Your Property. FEMA-258. (May 1995)

Manufactured Home Installation in Flood Hazard Areas. FEMA-85 (September 1985).

Technical Resources

The documents listed here focus on the technical aspects of flood hazard mitigation. They may require interpretation by a technical specialist.

Engineering Principles and Practices for Retrofitting Flood Prone Residential Buildings. (1995)

Managing Floodplain Development in Approximate Zone A Areas- A Guide for Obtaining and Developing Base (100-year) Flood Elevations. FEMA-265. (July 1995)

6.4 Internet Resources

The National Flood Insurance Program

<http://www.fema.gov/nfip>

The National Flood Insurance Program (NFIP) Web site is a subsection of the Federal Emergency Management Agency (FEMA) site (<http://www.fema.gov>). The NFIP information is intended for both the general public and the many organizations and agencies participating in the program. It includes much information about the NFIP and other flood disaster assistance available from the federal government. It also provides access to the newly revised NFIP booklet: Answers to Questions about the National Flood Insurance Program.

The Association of State Floodplain Managers

<http://www.floods.org>

The Association of State Floodplain Managers (ASFPM) is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning, and recovery. ASFPM fosters communication among those responsible for flood hazard activities, provides technical advice to governments and other entities about proposed actions or policies that will affect flood hazards, and encourages flood hazard research, education, and training. The ASFPM web site includes information on how to become a member, the organization's constitution and bylaws, directories of officers and committees, a publications list, information on upcoming conferences, a history of the association, and other useful information and Internet links.

USGS Water Resources

<http://water.usgs.gov>

<http://water.usgs.gov/public/realtime.html>

This page offers current U.S. water news; extensive current (including real-time) and historical water data; numerous fact sheets and other publications; various technical resources; descriptions of ongoing survey water programs; local water information; and connections to other sources of water information.

Office of Hydrology, National Weather Service

<http://www.nws.noaa.gov/oh>

<http://www.nws.noaa.gov/oh/hic/>

The National Weather Service's Office of Hydrology (OH) and its Hydrological Information Center offer information on floods and other aquatic disasters. This site offers current and historical data including an archive of past flood summaries, information on current hydrologic conditions, water supply outlooks, and an Automated Local Flood Warning Systems Handbook, Natural Disaster Survey Reports, and other scientific publications on hydrology and flooding.

The Floodplain Management Association

<http://www.floodplain.org>

The Floodplain Management Web site was established by the Floodplain Management Association (FMA) to serve the entire floodplain management community. It includes full-text articles, a calendar of upcoming events, a list of positions available, an index of publications available free or at nominal cost, a list of associations, a list of firms and consultants in floodplain management, an index of newsletters dealing with flood issues (with hypertext links if available), a section on the basics of floodplain management, a list of frequently asked questions (FAQs) about the Web site, and, of course, a copious catalog of Web links.

Northwest Regional Floodplain Managers Association (NORFMA)

<http://www.norfma.org/>

This site is a resource for floodplains, fisheries and river engineering information for the Northwest. This site provides technical information, articles and Internet links in the field of floodplain and fisheries management.

FEMA's List of Flood Related Web Sites

<http://www.fema.gov/nfip/related.htm>

This site contains a long list of flood related Internet sites from "American Heritage Rivers" to "The Weather Channel," and is a good starting point for flood information on the Internet.

HazLit Database (Univeristy of Colorado, Boulder)

<http://www.colorado.edu/hazards/litbase/hazlit.htm>

The Natural Hazards Research and Applications Information Center at the University of Colorado, Boulder provides this library, which houses one of the most extensive collections of social science hazards literature in the world. This non-lending library is an important resource for practitioners who need information on different aspects of hazards and disasters. The collection includes approximately 22,000 catalogued items, including books, serials, reports, journal articles, videotapes, and compact discs. The database is comprehensive and is an excellent resource for communities looking for information on hazards.

Planning for Natural Hazards: Reviewing your Comprehensive Plan



Coordination and consistency is essential to implementing plan policies that reduce flood risk within your community. Your community should ask the following questions in reviewing your comprehensive plan to assist you in identifying resources to strengthen plan policies and implementing regulations:

- Have you made use of technical information and assistance provided by agencies to assist your community in planning for flood hazards?
- What documents or technical assistance does your community need to find to further understanding of flood hazards and begin the process of assessing community risk from flood hazards?

Flood Endnotes:

- ¹ Federal Emergency Management Agency Virtual Library, Backgrounder: Floods and Flash Floods, <http://www.fema.gov/library/flood.htm> (March 2000)
- ² Oregon Cascades West Council of Governments. (Nov 1996) Cascade West Region of Oregon and the February Flood of 1996.
- ³ (ibid.)
- ⁴ (ibid.)
- ⁵ State Hazard Mitigation Plan. The Interagency Hazards Mitigation Team, (2000) Oregon State Police - Office of Emergency Management.
- ⁶ (ibid.)
- ⁷ (ibid.)
- ⁸ (ibid.)
- ⁹ Federal Emergency Management Agency Virtual Library, Backgrounder: Floods and Flash Floods, <http://www.fema.gov/library/flood.htm> (March 2000)
- ¹⁰ Multi Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy. Federal Emergency Management Agency. (1997)
- ¹¹ State Hazard Mitigation Plan. The Interagency Hazards Mitigation Team, (2000) Oregon State Police - Office of Emergency Management.

- ¹² Murray, Joseph. Personal Interview. Feb 9,2000.
- ¹³ State Hazard Mitigation Plan. The Interagency Hazards Mitigation Team, (2000)
Oregon State Police - Office of Emergency Management.
- ¹⁴ Federal Emergency Management Agency Virtual Library, Backgrounder: Floods and Flash Floods, <http://www.fema.gov/library/flood.htm> (March 2000)
- ¹⁵ State Hazard Mitigation Plan. The Interagency Hazards Mitigation Team, (2000)
Oregon State Police - Office of Emergency Management.
- ¹⁶ (1987) Federal Emergency Management Agency. Reducing Losses in High Risk Flood Hazard Areas- A Guidebook for Local Officials.
- ¹⁷ State Hazard Mitigation Plan. The Interagency Hazards Mitigation Team, (2000)
Oregon State Police - Office of Emergency Management.
- ¹⁸ (ibid.)
- ¹⁹ Murray, Joseph. Personal Interview. Feb 9,2000
- ²⁰ State Hazard Mitigation Plan. The Interagency Hazards Mitigation Team, (2000)
Oregon State Police - Office of Emergency Management.
- ²¹ (ibid.)
- ²² (ibid.)
- ²³ (ibid.)
- ²⁴ (ibid.)
- ²⁵ Federal Emergency Management Agency, Region 10. Floodplain Management: a Local Administrator's Guide to the National Flood Insurance Program. (no date on document)
- ²⁶ State Hazard Mitigation Plan. The Interagency Hazards Mitigation Team, (2000)
Oregon State Police - Office of Emergency Management.
- ²⁷ Code of Federal Regulations. 44CFR59.1
- ²⁸ Federal Emergency Management Agency, Region 10. Floodplain Management: a Local Administrator's Guide to the National Flood Insurance Program. (no date on document)
- ²⁹ Kincaid, Nancy. Personal Interview. 27 April 2000
- ³⁰ Beier, Ann. Personal Interview. 27 April 2000.
- ³¹ (ibid.)
- ³² Oregon Cascades West Council of Governments. (Nov 1996) Cascade West Region of Oregon and the February Flood of 1996.
- ³³ The 100 Year Flood Myth. FEMA , Region 10. Date Unknown.
- ³⁴ Last Update: 24 April 2000. <<http://www.fema.gov/nfip/readmap.htm>> (10 May 2000)
- ³⁵ Multi Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy. Federal Emergency Management Agency. (1997)
- ³⁶ State Hazard Mitigation Plan. The Interagency Hazards Mitigation Team, (2000)
Oregon State Police - Office of Emergency Management.
- ³⁷ (ibid.)
- ³⁸ Beier, Ann. Personal Interview. 23 May 2000
- ³⁹ Last update 24 April 2000. <<http://www.fema.gov/nfip/readmap.htm>> (10 May 2000)
- ⁴⁰ Oregon's Statewide Land-Use Planning Goals and Guidelines. (1995) Oregon Department of Land Conservation and Development.
- ⁴¹ (ibid.)
- ⁴² Oregon Removal-Fill Permit Program Brochure. Division of State Lands.
- ⁴³ Beier, Ann. Personal Interview. 23 May 2000
- ⁴⁴ Collins, Peggy, Personal Interview. 10 May 2000
- ⁴⁵ Federal Emergency Management Agency National Flood Insurance Program (NFIP), <http://www.fema.gov/nfip> (March 2000)

- ⁴⁶ (ibid.)
- ⁴⁷ (ibid.)
- ⁴⁸ (ibid.)
- ⁴⁹ Beier, Ann. Personal Interview. 15 May 2000.
- ⁵⁰ Army Corps of Engineers Regulatory Permit Program Brochure. (1989) United States Army Corps of Engineers.
- ⁵¹ Beier, Ann. Personal Interview. 23 May 2000
- ⁵² Fancey Mark. Personal Interview. 27 April 2000
- ⁵³ Tools and Techniques for Land-use Planning- DRAFT. (1998) Brower, David. State of North Carolina.
- ⁵⁴ (ibid.)
- ⁵⁵ (ibid.)
- ⁵⁶ (ibid.)
- ⁵⁷ Fancey Mark. Personal Interview. 27 April 2000
- ⁵⁸ Land-Use Planning in Oregon. Rohse, Mitch, (1987) Oregon State University Press.
- ⁵⁹ (ibid.)
- ⁶⁰ (ibid.)
- ⁶¹ Washington State Statutes, Chapter 86.16, "Floodplain Management", section 86.16.041.
- ⁶² Beier, Ann. Personal Interview. 23 May 2000
- ⁶³ Governor's Watershed Enhancement Board. <www.4sos.org/group/gweb.html>
- ⁶⁴ Tools and Techniques for Land-use Planning-DRAFT. (1998) Brower, David State of North Carolina.
- ⁶⁵ Kincaid, Nancy. Personal Interview.
- ⁶⁶ Beier, Ann. Personal Interview. 4 Feb 2000.
- ⁶⁷ Kincaid, Nancy. Personal Interview. 27 April 2000.
- ⁶⁸ Tools and Techniques for Land-use Planning. Brower, David State of North Carolina.
- ⁶⁹ Kincaid, Nancy; Beier, Ann; & Fancey, Mark. Personal Interview. 27 April 00
- ⁷⁰ Tools and Techniques for Land-use Planning. Brower, David State of North Carolina.
- ⁷¹ (ibid.)
- ⁷² Federal Emergency Management Agency Hazard Mitigation Grant Program, <http://www.fema.gov/mit/grant.htm> (March 2000)
- ⁷³ Federal Emergency Management Agency Flood Mitigation Assistance Program, <http://www.fema.gov/mit/fldmitast.htm#fludmit> (March 2000)
- ⁷⁴ National Resources Conservation Service (NRCS) <http://www.or.nrcs.usda.gov> (May 2000)
- ⁷⁵ Governor's Watershed Enhancement Board. <http://www.4sos.org/group/gweb.html> (March 2000)
- ⁷⁶ Olson, Dennis. Personal Interview. 15 May 2000.
- ⁷⁷ Federal Emergency Management Agency. <http://www.fema.gov> (March 2000)
- ⁷⁸ Murray, Joseph. Personal Interview. 9 Feb 2000.