

# Tillamook County Natural Hazards Code and Program Review



September 2016

Final Report (rev. March 2017)

**Prepared for:**

Tillamook County, Oregon Risk MAP,  
and Federal Emergency Management Agency

**Prepared by:**

Community Service Center

<http://csc.uoregon.edu/>



## **SPECIAL THANKS AND ACKNOWLEDGEMENTS**

The Community Service Center (CSC) developed this Natural Hazards Code and Program Review for Tillamook County through a contract with the Federal Emergency Management Agency. FEMA awarded the contract to support the implementation of the Risk Mapping Assessment and Planning (Risk MAP) data and analysis efforts into the county's regulatory and non-regulatory planning processes. Elements of the Risk MAP process will be used to support ongoing risk assessment activities in the county as well as other emergency management related activities including mitigation, recovery, emergency operations and emergency preparedness. The CSC thanks Bryan Pohl (Community Development Director) and Sarah Absher (Senior Planner) for their assistance with this project.

### **Community Service Center Team**

Michael Howard, OPDR Assistant Program Director  
Josh Bruce, OPDR Program Director  
Ethan Lockwood, Research Assistant  
Madi Pluss, Research Assistant  
Ethan Stuckmayer, Research Assistant

### **About the Community Service Center**

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

### **About the Oregon Partnership for Disaster Resilience**

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

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# CHAPTER I: INTRODUCTION

This report includes analysis of the Tillamook County Comprehensive Plan and Development Code, how they are interpreted and applied to development, and the implications for natural hazard preparedness. Case studies and model ordinances providing examples of natural hazard best management practices are used to support the report's recommendations.

## Background

The Federal Emergency Management Agency (FEMA) invited the Community Service Center's (CSC) Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon to become a Cooperating Technical Partner (CTP) and to work under a FEMA grant funded by the Risk Mapping Assessment and Planning (Risk MAP) program. Parallel to this process the Oregon Department of Geology and Mineral Industries (DOGAMI) is developing natural hazard risk assessments for Tillamook County and cities (Tillamook Multi-Hazard Risk Report, 2016 draft; Risk Report). The Risk Report has two goals: *"(1) to provide a quantitative risk assessment that informs communities of their risks related to certain natural hazards, and (2) interpret the results to identify specific mitigation opportunities (i.e., areas of mitigation interest) that the communities can act upon."*<sup>1</sup>

Consistent with Oregon Statewide Planning Goal 7 (Hazards), the Tillamook County Development Code includes provisions that aim to protect life and property from natural disasters and hazards. Tillamook County has contracted with the University of Oregon's Community Service Center (CSC) to conduct a review of the Tillamook County Development Code, focusing on supplementing and strengthening code associated with natural hazard mitigation.

The CSC team will integrate the non-regulatory Tillamook Multi-Hazard Risk Report (2016, draft) with on-the-ground planning efforts in Tillamook County. This report provides recommendations for policies, regulations, and programs that will help mitigate financial loss and injury associated with floods, tsunamis, landslides, coastal erosion, wildfires, and sand inundation. Ultimately the recommendations in this report will be used to inform a public process that will lead to comprehensive plan and code updates.

## Purpose and Methods

The purpose of this report is to identify and review a range of regulatory and non-regulatory standards that can be utilized by Tillamook County to mitigate the risk of natural hazards impacting the region. This report includes potential code language

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<sup>1</sup> DOGAMI, "Multi-Hazard Risk Report for Tillamook County including the Cities of Bay City, Garibaldi, Manzanita, Nehalem, Rockaway Beach, Tillamook, Wheeler & Unincorporated Communities of Neskowin, Oceanside, Netarts, and Pacific City." (Final Draft - December 1, 2016)

from model ordinances and other sources, but review and adoption of code revisions is not within the scope of this project.

To develop recommendations, CSC evaluated related case studies, ordinances, model codes, literature, best practices, and programs implemented by other jurisdictions. To be most applicable, the reviews are based on examples of comparable geography and demographics. The final mitigation strategies reflect a spectrum of regulation, ranging from highly controlled ordinances and strict permitting procedure, to non-regulatory programs that reward best practices. Implementation steps and recommendations are provided within Chapter 10 to summarize the results of our research and present implementation steps for consideration.

## Organization of Report

**Chapter 2: Strategies for Mitigating Risk** provides an overview of the nature of risks related to development in hazardous areas.

**Chapter 3: Flooding Hazards** identifies the extent of the hazard in relation to development patterns, summarizes existing tsunami planning in the county, discusses model ordinances, and presents policy options to strengthen the Tillamook County Development Code as it relates to flood hazard.

**Chapter 4: Tsunami Hazards** identifies the extent of the hazard in relation to development patterns, summarizes existing tsunami planning in the county, discusses model ordinances, and presents policy options to strengthen the Tillamook County Development Code as it relates to tsunami hazard.

**Chapter 5: Landslide Hazards** identifies the extent of the hazard in relation to development patterns, summarizes existing tsunami planning in the county, discusses model ordinances, and presents policy options to strengthen the Tillamook County Development Code as it relates to landslide hazard.

**Chapter 6: Coastal Erosion Hazards** identifies the extent of the hazard in relation to development patterns, summarizes existing coastal erosion planning in the county, discusses model ordinances, and presents policy options to strengthen the Tillamook County Development Code as it relates to coastal erosion hazard.

**Chapter 7: Wildfire Hazards** identifies the extent of the hazard in relation to development patterns, summarizes existing coastal erosion planning in the county, discusses model ordinances, and presents policy options to strengthen the Tillamook County Development Code as it relates to wildfire hazard.

**Chapter 8: Sand Inundation Hazards** identifies the extent of the hazard in relation to development patterns, summarizes existing dune migration planning in the county, discusses model ordinances, and presents policy options to strengthen the Tillamook County Development Code as it relates to sand inundations hazards.

**Chapter 9: Multiple Hazards** identifies mitigation strategies that apply to multiple hazards.

**Chapter 10: Recommendations and Implementation** presents implementation strategies for each specific hazard and provides direction to move project forward.

**Appendix A** contains case studies that informed and strengthened the policy options recommended in this report.

## CHAPTER 2: MULTI-HAZARD FRAMEWORK

### The Federal Policy and Program Framework

#### Federal Emergency Management Agency

The pre-disaster mitigation role of the Federal Emergency Management Agency (FEMA) is to provide support and assistance to all communities across the nation to preemptively mitigate and respond to emergencies. FEMA offers financial assistance in the form of grant money through a variety of general and hazard specific programs and grants. The primary grant programs include the Hazard Mitigation Grant Program (HMGP)<sup>2</sup> for long-term hazard mitigation following a major disaster, Pre-Disaster Mitigation (PDM)<sup>3</sup> for hazard mitigation planning and projects, and Flood Mitigation Assistance (FMA)<sup>4</sup> for projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP).

#### Risk Mapping, Assessment, and Planning (Risk MAP)

Risk Mapping, Assessment, and Planning (Risk MAP) is the Federal Emergency Management Agency (FEMA) Program that provides communities with information and tools they can use to enhance their mitigation plans and take action to better protect their citizens. Through more precise mapping products, risk assessment tools, and planning and outreach support, Risk MAP strengthens local ability to make informed decisions about reducing risk. Through collaboration with State, Tribal, and local entities, Risk MAP delivers quality data that increases public awareness and leads to action that reduces risk to life and property.

#### Disaster Mitigation Act

The Disaster Mitigation Act of 2000 is an amendment to the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1998. This amendment made the existing requirement for states to have natural hazard mitigation plans a prerequisite for disaster assistance. Additionally, incentive was provided in the form of additional funding for states that enhanced coordination and integration of state, local, and tribal natural hazards planning.

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<sup>2</sup> "Hazard Mitigation Grant Program." Federal Emergency Management Agency. Available at: <https://www.fema.gov/hazard-mitigation-grant-program>

<sup>3</sup> "Pre-Disaster Mitigation Grant Program." Federal Emergency Management Agency. Available at: <https://www.fema.gov/pre-disaster-mitigation-grant-program>

<sup>4</sup> "Flood Mitigation Assistance Grant Program." Federal Emergency Management Agency. Available at: <https://www.fema.gov/flood-mitigation-assistance-grant-program>

## **National Marine Fisheries Service and Endangered Species Act**

For several years, the National Oceanic and Atmospheric Administration Fisheries Service (NOAA-Fisheries) and FEMA have been working together to identify measures that will reduce negative impacts from the National Flood Insurance Program minimum standards on salmon, steelhead and other species listed under the Endangered Species Act (ESA). This will become even more important as Oregon and Tillamook County face extreme weather events and other challenges due to a changing climate.

On April 14th, 2016, the National Marine Fisheries Service (NMFS) delivered a Biological Opinion (BiOp) to FEMA. Based on the BiOp, FEMA will be setting new minimum requirements for local floodplain development ordinances based on federal requirements to protect endangered species. The “Reasonable and Prudent Alternative” contains six elements that are designed to achieve these outcomes.

After having been sued, FEMA must now consult with the NMFS or the U.S. Fish and Wildlife Service (USFWS) and get approval of compliance for any programs that may impact endangered species listed as under the Endangered Species Act (ESA). The lawsuit deals with certain policies that FEMA promotes, specifically policies regarding development in their Special Flood Hazard Areas (SFHA), can negatively impact certain endangered species.

## **The State Policy and Program Framework**

### **Oregon Statewide Planning Goals**

Planning for natural hazards is an integral element of Oregon’s statewide land use planning program that began with the passage of Senate Bill 100 in 1973. All Oregon counties and cities are required to have comprehensive plans and implementing ordinances that comply with the 19 statewide planning goals that direct the state’s policies on land use issues.

The Department of Land Conservation and Development (DLCD) administers the state land use planning program and is responsible for reviewing local comprehensive plans for consistency with the 19 statewide goals.

### **Goal 7: Areas Subject to Natural Hazards**

Goal 7 calls for local plans to include inventories, policies, and ordinances to guide development in, or away from, hazard areas to protect life and property. Natural hazards considered for purposes of Goal 7 are: wildfires, floods (coastal and riverine), landslides, earthquakes, tsunamis, and coastal erosion. Local governments may identify and plan for other natural hazards as they apply.

### **Goal 17: Coastal Shorelands**

Goal 17 calls for local plans to reduce the hazard to human life and property resulting from the use and enjoyment of Oregon’s coastal shorelands. Land use

plans and implementing actions and permit reviews are to include consideration of the critical relationships between coastal shorelands and resources of coastal waters, and of the geologic and hydrologic hazards associated with coastal shorelands.

## **Goal 18: Beaches and Dunes**

Goal 18 calls for local plans to reduce the hazard to human life and property from human-induced actions in coastal beach and dune areas. These plans must be designed to conserve, protect, where appropriate develop, and where appropriate restore the resources and benefits of coastal beach and dune areas.

## **Oregon Department of Geology and Mineral Industries**

The mission of the Oregon Department of Geology and Mineral Industries (DOGAMI) is to provide earth science information and regulation to make Oregon safe and prosperous. DOGAMI produces maps and reports that can be used by the public and by government to reduce the loss of life and property due to geologic hazards and to manage geologic resources. DOGAMI produces hazard maps associated with earthquakes, flooding, landslide and debris flows, volcanic eruptions, and coastal geologic hazards including coastal erosion and tsunami. Utilization and incorporation of these maps into planning documents and development codes is left to the individual counties and communities.

## **Overview of Natural Hazards in Tillamook County**

Tillamook's unique geographic setting increases the county's vulnerability to geophysical, coastal, and inland hazards. Flood, tsunami, landslide, wildfire, and coastal erosion are assessed in the Tillamook Multi-Hazard Risk Report (2016 draft). Sand inundation also impacts portions of Tillamook County and is assessed in this report. Understanding the causes, characteristics, and consequences associated with each hazard will inform the best set of options on how to mitigate impacts to future development. The following table provides a synthesis of each hazards impact on Tillamook County from the Risk Report and provides a hazard score based on the county's most recent hazard vulnerability assessment (1 = hazard of higher concern, 8 = hazard of lower concern).<sup>5</sup> For local governments, conducting the hazard vulnerability assessment is a useful step in planning for hazard mitigation, response, and recovery. The method provides a set of hazard priorities, but does not predict the occurrence of a hazard. Coastal erosion and dune migration were not analyzed as part of the hazard vulnerability assessment and therefore are listed as unranked. For more detailed information on each of the profiled natural hazards see the hazard specific chapters of this report and the Risk Report.

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<sup>5</sup> Tillamook County Natural Hazards Mitigation Plan (draft, 2017), "Local Risk Assessment".

**Table I: Tillamook County Natural Hazard Impacts & Risk Assessment**

Hazard	Scenario	Potential Displaced Residents	Exposed Buildings	Exposed Essential Facilities	Exposure Value (In Millions)	Hazard Score (Ranking)
Flood	1% Annual Chance*	1,322	1,999	5	\$26	223 (#3)
Coastal Erosion	High Hazard**	156	609	0	\$117	204 (#4)
Landslide	High and Very High Susceptibility***	7,121	7,906	12	\$779	169 (#6)
Tsunami	CSZ M9.0—Medium****	2,310	5,167	6	\$561	158 (#7)
Wildfire	High Risk*****	590	565	2	\$48	61 (#8)
Sand Inundation	-	-	-	-	-	Unranked

Source: Tillamook County Multi-Hazard Risk Report (2016, draft)

\* The flooding 1% annual chance represent the effects of the maximum flood event expected to occur once every hundred years.

\*\* The coastal erosion high hazard zone was determined using the DOGAMI Open-File Report O-14-02, Evaluation of erosion hazard zones for the dune-backed beaches of Tillamook County, Oregon.

\*\*\* The landslide high and very-high susceptibility zones were determined by the Landslide Susceptibility Index, DOGAMI open-file report O-16-02

\*\*\*\* The tsunami CSZ Mag 9.0, medium, refers to a tsunami resulting from a Cascadia Subduction Zone magnitude 9 earthquake event.

\*\*\*\*\* The wildfire high risk area was determined using the West Wide Wildfire Risk Assessment (WWA) database. The Tillamook Risk Report notes this methodology may underestimate the risk of wildfire within the county.

## Climate Change

Research has shown that sea level and wave heights along the coast are rising and increased landslides, coastal erosion, and coastal flooding is predicted.<sup>6</sup> Warmer winter temperatures are causing decreases in mountain snowpack and an increased incidence of drought and wildfire are expected. An increase in extreme precipitation is projected for areas of Coastal Oregon and can result in a greater risk of flooding in certain basins, including an increased incidence of magnitude and return intervals. Landslides in Oregon are strongly correlated with rainfall, so increased rainfall, particularly extreme events, will likely trigger more landslides.

Overall, climate change forces communities to reconsider their long held belief that the past natural hazard trends sufficiently predict future natural hazards. As the climate shifts floodplain boundaries will change, new areas of coast may begin to erode, and existing hazard may change in frequency and magnitude.

<sup>6</sup> Northwest Climate Assessment Report (NWCAR, 2013) <http://occri.net/reports>

# Strategies for Risk Mitigation: Regulatory and Non-Regulatory

Programs and policies discussed in this report can be divided into two major subgroups: regulatory (non-voluntary), or non-regulatory (voluntary). This section describes the functional differences between regulatory and non-regulatory risk mitigation strategies and provides a high-level summary of strategies currently employed by Tillamook County.

## Regulatory

Regulatory strategies are written instruments containing enforceable rules. They create and constrain rights, duties, and responsibilities. In the case of the Tillamook County Land Use Ordinance, developments within County jurisdiction must gain regulatory approval and abide by the constraints put forth within. Enforcement can be either proactive – requiring a development plan to meet certain standards before construction may begin; or reactive – requiring an inspector to ensure that a development is compliant with relevant regulations.

The broad goal of development codes is to protect the public health, safety and welfare and to provide developers and landowners with transparent rules that reduce the risks associated with development in natural hazard areas. Regulatory natural hazards mitigation strategies discussed in this report are enforceable elements of the Tillamook County Land Use Ordinance that dictate the location and characteristics of future development activity.

Regulatory policy options presented in this report are based upon model ordinances, best practices, and case studies, and relevant sections of development codes from jurisdictions that have addressed natural hazard risks similar to those of Tillamook County.

## The Role of Land Use Planning in Hazard Mitigation

Land use planning guides and regulates land use so as to ensure land development is efficient, ethical, and prevents conflicts. By regulating the actions of property owners and developers, land use planning has a decisive influence on development patterns. Often, the most desirable lands for residential development are also the most hazardous. Development along coastal lands is popular for its favorable views and convenient water access. However, it places homes at a greater risk for flood, coastal erosion, strong wind, and tsunami damage. Likewise, forest-urban interface areas are ideal for residents seeking privacy and access to wooded areas, but there is an elevated risk of wildfire and landslide damage.

Land use planning can shape development in ways that mitigate risk by prescribing regulatory provisions to types of land that are exposed to the risks of natural hazards. Development codes can prohibit development in dangerous locations or regulate development in a manner that minimizes risk.

A key consideration is that land use plans and their implementing ordinances come into effect at the time of a land use action. The implication is that they only apply

to development that is subject to the regulation. Most ordinances do not apply retroactively; existing uses are “grandfathered” in and are often not subject to new regulation.

## Non-Regulatory

Non-regulatory tools serve as guidance rather than law, and they are often used to complement regulatory policies. These tools rely on voluntary efforts and public support. They can increase awareness and buy-in to programs and are often developed to increase the effectiveness of regulations through education, outreach, incentives, or interagency coordination.

Non-regulatory strategies to mitigate natural hazards are not dependent upon government oversight, but are achieved primarily through public and community participation. Non-regulatory strategies may rely on the county government for financial and structural support.

## Natural Hazards Mitigation Plan

Natural Hazards Mitigation Plans are a planning requirement for local governments to access funds from the Disaster Mitigation Act of 2000. State natural hazard mitigation plans are required before local governments can access federal funds. Oregon completed a statewide hazard mitigation plan that was last amended and adopted in 2015. Tillamook County last updated their natural hazards mitigation plan in 2012 and is currently in an update process. Although the plan is required for pre-disaster funding, its contents are non-regulatory in nature. Rather, it sets forth voluntary goals, objectives, and actions that can increase disaster preparedness or decrease recovery time.

The aim of the NHMP is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the county towards building a safer, more disaster resistant community. The NHMP is intended to serve many purposes.

The actions described in the NHMPs are designed for implementation through existing plans and programs within each jurisdiction.

## Policy Options Matrix

The following matrices list each policy option listed in this document, with a condensed breakdown of applicable county code, a description of the policy option, and the issues each policy option addresses.

**Table 2: Flood Policy Options Matrix**

Comprehensive Plan			
Policy Option	Applicable Code	Implication	Implementation
Provide stronger policy language related to the use of Wetlands as a flood conveyance option	Goal 5, Section 1.3b.3 Wetlands	Including language stating that the County intends to keep wetlands clear of development, fill, and obstructions, future flooding events can be better mitigated.	Include in Tillamook County's Comprehensive Plan Update Process
Update Finding and Policies section of Goal 7 to reflect data and findings from new FIRM/FIS and Risk Report	Goal 7, Section 2.5 Flood Findings and Policies	Preliminary Flood Insurance Rate Maps (FIRM)/ Flood Insurance Study (FIS) for the county will be available in summer 2016. The FIS and FIRMs are expected to become effective in Fall 2017. Comprehensive Plan and Flood Ordinance updates to reflect the updated FIS and FIRMs should follow.	Include in Tillamook County's Comprehensive Plan Update Process
Adopt Policies and Findings that result from NMFS Biological Opinion and DLCD model language related to National Flood Insurance Program	Goal 17, Section 4.2 Shoreland Development	Based on the BiOp, FEMA will be setting new minimum requirements for local floodplain development ordinances based on federal requirements to protect endangered species.	Tillamook County should work closely with FEMA, the Department of Land Conservation and Development (DLCD), and NMFS to understand and enforce standards set forth by this policy change. DLCD expects to provide guidance and model codes and to provide technical assistance.
Land Use Ordinance			
Effectuated Areas/Communities	Neskowin and Pacific City		
Policy Option	Applicable Code	Implication	Implementation
Update Land Use Ordinance Methods Language	Section 3.510 Flood Hazard Overlay Zone (FH)	CPW recommends adding a methods section in order to provide more detail related to the rationale for development standards and an overview of mitigation strategies.	Amend Flood Hazard Overlay standards in Tillamook County Land Use Ordinance
Adopt updated FIRM/FIS	Section 3.510(2) Flood Hazard Overlay Zone (FH)	Preliminary Flood Insurance Rate Maps (FIRM)/ Flood Insurance Study (FIS) for the county will be available in summer 2016. The FIS and FIRMs are expected to become effective in Fall 2017. Comprehensive Plan and Flood Ordinance updates to reflect the updated FIS and FIRMs should follow.	Review updated FIRM/FIS beginning in late 2016. Adopt updated version in 2017.
Cumulative Substantial Improvements	Section 3.510(4) Flood Hazard Overlay Zone (FH)	Currently substantial improvement is calculated cumulatively over a five-year period. Increasing the calculation period to ten years may provide additional assurance that improved structures are flood resistant (the CRS allocates 20 points for such a policy).	Amend Flood Hazard Overlay standards in Tillamook County Land Use Ordinance
Development Limitation - Use of Fill	Section 3.510(13)(b) Flood Hazard Overlay Zone (FH)	Tillamook County currently discourages the use of fill in the Flood Hazard Zone but will still allow its use under certain conditions. By fully prohibiting the use of fill in the flood hazard areas, communities can earn up to 280 points.	Amend Flood Hazard Overlay standards in Tillamook County Land Use Ordinance
Development Limitation - Prohibition of Building Types	Section 3.510(13)(b) Flood Hazard Overlay Zone (FH)	Prohibition of buildings within the floodplain is the highest regulatory practice the County can take to limit the risk to life and property from flooding. CRS awards 1,000 points to communities that place Development Limitations to prohibit all buildings within the floodplain, points are prorated if a jurisdiction prohibits some development, such as residences.	Amend Flood Hazard Overlay standards in Tillamook County Land Use Ordinance
Development Limitation - Protection of Critical Facilities	Section 3.510(13)(b) Flood Hazard Overlay Zone (FH)	Tillamook County currently does not include a provision for the protection of critical facilities. Protection of critical facilities from flood damage awards 80 points. For CRS credit purposes, critical facilities are defined in Section 120 of the CRS Coordinator's Manual.	Amend Flood Hazard Overlay standards in Tillamook County Land Use Ordinance
Development Limitation - Enclosure Limits	Section 3.510(13)(b) Flood Hazard Overlay Zone (FH)	Prohibit the enclosure of property below base flood elevation, particularly in V-zones.	Amend Flood Hazard Overlay standards in Tillamook County Land Use Ordinance

Source: Community Service Center

**Table 3: Tsunami Policy Options Matrix**

Comprehensive Plan			
Policy Option	Applicable Code	Implication	Implementation
Update Finding section of Goal 7 to reflect data and finding from the Risk Report	Goal 7, Section 2.6 Tsunami (Seismic Waves) Findings and Policies	Provide Findings that reflect current science on tsunami in unincorporated Tillamook County	Include in Tillamook County's Comprehensive Plan Update Process
Include additional Policies within Goal 7 to reflect proposed Tsunami Hazard Overlay Zone	Goal 7, Section 2.6 Tsunami (Seismic Waves) Findings and Policies	Utilize the Comprehensive Plan to inform the process of development standards to be implemented in the Land Use Ordinance	Include in Tillamook County's Comprehensive Plan Update Process
Land Use Ordinance			
Effectuated Areas/Communities	Neskowin and Pacific City		
Policy Option	Applicable Code	Implication	Implementation
Create a new Tsunami Hazard Overlay Zone	3.500 Tsunami Hazard Overlay Zone (proposed)	There is currently no mitigation policy or standards directly related to tsunami in the Tillamook County Land Use Ordinance. The creation of a Tsunami Hazard Overlay, not only provides citizens with standards to use to protect them from tsunami inundation but also raises awareness of the risks associated with developing in a tsunami inundation area.	Use the DLCD Tsunami Land Use Guide's model ordinance to create the standards for the new Tsunami Hazard Overlay.
Require a Tsunami Hazard Development Permit	3.500 Tsunami Hazard Overlay Zone (proposed)	A Tsunami Hazard Area permit provides site and development specific hazard analysis and details engineering requirements to minimize the risk posed by coastal hazards.	Require for all new development in the proposed 3.500 Tsunami Hazard Overlay Zone
Prohibit Essential/Hazardous Facilities within the Tsunami Hazard Overlay	3.500 Tsunami Hazard Overlay Zone (proposed)	By locating essential facilities outside of the Tsunami Hazard Overlay, there is a higher likelihood of these facilities being available to serve those in need post-tsunami event.	Include this provision as part of the proposed 3.500 Tsunami Hazard Overlay Zone
Allow for the use of Flexible Development Options	3.500 Tsunami Hazard Overlay Zone (proposed)	Allow for greater flexibility and encourage development designs that incorporate evacuation measures, appropriate building siting, and other features that reduce the risks to life and property from tsunami hazard.	Include this provision as part of the proposed 3.500 Tsunami Hazard Overlay Zone

Source: Community Service Center

**Table 4: Coastal Erosion Policy Options Matrix**

Comprehensive Plan			
Policy Option	Applicable Code	Implication	Implementation
Update Finding and Policies section of Goal 7 to reflect data and finding from the Risk Report	Goal 7, Section 2.4 Erosion - Findings and Policies	Provide Findings and Policies that reflect current science on coastal erosion in unincorporated Tillamook County	Include in Tillamook County's Comprehensive Plan Update Process
Update the inventory and mapping of coastal erosion to reflect the finding of the Risk Report and DOGAMI mapping efforts.	Goal 18, Beaches and Dunes Element 4 Coastal Erosion	Provide up-to-date mapping of the extent and severity of the risk posed by coastal erosion in unincorporated Tillamook County.	Include in Tillamook County's Comprehensive Plan Update Process
Land Use Ordinance			
Effectuated Areas/Communities	Neskowin and Pacific City		
Policy Option	Applicable Code	Implication	Implementation
County Wide Coastal Hazards Overlay Zone	3.500 Countywide Coastal Hazards Overlay Zone (proposed)	Provide consistent coastal hazard development regulations for all of unincorporated Tillamook County.	The overlay zone should combine the High Hazard and Medium Hazard zones from the DOGAMI OFR O-14-02 into a single regulatory trigger zone.
Coastal Hazard Area Permit	3.500 Countywide Coastal Hazards Overlay Zone (proposed)	Require a permit containing site specific analysis of natural hazards and mitigation of risks to these hazards.	Require for all new development in the proposed 3.500 Countywide Coastal Hazards Overlay Zone
Bluff-Backed Shoreline Setback	3.500 Countywide Coastal Hazards Overlay Zone (proposed)	Utilize a scientifically determined setback for bluff-backed shoreline development.	Require for all new development in the proposed 3.500 Countywide Coastal Hazards Overlay Zone
Moveable Structure Design	3.500 Countywide Coastal Hazards Overlay Zone (proposed)	Require that building design allow structures to be relocated further back or even off site in the event of significant coastal erosion.	Require for all new development in the proposed 3.500 Countywide Coastal Hazards Overlay Zone
New Infrastructure Requirement	3.500 Countywide Coastal Hazards Overlay Zone (proposed)	Require that new infrastructure be located as far inland as possible to protect it from coastal erosion.	Require for all new development in the proposed 3.500 Countywide Coastal Hazards Overlay Zone
Hazard Disclosure and County Liability Waiver	3.500 Countywide Coastal Hazards Overlay Zone (proposed)	Require property owners to acknowledge risk and to waive county liability for the effects of a natural hazard.	Require for all new development in the proposed 3.500 Countywide Coastal Hazards Overlay Zone
Safest Site Requirement	3.500 Countywide Coastal Hazards Overlay Zone (proposed)	Require that structures be located on the safest part of a site as determined by a certified engineering geologist.	Require for all new development in the proposed 3.500 Countywide Coastal Hazards Overlay Zone
Subdivision Standards	3.500 Countywide Coastal Hazards Overlay Zone (proposed)	Prevent the creation of new lots or parcels that do not contain an area of buildable land outside of high coastal hazard risk areas.	Require for all new development in the proposed 3.500 Countywide Coastal Hazards Overlay Zone
Residential Density Limitations	3.500 Countywide Coastal Hazards Overlay Zone (proposed)	Prevent new residential development in areas of preexisting development that are susceptible to high coastal hazard risk.	Require for all new development in the proposed 3.500 Countywide Coastal Hazards Overlay Zone
Erosion Control and Stormwater Management	3.500 Countywide Coastal Hazards Overlay Zone (proposed)	Provide erosion control and stormwater management standards to decrease the impact of new development on coastal erosion.	Require for all new development in the proposed 3.500 Countywide Coastal Hazards Overlay Zone

Source: Community Service Center

**Table 5: Landslide Policy Options Matrix**

Comprehensive Plan			
Policy Option	Applicable Code	Implication	Implementation
Adopt DOGAMI's landslide susceptibility index to determine the specific locations that will be impacted by regulatory landslide mitigation actions	Landslides- Findings and Policies Goal 7, 2.1	Accurately identify areas susceptible to landslide	Include during Comprehensive Plan Update process.
Land Use Ordinance			
Effectuated Areas/Communities	Oceanside/Netarts and Neskowin		
Policy Option	Applicable Code	Implication	Implementation
Geologic Hazard Overlay Zone	3.500 Geologic Hazard Overlay (proposed)	Provide consistent geologic hazard development regulations for all of unincorporated Tillamook County.	Require for all new development in the proposed 3.500 Geologic Hazards Overlay Zone
Development Requirements for Geologic Hazard Areas	3.500 Geologic Hazard Overlay (proposed)	Require a site specific analysis of geologic hazards through a geologic assessment or report.	Require for all new development in the proposed 3.500 Geologic Hazards Overlay Zone
Geologic Hazard Point-Based Assessment System	3.500 Geologic Hazard Overlay (proposed)	Provide appropriate level of site specific hazard analysis based on preexisting geologic condition and the type of development.	Require for all new development in the proposed 3.500 Geologic Hazards Overlay Zone
Buffer Zone Requirement	3.500 Geologic Hazard Overlay (proposed)	Utilize a geologic engineer to determine buffer requirements in highly susceptible areas.	Require for all new development in the proposed 3.500 Geologic Hazards Overlay Zone
Revegetation Standards	3.500 Geologic Hazard Overlay (proposed)	Provide standards for revegetation of steep slopes to mitigate increases in geologic hazard risk.	Require for all new development in the proposed 3.500 Geologic Hazards Overlay Zone
Non-Regulatory Geologic Hazard Abatement District	N/A	Provides citizens with a non-regulatory tool for protecting structures and people from the risk of geologic hazards.	Require for all new development in the proposed 3.500 Geologic Hazards Overlay Zone

Source: Community Service Center

**Table 6: Wildfire Policy Options Matrix**

Comprehensive Plan			
Policy Option	Applicable Code	Implication	Implementation
Adopt Northwest Inter-Agency Fire Prevention Group guide fire safety measures	Forest Lands Fire Protection- Goal 4, Section 4.10	Uphold stringent requirements for proposed development within the Fire zone	Include during Comprehensive Plan Update process.
Land Use Ordinance			
Effectuated Areas/Communities	Blaine, Cloverdale, Oceanside/Netarts		
Policy Option	Applicable Code	Implication	Implementation
Firewise Standards or Firewise Recognition	N/A	Provide a voluntary approach to mitigating the risk posed by wildfire	Require for all new development in the proposed 3.500 Wildfire Hazard Overlay
Wildfire Hazard Overlay	Section 3.500 Wildfire Hazard Overlay (proposed)	Provide consistent wildfire hazard development regulations for all of unincorporated Tillamook County.	Require for all new development in the proposed 3.500 Wildfire Hazard Overlay
Class A Roofing Material Requirement	Section 3.500 Wildfire Hazard Overlay (proposed)	Protect structures from wildfires by requiring the highest fire-resistance roofing material to be used for all new development	Require for all new development in the proposed 3.500 Wildfire Hazard Overlay
Road Identification and Address Marking Requirement	Section 3.500 Wildfire Hazard Overlay (proposed)	Require that building be easily locatable in the even of a wildfire event to protect people and property	Require for all new development in the proposed 3.500 Wildfire Hazard Overlay
Fire Protection Proof for Subdivision Requirement	Section 3.500 Wildfire Hazard Overlay (proposed)	Require proof of fire protection for a fire district to protect new development from the risk of wildfire	Require for all new development in the proposed 3.500 Wildfire Hazard Overlay
Wildland Fire Hazard Assessment	Section 3.500 Wildfire Hazard Overlay (proposed)	Conduct a site specific analysis of wildfire risk to determine appropriate mitigation strategies.	Require for all new development in the proposed 3.500 Wildfire Hazard Overlay

Source: Community Service Center

**Table 7: Sand Inundation Policy Options Matrix**

Comprehensive Plan			
Policy Option	Applicable Code	Implication	Implementation
Identify that sand inundation occurs throughout Pacific City not just along Sunset Drive.	Goal 18 Beaches and Dunes 2.2b, Active Foredunes (FDA)	Accurately identify the extend of sand inundation in Pacific City.	Include during Comprehensive Plan Update process.
Acknowledge the existing Pacific City Foredune Management Plan	Goal 18 Beaches and Dunes 3, Foredune Management	The Comprehensive Plan should reflect all existing foredune grading plans and allowances.	Include during Comprehensive Plan Update process.
Identify the need for dune management studies in Pacific City and Nedonna Beach to undergo a review and update process.	Goal 18 Beaches and Dunes 3.3, Foredune Management Policies	The Pacific City and Nedonna Beach dune management studies are over 15 years old and the dynamic nature of dunes necessitates an review and update to these studies.	Include during Comprehensive Plan Update process.
Land Use Ordinance			
Effectuated Areas/Communities	Neskowin and Pacific City		
Policy Option	Applicable Code	Implication	Implementation
Update beach and dune landform maps	Section 3.530 Beach and Dune Overlay (BD) (2)(a) Foredune Grading	Beach and dune landforms are dynamic and the current referenced report was conducted in 1975, there is a need up-to-date GIS maps of beach and dune landforms should be developed to consistently and accurately apply overlay requirements	Possible funding is through FEMA and the actual mapping should be conducted by DOGAMI.
Foredune Management Plans for all areas of sand inundation	Section 3.530 Beach and Dune Overlay (BD) (2)(a) Foredune Grading	Foredune management plans should be created for Tierra del Mar and Neskowin and the existing plans for Pacific City and Nedonna Beach should be reviewed and updated.	Funding for Foredune Management Plans can come in part from the affected areas and communities, but outside financial assistance will also be required.
Grading type specific permits	Section 3.530 Beach and Dune Overlay (BD) (4)(C).(2) Foredune Grading	Tillamook County should restructure and strengthen its grading permit specification and process to provide clear requirements based on the type of grading that is occurring.	Restructure and clarify the Foredune Grading section of the Land Use Ordinance
Foredune grading definitions	Section 3.530 Beach and Dune Overlay (BD) (4)(C).(2) Foredune Grading	Provide clear definitions that distinguish between view grading, preventive grading, remedial grading, and infrastructure grading.	Restructure and clarify the Foredune Grading section of the Land Use Ordinance
Foredune grading plan requirements	Section 3.530 Beach and Dune Overlay (BD) (4)(C).(2) Foredune Grading	Provide foredune grading plan requirements within a distinct and easy to read section of the code.	Restructure and clarify the Foredune Grading section of the Land Use Ordinance
Foredune grading plan decision criteria	Section 3.530 Beach and Dune Overlay (BD) (4)(C).(2) Foredune Grading	Provide foredune grading plan decision criteria within a distinct and easy to read section of the code.	Restructure and clarify the Foredune Grading section of the Land Use Ordinance
Foredune grading permit conditions	Section 3.530 Beach and Dune Overlay (BD) (4)(C).(2) Foredune Grading	Provide foredune grading permit conditions within a distinct and easy to read section of the code.	Restructure and clarify the Foredune Grading section of the Land Use Ordinance
Remedial/infrastructure grading plan requirements	Section 3.530 Beach and Dune Overlay (BD) (4)(C).(2) Foredune Grading	Provide remedial/infrastructure grading plan requirements within a distinct and easy to read section of the code.	Restructure and clarify the Foredune Grading section of the Land Use Ordinance

Source: Community Service Center

## CHAPTER 3: FLOOD

This chapter identifies the risk coastal erosion poses to unincorporated Tillamook County, the extent of risk, and the rate and location of development affected by flood. Following are policy options the county can consider to strengthen the Tillamook County Comprehensive Plan, Land Use Ordinance, and Land Division Ordinance. Policy options are presented with descriptions of best practices, identification of the applicable county code sections, and details of economic, administrative, health, or environmental impacts of implementing the policy.

### Extent of Risk

Floods are naturally occurring phenomena that can and do happen almost anywhere. In its most basic form, a flood is an accumulation of water over normally dry areas. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses. Severe flood losses can destroy buildings, crops, and cause severe injuries or death. Floods represent the most common of the natural hazard threats in Tillamook County. Floods in Tillamook County have created public health hazards, public safety concerns, closed and damaged major highways, destroyed railways, damaged structures, and caused major economic disruption. Tillamook County is susceptible to two different types of flooding. Riverine flooding affects development along many of the riverbanks within the county, and due to its location along the Pacific Ocean, a significant portion of the county is exposed to coastal flooding. The preliminary flood insurance rate maps (FIRMs), flood insurance study (FIS), and database will be available on FEMA's Map Service Center website at:

<https://msc.fema.gov/portal/advanceSearch> or [www.fema.gov/preliminaryfloodhazarddata](http://www.fema.gov/preliminaryfloodhazarddata). Once the data is final you may also find them on the Oregon Risk MAP website at: <http://www.oregonriskmap.com>.

### Development in Hazardous Areas

The Tillamook County Multi-Hazard Risk Report estimates four probabilities of riverine flooding based on recurrence intervals of a 10-year (10%), 50-year (2%), 100-year (1%), and 500-year (.2%) events. The draft Risk Report also estimates losses based on the 100-year (1%) coastal flooding event. Because data is available for both riverine and coastal flooding at the 1% chance, loss estimation statistics for this event are used. A 1% annual flood corresponds to the chance that a 100-year flood event occurs each year. A 100-year flood could have many times within a short period of time or longer than 100-years apart. The countywide exposure to a 1% flooding exposure totals approximately \$290 million. A large portion of this building value is located within unincorporated Tillamook County, with value exposure over \$217 million. Two essential facilities are exposed to a 1% annual flood event, the Nestucca Fire and Rescue Station #87 and Pacific City Fire Station #82.

## **Existing Programs and Resources**

### **National**

#### **National Flood Insurance Program (NFIP)**

The NFIP provides affordable flood insurance to homeowners, business owners, and renters in participating communities. In exchange, those communities must adopt and enforce minimum floodplain management regulations to reduce the risk of damage from future floods.

#### **Community Rating System (CRS)**

Within the NFIP, CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community's higher regulatory standards.

### **State**

#### **Statewide Planning Goal 5: Natural Hazards**

The purpose of Goal 5 is to protect natural resources and conserve scenic and historic areas and open spaces. Local governments shall adopt programs that will protect natural resources and conserve scenic, historic, and open space resources for present and future generations. These resources promote a healthy environment and natural landscape that contributes to Oregon's livability. Related to flood specifically, Goal 5 removes wetlands from developments due to their flood conveyance properties.

#### **Statewide Planning Goal 17: Coastal Shorelands**

The purpose of Goal 17 is 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. Programs to achieve these objectives shall be developed by local, state, and federal agencies having jurisdiction over coastal shorelands. Land use plans, implementing actions and permit reviews shall include consideration of the critical relationships between coastal shorelands and resources of coastal waters. Related to flood, the management of uses and development in floodplain areas should be expanded beyond the minimal considerations necessary to comply with the National Flood Insurance Program.

#### **Division of State Lands Fill and Removal Permit**

The purpose of Oregon's 1967 Removal-Fill Law (ORS 196.795-990) is to protect public navigation, fishery and recreational uses of the waters. "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 that is in the boundaries of this state." The law applies to all landowners, whether private individuals or public agencies.

## The Oregon Plan for Salmon and Watersheds

The Oregon Plan for Salmon and Watersheds organized specific actions - called "measures" - around the factors that contributed to the decline in fish populations and watershed health. Most of these focus on actions to improve water quality and quantity and habitat restoration. Landowners and other private citizens, community organizations, interest groups, and all levels of government came together to organize, fund, and implement these measures. Watershed councils and soil and water conservation districts have led efforts in many watersheds.

## Oregon's Wetlands Protection Program

The Oregon Wetland Protection Program is designed to focus wetland protection and restoration work in a strategic way, and communicate long- and short-term objectives to the Environmental Protection Agency and others. The plan was developed under a 2010 EPA development grant, and was approved for the 2011-2016 period. It is the first such plan to be approved in EPA Region 10.

## County

### Flood Hazard Overlay

The purpose of the Flood Hazard zone to promote the public health, safety, and general welfare and to minimize public and private losses or damages due to flood conditions in specific areas. The overlay lays out specific standards and regulations to guide development that falls within the flood hazard area to help mitigate potential damage.

## Comprehensive Plan Review

Tillamook County's Comprehensive Plan provides the framework for the existing flood mitigation actions. This section identifies how the hazard has been included in the comprehensive plan and suggests ways to strengthen and improve its inclusion in support of mitigation strategies.

### Wetlands: Goal 5, Section 1.3b.3

Tillamook County has adopted regulations to assist in preventing future flood damage. The Comprehensive Plan outlines policies to achieve this goal. The key to these regulations is the reservation of a flood conveyance area that is kept free of buildings, fill and other obstructions. The policy outlined in this section of the comprehensive plan provides rationale for the County to hold land from development within the floodway.

**CSC Comment:** This is a significant best practice in mitigating the risk to people and property in the event of flooding. Flood conveyance areas were mapped from

detailed engineering studies. An updated Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) are being created through the Risk MAP program. A preliminary FIS and FIRMs will be available in summer 2016. Final versions of the FIS and FIRMs are expected to be complete and ready for adoption in 2017.

## **Flooding: Goal 7, Section 2.5**

Policies specified in the Comprehensive Plan related to flood management are controlled under the Flood Hazard Overlay. The Comprehensive Plan dictates that areas identified in the FIRMs shall comply with the Flood Hazard standards. The plan further outlines the standards to be included in the Flood Hazard Overlay, stating that they should at least meet the minimum standards set forth by the National Flood Insurance Program (NFIP).

**CSC Comment:** DOGAMI Bulletin 74 referenced in the Comprehensive Plan was published in 1972 and is out of date. Weather patterns and development have changed flooding patterns in Tillamook County. Updated flood studies and maps should be incorporated in the comprehensive plan inventory to allow for a more accurate description of the hazard. The Flood Insurance Rate Map for Tillamook County is in the process of being updated and will be available for the County's review in late 2016 before it is formally adopted in 2017.

## **Shoreland Development: Goal 17, Section 4.2**

New shoreland development, expansion, maintenance or restoration of existing development; or restoration of historic waterfront areas shall be sited, designed, constructed and maintained to minimize adverse impacts on riparian vegetation, water quality and aquatic life and habitat in adjacent aquatic areas, and to be consistent with existing hazards to life and property posed by eroding areas and flood hazard areas. To accomplish this the requirements of the NFIP shall be used to regulate development in flood hazard areas within coastal shorelands.

**CSC Comment:** Maintaining consistency in development policy related to flooding is crucial. The NFIP outlines [minimum requirements](#) for development within a flood hazard area. Local governments, participating in the NFIP, must use this as a baseline regulatory framework, but are encouraged to impose stricter regulations based on need. The [Community Rating System Coordinator's Manual](#) (2013) offers a wealth of higher regulatory standards that could be implemented in Tillamook County, and is utilized to make policy recommendations later in this document.

## **Land Use Ordinance Policy Options**

This section presents a toolbox of flood hazard mitigation strategies. Recommendations range from highly regulatory to incentive-based, and best practices are linked to specific case studies found in Appendix A, as appropriate. Within each strategy, best practices identified through policy analysis research form the basis for the recommendation. Location of applicable Land Use Ordinance sections related to the implementation of the strategy is identified and any model code language is presented for potential adoption. The implications of adoption are also discussed.

In the following section, model development code is **bold**.

*For a complete list of the recommended comprehensive plan and land use ordinance policy options see Tables 2 through 7.*

## Methods for Reducing Flood Losses

### Best Practice:

The [Oregon Model Flood Damage Prevention Ordinance](#) offers specific methods to be implemented in order to reduce flood loss. These help define how the county will accomplish the purpose of the flood ordinance.

### Applicable Development Code:

Section 3.510 Flood Hazard Overlay Zone (FH)

### Model Development Code:

#### **Methods for Reducing Flood Losses**

**In order to accomplish its purposes, this ordinance includes methods and provisions for:**

- (1) Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;**
- (2) Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;**
- (3) Controlling the alteration of natural flood plains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;**
- (4) Controlling filling, grading, dredging, and other development which may increase flood damage;**
- (5) Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or may increase flood hazards in other areas.**
- (6) Coordinating and supplementing the provisions of the state building code with local land use and development ordinances.**

### Implication for Tillamook County:

This section of model code language matches the [Oregon Model Flood Damage Prevention Ordinance](#)<sup>7</sup>. However, immediately following this section, the model ordinance offers more specific methods for reducing flood losses. This section is

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<sup>7</sup> Oregon Model Flood Damage Prevention Ordinance, Department of Land Conservation and Development. 2014 [https://www.oregon.gov/LCD/HAZ/docs/Flood\\_model\\_ordinance\\_01\\_14.pdf](https://www.oregon.gov/LCD/HAZ/docs/Flood_model_ordinance_01_14.pdf)

included below in order to outline the methods and provisions demonstrating how the County could reduce loss to flooding events. The methods section differs from the General Standards section that already exists in the Tillamook County Land Use Ordinance in that it provides more detail related to the rationale for development standards and provides an overview of mitigation strategies.

## **Update and Adopt FIS and FIRMs**

### **Best Practice:**

A Flood Insurance Study (FIS) is an in depth scientific report that details factors catalytic to flooding, flood patterns, and floodplain changes over time. The Flood Insurance Rate Map (FIRM) is the geographic representation of the FIS and shows, on a map, where the floodplain exists. Updated preliminary versions will be available in summer 2016. After a period of review by the County, the FIS and FIRMs are expected to become effective in 2017. Comprehensive Plan and Flood Ordinance updates to reflect the updated FIS and FIRMs should follow.

### **Applicable Development Code:**

Section 3.510(2) Flood Hazard Overlay Zone

### **Implication for Tillamook County:**

The use of current Flood Insurance Rate Maps (FIRMs) is a best practice as identified by FEMA. These maps represent the most detailed data available for the coast and Tillamook County. Preliminary Flood Insurance Rate Maps (FIRM) and updated Flood Insurance Study (FIS) for the county will be available in summer 2016. The FIS and FIRMs are expected to become effective in Fall 2017. Comprehensive Plan and Flood Ordinance updates to reflect the updated FIS and FIRMs should follow.

## **Cumulative Substantial Improvements**

### **Best Practice:**

Improvements to a property within the Flood Hazard Overlay Zone are subject to standards of this zone only if the improvements account for 50% or more of the property's value. Currently, this is calculated cumulatively over a five-year period. Extending this period to 10 years would bring more properties into land use code review to ensure compliance with existing standards.

### **Applicable Development Code:**

Section 3.510(4) Flood Hazard Overlay Zone

### **Implication for Tillamook County:**

The Tillamook County Land Use Ordinance allows, improvements to structures valued at up to 50% of the structure's pre-improvement value located in the Flood

Hazard Overlay to be permitted without needing to meet the current flood protection requirements. Improvements are calculated cumulatively over a five-year period. Under current standards a property owner could make a 49% improvement every 5 years and not be required to abide by Flood Hazard Overlay standards (potentially greatly increasing the size of the structure and its impact upon the flood hazard and community). Increasing the cumulative time frame from five to 10 years has the effect of requiring more structures to come into compliance if the owners want to improve them or if they are damaged.

The existing requirement would net Tillamook County 20 Community Rating System (CRS) points. However, an additional 20 points can be earned if the time frame for improvements is increased from five years to 10 years. Another 20 points can be earned if the Land Use Ordinance defines “reconstruction” to include substantially damaged structures as defined in Section 430-18 of the [CRS Coordinators Manual](#)<sup>8</sup>.

## Development Limitations - Fill

### Best Practice:

The use of fill to elevate buildings reduces floodplain storage capacity and has an adverse impact on native vegetation, wetlands, drainage, and water quality. Tillamook County currently allows the use of fill under certain conditions. The highest standard is to prohibit fill in order to preserve the integrity of the floodplain.

### Applicable Development Code:

Section 3.510(13) Flood Hazard Overlay Zone

### Implication for Tillamook County

Tillamook County currently discourages the use of fill in the Flood Hazard Zone but allows its use under certain conditions. The use of fill to elevate buildings has advantages that make it desirable for developers and homeowners. However, there are problems with using fill: it reduces floodplain storage capacity and it has an adverse impact on native vegetation, wetlands, drainage, and water quality. The best practice as stated in the [CRS Coordinator's Manual](#) Development Limitations (DL) (430-6&7), is to outright prohibit the use of this type of development. By fully prohibiting the use of fill in the flood hazard areas, communities can earn up to 280 points.

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<sup>8</sup> Community Rating System Coordinator's Manual. National Flood Insurance Program. 2013  
[http://www.fema.gov/media-library-data/1406897194816-fc66ac50a3af94634751342cb35666cd/FIA-15\\_NFIP-Coordinators-Manual\\_2014.pdf](http://www.fema.gov/media-library-data/1406897194816-fc66ac50a3af94634751342cb35666cd/FIA-15_NFIP-Coordinators-Manual_2014.pdf)

## Development Limitation – Building Prohibition

### Best Practice:

Jurisdictions have the option of prohibiting residential, nonresidential, essential facilities, or hazardous uses in flood hazard areas. Prohibition of buildings within the Special Flood Hazard Area (SFHA) is among the highest regulatory actions the County can take to limit the risk to life and property from flooding. A prohibition of this kind would reduce the number of structures that are subject to damage by a flooding event.

### Applicable Development Code:

Section 3.510(13) Flood Hazard Overlay Zone

### Implication for Tillamook County:

Because a complete prohibition on floodplain development is a significant best practice for flood risk mitigation, it would require heavy public consideration and support. The prohibition of all uses may not be feasible and special consideration should be taken to address which uses should be prohibited should the County choose to pursue this recommendation. The County may prefer to choose a less strict prohibition of uses, such as prohibiting only residential uses within the Special Flood Hazard Areas, or limiting the prohibition to the floodway. CRS awards 1,000 points to communities that place Development Limitations (DL) to prohibit all buildings within the Special Flood Hazard Area, but points will be prorated if the jurisdiction prohibits only certain types of buildings, such as residences, commercial, or warehousing. CRS points are also available should the County choose to prohibit structures within the regulatory floodway only.

## Development Limitations – Prohibit Critical Facilities

### Best Practice:

Generally, facilities that can aid in flood response or facilities that, if flooded, make the problem worse are considered critical facilities. These types of building uses should not be allowed to be built within flood hazard areas.

### Applicable Development Code:

Section 3.510(13) Flood Hazard Overlay Zone

### Implication for Tillamook County:

Other provisions to help comply with the CRS criteria include the protection of critical facilities from flood damage (Protection of Critical Facilities (PCF)). For CRS credit purposes, critical facilities are defined in Section 120 of the [CRS Coordinator's Manual](#). There are usually two kinds of critical facilities that a community should address:

- Facilities that are vital to flood response activities or critical to the health and safety of the public before, during, and after a flood, such as a hospital, emergency operations center, electric substation, police station, fire station, nursing home, school, vehicle and equipment storage facility, or shelter.
- Facilities that, if flooded, would make the flood problem and its impacts much worse, such as a hazardous materials facility, power generation facility, water utility, or wastewater treatment plant.

Tillamook County code currently does not include a provision for the protection of critical facilities. Full credit is for a prohibition on new critical facilities in the 500-year floodplain. Inclusion of language to that end would net the County 80 CRS points.

## **Development Limitations – Enclosure Limits**

### **Best Practice:**

Enclosed sections of buildings that lay below the base flood elevation can significantly alter flood patterns, raise property owner insurance premiums, and put life and property at risk. Prohibition of these types of enclosures is a floodplain management best practice.

### **Applicable Development Code:**

Section 3.510(13) Flood Hazard Overlay Zone

### **Implication for Tillamook County:**

Tillamook County should consider placing regulatory standards on the enclosure of property below the base flood elevation to achieve have two objectives: 1) they protect the structural integrity of the building from wave action or hydrostatic pressure, and 2) they discourage property owners from finishing the area below the base flood elevation and storing valuable or hazardous items in that area. These regulations are particularly useful in V Zones and other coastal areas subject to wave damage and in places where projected flood depths result in lowest floors constructed eight (8) feet or more above grade. For the second objective, over time there is a tendency on the part of property owners to enclose the lower areas and convert them to bedrooms, family rooms, or other finished areas, in violation of floodplain management regulations. Regulatory standards to limit the development of these enclosures can accumulate CRS points for the County; a full 240 points are earned if regulations prohibit any building enclosures, including breakaway walls, below the base flood elevation.

**Table 8: Summary Community Rating System Higher Standards Recommended for Tillamook County**

CRS Higher Standard	CRS Coordinator's Manual Reference	Potential Points Scored
Cumulative Substantial Improvements (CSI)	432.d, Page 430-18	<b>20 points</b> can be earned if the time frame for improvements is increased from five years to 10 years. Another <b>20 points</b> can be earned if the Land Use Ordinance can better clarify if "reconstruction" includes substantially damaged structures.
Development Limitation - Use of Fill	432.a, Page 430-6	Up to <b>280 points</b> for fully prohibiting the use of fill in the flood hazard areas.
Development Limitation - Prohibition of Building Types	432.a, Page 430-6	<b>1,000 points</b> to communities that prohibit all buildings within the floodplain. Pro-rated if prohibiting only certain types of buildings, such as residences.
Development Limitation - Protection of Critical Facilities	432.f, Page 430-21	<b>80 points</b> for a prohibition on new critical facilities in the 500-year floodplain.
Development Limitation - Enclosure Limits	432.g, Page 430-23	<b>240 points</b> if regulations prohibit any building enclosures, including breakaway walls, below the base flood elevation.

Source: Community Service Center

## Model Ordinance and Codes

The following model ordinances and standards were identified during research on flood mitigation. These documents have example language for specific mitigation strategies that could be implemented in Tillamook's development code.

### Oregon Model Flood Damage Prevention Ordinance

This [Oregon Model Flood Damage Prevention Ordinance](#) was developed by the State of Oregon in cooperation with the Federal Emergency Management Agency (FEMA). This model companion ordinance incorporates by reference the Oregon Specialty Codes as adopted and administered by the Oregon Building Code Division.

## Community Rating System Coordinator's Manual 2013

The Community Rating System (CRS) is a national program developed by the Federal Emergency Management Agency (FEMA). The [\*CRS Coordinator's Manual\*](#) spells out the credits and credit criteria of the CRS for community activities and programs that go above and beyond the minimum requirements for participation in FEMA's National Flood Insurance Program.

## CHAPTER 3: TSUNAMI

This chapter identifies the risk coastal erosion poses to unincorporated Tillamook County, the extent of risk, and the rate and location of development affected by tsunami. Following are policy options the county can consider to strengthen the Tillamook County Comprehensive Plan, Land Use Ordinance, and Land Division Ordinance. Policy options are presented with descriptions of best practices, identification of the applicable county code sections, and details of economic, administrative, health, or environmental impacts of implementing the policy.

### Extent of Risk

Tsunamis are rare and extremely large waves that are caused by undersea volcanic eruptions, landslides, or earthquakes. In a Cascadia Subduction Zone (CSZ) earthquake scenario, rapidly shifting sea floor along a fault transfers its energy to the ocean surface creating waves. As these waves travel into shallower water close to land, they increase in height and can cause extensive destruction along the coast and estuaries. The extent of risk to life and property from tsunami varies greatly and is dependent upon the size scenario of the tsunami and the amount of development that exists within the resulting inundation zone. The tsunami scenarios for exposure analysis used in the draft Risk Report were from local source CSZ events and represented by “t-shirt” sizes of small, medium, large, X large, and XX large. These tsunami scenarios are determined by analyzing different CSZ rupture locations and intensities in relation to Tillamook County. To view the Tsunami Inundation Maps for Tillamook County visit the DOGAMI website: <http://www.oregongeology.org/pubs/tim/p-TIM-overview.htm#TIMindexmap>.

### Development in Hazardous Areas

Most development along the coast will experience extensive impact from a tsunami, and communities built along the bays and estuaries will be affected to a lesser extent. The most severe tsunami scenario event from a Cascadia Subduction Zone (CSZ) earthquake would affect all communities in the county as development in Tillamook County has predominately occurred within close proximity to the Pacific Ocean. Communities such as Rockaway Beach, Pacific City, and Neskowin are particularly vulnerable to tsunamis due to their low-lying coastal development. While tsunami hazards are unpredictable and cannot be prevented, steps can be taken to lessen the impact a tsunami event might have on the development of Tillamook County coastal communities.

The draft Risk Report includes an assessment of risk to development within tsunami inundation zones. The Risk Report indicates that during a Medium tsunami event, approximately 3,000 buildings, valued at approximately \$328 million, are at risk of damage. This represents nearly half of all building value in unincorporated Tillamook County. The Medium tsunami event scenario is the event scenario that correlates with the earthquake scenario utilized in the Risk Report. For exposure and loss information for the other tsunami scenarios see the Risk Report.

**Table 9: Extent of Risk to Medium Tsunami event in Tillamook County**

<i>Tsunami - CSZ Mag 9.0 – Medium</i>					
Community	Total number of buildings	Total estimated building value (\$, in thousands)	Exposed Buildings	Building Value (\$, in thousands)	Ratio of Exposure Value
Unincorporated Tillamook (rural)	520	\$ 46,924	1,692	\$ 147,262	11%
Neskowin	268	\$ 56,198	461	\$ 81,824	69%
Oceanside - Netarts	62	\$ 11,292	88	\$ 15,432	8%
Pacific City	175	\$ 15,825	806	\$ 83,301	39%
Total	1,025	\$ 130,239	3,047	\$ 327,819	18%

Source: Risk Report, 2016 (modified by CSC), Table A-5.

The Risk Report indicates that during a Large tsunami event, approximately 4,400 buildings, valued at approximately \$481 million, are at risk of damage. This represents nearly half of all building value in unincorporated Tillamook County. The large tsunami scenario is the most likely recommended to replace the existing SB 379 line. For exposure and loss information for the other tsunami scenarios see the Risk Report.

**Table 10: Extent of Risk to Large Tsunami event in Tillamook County**

<i>Tsunami - CSZ Mag 9.0 – Large</i>					
Community	Total number of buildings	Total estimated building value (\$, in thousands)	Exposed Buildings	Building Value (\$, in thousands)	Ratio of Exposure Value
Unincorporated Tillamook (rural)	520	\$ 46,924	2,548	\$ 223,814	18%
Neskowin	268	\$ 56,198	485	\$ 86,960	73%
Oceanside - Netarts	62	\$ 11,292	141	\$ 21,433	11%
Pacific City	175	\$ 15,825	1,252	\$ 148,741	70%
Total	1,025	\$ 130,239	4,426	\$ 480,948	26%

Source: Risk Report, 2016 (modified by CSC), Table A-5.

## Existing Programs and Resources

### National

#### NOAA National Coastal Zone Management Program

The National Coastal Zone Management Program is a voluntary partnership between the federal government and 34 coastal, as well as Great Lakes, states. The program provides the basis for protecting, restoring, and responsibly developing our nation's diverse coastal communities and resources.

## **Administrative Grants**

Under section 306 of the Coastal Zone Management Program 1:1 matching funding is provided for state program administration.

## **Coastal Resource Improvement Program**

Up to half of state section 306 funding can be used for small-scale construction or land acquisition projects that enhance public access to the coastal, facilitate redevelopment of urban waterfronts, or preserve and restore coastal resources.

## **Coastal Zone Enhancement Grants**

Under section 309 zero match funding is provided to states to enhance their coastal zone management programs in one or more areas of national significance.

## **Coastal Nonpoint Pollution Control Program (Technical Assistance)**

Congress appropriates 1:1 matching funding to help state coastal zone managements programs.

## **State**

### **Oregon Coastal Management Program**

The Coastal Management Program was approved by NOAA in 1977 and is led by the Oregon Department of Land Conservation within a network of cooperating agencies that have authority in the coastal zone. The Oregon Land Use Planning Act and 19 statewide planning goals provide the primary authority for the coastal management program.

### **Oregon Senate Bill 379**

The Oregon Tsunami Regulatory Maps, enacted in 1995 by Oregon Senate Bill 379, show a single tsunami inundation line on U.S. Geological Survey topographic maps. The official maps were created by DOGAMI and are used for implementation of Oregon Revised Statutes (ORS) 455.446 and 455.447, which limits, through the Oregon Building Code, construction of certain critical and essential facilities in the tsunami inundation zone. These regulatory maps are not intended for emergency evacuation purposes and do not necessarily represent tsunami inundation from a worst-case event. They show the best estimate of tsunami inundation from the most likely tsunami originating from an earthquake on the Cascadia subduction zone fault.

## County

### Comprehensive Plan Chapter 7 Section 2.6 Tsunami (Seismic Waves) – Finding and Policies

The tsunami section is the smallest section within Chapter 7 of Tillamook County's Comprehensive Plan. The sections within this chapter outline policies and findings related to the natural hazards impacted the county. Section 2.6 relates to tsunami and lists only one policy; that the county mitigate tsunami risk through use of the National Flood Insurance Program's minimum standards.

## Comprehensive Plan Review

Tillamook County's Comprehensive Plan provides the framework for the existing tsunami mitigation actions. This section identifies how the hazard has been included in the comprehensive plan and suggests ways to strengthen and improve its inclusion in support of mitigation strategies.

### Chapter 7 Section 2.6 Tsunami (Seismic Waves) – Finding and Policies

**CSC Comment:** The tsunami section represents the shortest section in the Goal 7 (Hazards) Chapter of the Tillamook County Comprehensive Plan. While this is likely due to the limited and unreliable tsunami data available at the time, federal, state and local agencies have produced updated maps, data, and reports related to tsunami risk and mitigation. Specifically, reports from FEMA, DOGAMI, and the DLCD can be used to better inform the "Findings" portion of this section, including updated harbor, bay, and estuary reactions and inundation predictions. Additionally, it's important to note that while flood and tsunami hazards are similar in nature, Tillamook County should not rely solely on its coastal flood zone regulations to mitigate tsunami risk. Policies outlined in the 2015 DLCD's [\*Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities\*](#) can be used to supplement this section's current policies.

## Land Use Ordinance Policy Options

This section presents a toolbox of tsunami hazard mitigation strategies. Recommendations range from highly regulatory to incentive-based, and best practices are linked to specific case studies found in Appendix A, as appropriate. Within each strategy, best practices identified through policy analysis research form the basis for the recommendation. Location of applicable Land Use Ordinance sections related to the implementation of the strategy is identified and any model code language is presented for potential adoption. The implications of adoption are also discussed.

In the following section, model development code is **bold**

*For a complete list of the recommended comprehensive plan and land use ordinance policy options see Tables 2 through 7.*

# Tsunami Hazard Overlay Zone

## Best Practice

Utilize an overlay zone based on the “large” tsunami event from the 2013 DOGAMI [Tsunami Inundation Scenarios for Oregon](#) (OFR O-13-19) to form a regulatory trigger zone.

## Applicable Development Code:

3.500 Overlay Zones. A Tsunami Hazard Overlay does not exist in current code, this recommendation is to create a new overlay.

## Model Code Language:

### Purpose

***The purpose of the Tsunami Hazard Overlay Zone is to increase the resilience of the community to a local source (Cascadia Subduction Zone) tsunami by establishing standards, requirements, incentives, and other measures to be applied in the review and authorization of land use and development activities in areas subject to tsunami hazards. The standards established by this section are intended to limit, direct and encourage the development of land uses within areas subject to tsunami hazards in a manner that will:***

***(a) Reduce loss of life;***

***(b) Reduce damage to private and public property;***

***(c) Reduce social, emotional, and economic disruptions; and***

***(d) Increase the ability of the community to respond and recover.***

[...]

## Implication for Tillamook County

Tillamook County should incorporate the model ordinance introduced by DLCD’s [Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities](#). The ordinance includes regulation related to inundation zone mapping and mitigation strategies. DOGAMI has produced Tsunami Inundation Maps (TIMs) that provide detailed information on the tsunami event scenarios described above and in the Risk Report. The Risk Report primarily provides exposure analysis for the “medium” TIM line (although there is information provided for other event scenarios in the appendices). The DLCD Land Use Guide recommends jurisdictions use the “large” Tsunami Inundation Map ([TIM-Till-1 through 14](#)) line to define its overlay zone boundary. DOGAMI is in the process of recommending that the “large” tsunami event scenario be used to inform the update of the Senate Bill 379 regulatory inundation line (this zone would then identify the area to which ORS 455 development restrictions apply). The DLCD Land

Use Guide provides code language the County can use to form standards, by which future development within this new overlay must comply.

Alternatively, as a higher regulatory action, the county could adopt the use of all five of the TIM scenarios ranging from small to XXlarge to create a “gradient” of development standards. This option would apply different regulations to developments depending upon which area they are located in. Development within the most probable/highest risk area (e.g., “small” scenario) would have a more strict set of regulations than a development within the less probable/ lower risk areas (e.g., “XXlarge” scenario).

## **Tsunami Hazard Development Permit**

### **Best Practice:**

A Hazard Acknowledgement and Disclosure Statement shall accompany all applications for new development or substantial improvements in the Tsunami Hazard Overlay Zone. Development shall be conditioned to require the recording of the required Hazard Acknowledgement and Disclosure Statement in the deed record.

### **Applicable Development Code:**

3.500 Overlay Zones. Because a Tsunami Hazard Overlay does not exist in current code, this recommendation is to create a new overlay.

### **Model Code Language:**

**(a) All applications for new development or substantial improvements in the Tsunami Hazard Overlay Zone shall be accompanied by a Hazard Acknowledgement and Disclosure Statement, executed by the property owner, which sets forth the following:**

**(A) A statement that the property is subject to inundation by a local source Cascadia event tsunami, including the DOGAMI scenarios (S, M, L, XL, or XXL) that could potentially flood the site, and that development thereon is subject to risk of damage from tsunami;**

**(B) A statement that a local source tsunami poses a potential life safety threat to occupants of the property, and that the protection of life safety will require occupants to evacuate to high ground in the event of a local source tsunami; and**

**(C) A statement acknowledging that the property owner accepts and assumes all risks of damage from tsunami associated with the development of the subject property.**

**(b) Approval of new development or substantial improvements in the Tsunami Hazard Overlay Zone shall be conditioned to require the recording of the required Hazard Acknowledgement and Disclosure Statement in the deed records of [insert name of county].**

## Implication for Tillamook County:

A Tsunami Hazard Area permit provides site and development specific hazard analysis and details engineering requirements to minimize the risk posed by coastal hazard.

## Prohibit Essential/Hazardous Facilities within the Tsunami Hazard Overlay

### Best Practice:

Establish restrictions on the types of facilities within the Tsunami Hazard Overlay Zone. Specifically, facilities that are “essential” or “hazardous” should be prohibited within the tsunami inundation areas. Essential facilities are those that are critical to the response and recovery of an earthquake/-tsunami event. These may include but are not limited to: hospitals, fire and police stations, government communication centers, buildings with the capacity to hold 250+ individuals, large educational facilities, jails, and detention centers. Hazardous facilities are those facilities that, if damaged or destroyed, would only make the impacts of the disaster greater.

### Applicable Development Code:

3.500 Overlay Zones. Because a Tsunami Hazard Overlay does not exist in current code, this recommendation is to create a new overlay.

### Model Code Language:

#### **(1) “Essential Facilities” means:**

- (a) Hospitals and other medical facilities having surgery and emergency treatment areas;**
- (b) Fire and police stations;**
- (c) Tanks or other structures containing, housing or supporting water or fire-suppression materials or equipment required for the protection of essential or hazardous facilities or special occupancy structures;**
- (d) Emergency vehicle shelters and garages;**
- (e) Structures and equipment in emergency preparedness centers;**
- (f) Standby power generating equipment for essential facilities; and**
- (g) Structures and equipment in emergency preparedness centers.**

**(2) “Hazardous facility” means structures housing, supporting or containing sufficient quantities of toxic or explosive substances to be of danger to the safety of the public if released.**

## Implication for Tillamook County:

Per the Risk Report, there are currently three essential facilities located within the medium tsunami inundation area. By locating essential facilities outside of the Tsunami Hazard Overlay, there is a higher likelihood of these facilities being available to serve those in need post-tsunami event.

It is also understood that due to restricted land availability, development costs, and level of service requirements for emergency services, locating these facilities outside of the tsunami inundation area may not be possible. In these cases, the County should consider imposing stricter standards to prohibit essential and hazardous facilities from being located within the “large” event scenario boundary (i.e., to identify as the area to which ORS development restrictions currently apply).

## **Flexible Development Option**

### **Best Practice:**

The County should consider providing incentives that encourage and promote site planning and development within the Tsunami Hazard Overlay that results in lower risk exposure to tsunami hazard than what would otherwise be achieved through established development standards. These incentives could include but are not limited to density bonuses, relaxed setback requirements, and clustering development in lower hazard risk areas of the parcel.

### **Applicable Development Code:**

3.500 Overlay Zones. Because a Tsunami Hazard Overlay does not exist in current code, this recommendation is to create a new overlay.

### **Model Code Language:**

**a) The purpose of the Flexible Development Option is to provide incentives for, and to encourage and promote, site planning and development within the Tsunami Hazard Overlay Zone that results in lower risk exposure to tsunami hazard than would otherwise be achieved through the conventional application of the requirements of this chapter. The Flexible Development Option is intended to:**

**(A) Allow for and encourage development designs that incorporate enhanced evacuation measures, appropriate building siting and design, and other features that reduce the risks to life and property from tsunami hazard; and**

**(B) Permit greater flexibility in the siting of buildings and other physical improvements and in the creation of new lots and parcels in order to allow the full realization of permitted development while reducing risks to life and property from tsunami hazard.**

### **Implication for Tillamook County:**

Allow for greater flexibility and encourage development designs that incorporate evacuation measures, appropriate building siting, and other features that reduce the risks to life and property from tsunami hazard

## Model Ordinance and Codes

The following model ordinances and standards were identified during research on tsunami mitigation. These documents have example language for specific mitigation strategies that could be implemented in Tillamook's development code.

### Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities<sup>9</sup>

The [land use guide](#) is designed to be tailored by communities to address their individual tsunami risk and location, and provides comprehensive information focused on land use planning approaches to reduce tsunami hazard risk and implement important land use resilience measures. The guidance includes sample tsunami related comprehensive land use plan text and policies, information on needed map amendments, a tsunami hazard overlay (THO) zone model to implement resilience measures, tsunami land use strategy financing and incentive concepts, and more.

### Clatsop County Tsunami Overlay District

The Clatsop County Tsunami Hazard Overlay Project set forth to create a more concrete set of policies and standards for which types of development could, or could not, take place within the tsunami inundation zone. The Overlay Project used the [Land Use Guide for Oregon Coastal Communities](#) as a model to write its code language.

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<sup>9</sup> Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities, Accessed May 12, 2016  
<http://www.oregon.gov/LCD/OCMP/docs/Publications/TsunamiGuide20150407.pdf>

## CHAPTER 5: COASTAL EROSION

This chapter identifies the risk coastal erosion poses to unincorporated Tillamook County, the extent of risk, and the rate and location of development affected by coastal erosion. Following are policy options the county can consider to strengthen the Tillamook County Comprehensive Plan, Land Use Ordinance, and Land Division Ordinance. Policy options are presented with descriptions of best practices, identification of the applicable county code sections, and details of economic, administrative, health, or environmental impacts of implementing the policy.

### Extent of Risk

Coastal erosion is a continuous process influenced by numerous variables including geologic, atmospheric, and oceanic factors. The Oregon Climate Change Research Institute (OCCRI) Northwest Climate Assessment Report (NWCAR, 2013) predicts that continued sea level rise and increased wave action along the Oregon coast will result in an overall increased risk from coastal erosion in the coming years and decades.<sup>10</sup> Coastal erosion poses a risk to property near the coastline both due to the gradual loss of sediment (a chronic problem) and from rapidly occurring landslides (an episodic problem). Erodible dune-backed and bluff-backed beaches make up 90% of the Tillamook County coastline making coastal erosion an extensive natural hazard.<sup>11</sup>

### Development in Hazardous Areas

The Tillamook County Multi-Hazard Risk Report (2016, draft), hereafter Risk Report, indicates that there are 296 structures located within unincorporated Tillamook County within a high hazard coastal erosion zone with a total value of \$62 million. There are an additional 207 structures within the very high hazard coastal erosion zone with a total value of \$52 million. The unincorporated community of Neskowin has the highest ratio of building exposure within the moderate to very high coastal erosion susceptibility categories.

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<sup>10</sup> Northwest Climate Assessment Report (NWCAR, 2013) Accessed June 1, 2016  
<http://occri.net/reports>

<sup>11</sup> Appendix D: Adapting to Coastal Erosion Hazards in Tillamook County: FRAMEWORK PLAN Final Draft, June 10, 2011 Accessed June 1, 2016  
[http://www.co.tillamook.or.us/qov/ComDev/documents/planning/Website Forms/Revised Neskowin Adaptation Plan 25Jun14.pdf](http://www.co.tillamook.or.us/qov/ComDev/documents/planning/Website%20Forms/Revised%20Neskowin%20Adaptation%20Plan%2025Jun14.pdf)

**Table 11: Coastal Erosion Exposure Analysis for Unincorporated Areas**

Community/Area	Loss Ratio of Total Building Value*		
	Very High Hazard <sup>1</sup>	High Hazard <sup>2</sup>	Moderate Hazard <sup>3</sup>
Unincorporated County (rural)	1.0%	1.5%	2.6%
Neskowin	27.2%	28.8%	34.1%
Oceanside and Netarts	0%	0%	0%
Pacific City	2.8%	4.2%	9.3%
<b>Total</b>	<b>3.20%</b>	<b>3.80%</b>	<b>5.80%</b>

Source: Risk Report, 2016 (modified by CSC), Table A-7.

1. Mid-range estimate of 2030 sea level rise (SLR) along with 2% annual chance (50-year) storm total water level scenario.

2. Mid-range 2050 SLR along with the 2% annual chance storm total water level

3. Mid-range 2100 SLR along with the 1% annual chance (100-year) storm total water level

Per the Oregon Natural Hazards Mitigation Plan (Oregon NHMP) over the past five years Tillamook County's population increased by roughly 30% and the number of housing units increased by 40%. Population growth, unsurprisingly, was found to cluster around major corridors and waterways. Additionally, the *Adapting to Coastal Erosion Hazards in Tillamook County: Framework Plan* (2011) found that development pressures are often the highest for lands most vulnerable to coastal hazards.<sup>12</sup> This, in combination with the increasing population, indicate that new development will likely put more building value and people in areas susceptible to coastal erosion in the coming years.

## Existing Policies and Programs

### National

#### NOAA National Coastal Zone Management Program

The National Coastal Zone Management Program is a voluntary partnership between the federal government and 34 coastal, as well as Great Lakes, states. The program provides the basis for protecting, restoring, and responsibly developing our nation's diverse coastal communities and resources. Funding grant and program resources available through this program are identified below.

### Administrative Grants

Under section 306 of the Coastal Zone Management Program 1:1 matching funding is provided for state program administration.

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<sup>12</sup> Appendix D: Adapting to Coastal Erosion Hazards in Tillamook County: FRAMEWORK PLAN Final Draft, June 10, 2011

## Coastal Resource Improvement Program

Up to half of state section 306 funding can be used for small-scale construction or land acquisition projects that enhance public access to the coastal, facilitate redevelopment of urban waterfronts, or preserve and restore coastal resources.

## Coastal Zone Enhancement Grants

Under section 309 zero match funding is provided to states to enhance their coastal zone management programs in one or more areas of national significance.

## Coastal Nonpoint Pollution Control Program (Technical Assistance)

Congress appropriates 1:1 matching funding to help state coastal zone managements programs.

## FEMA Community Rating System (CRS) Credit for Management of Coastal Erosion Hazards

While the mapping and regulatory standards of NFIP program do not directly address coastal erosion, Tillamook County can receive points toward higher flood insurance premium reductions within the CRS by (1) informing the public about coastal erosion hazards, (2) mapping and regulating the coastal erosion hazard, (3) special structural and nonstructural coastal erosion mitigation, and (4) through special emergency preparedness efforts specific to the hazard of coastal erosion.

## State

### Oregon Coastal Management Program

The Coastal Management Program was approved by NOAA in 1977 and is lead by the Oregon Department of Land Conservation and Development (DLCD) within a network of cooperating agencies that have authority in the coastal zone. The Oregon Land Use Planning Act and 19 statewide planning goals provide the primary authority for the coastal management program. The following grant offers potential funding through this program.

### OCMP Technical Assistance Grants

High priority project technical assistance grants support major projects that are "above and beyond" the ongoing, regular plan implementation activities. These special allocations for high priority coastal resources management and critical planning needs address issues identified by local planners, state agency resource specialists, and federal agency representatives. Examples of types of special high priority projects that have been funded include: GIS information development and mapping for local needs, GIS training and software for planners, riparian habitat inventories, and buildable lands inventories. Applications for special high priority projects are submitted by local jurisdictions and evaluated by OCMP staff. The grants are executed using the existing DLCD "technical assistance grants" procedure.

## Oregon Natural Hazards Mitigation Plan, 2015

The statewide hazard mitigation plan found Tillamook County to be the county most vulnerable to coastal hazards in the state. In particular, the communities of Neskowin, Pacific City, Tierra del Mar, Twin Rocks, and Rockaway beach were identifies as being susceptible to coastal erosion. There are two state-owned or leased critical or essential facilities within coastal erosion areas of Tillamook County and additionally there are 10 state-owned or leased non-critical facilities within the County. These 12 properties are valued at \$12.8 million.<sup>13</sup>

### House Bill 1601

Known as the Oregon Beach Bill, HB 1601 passed in 1967 and defined the ocean shore area to be all wet sand within sixteen vertical feet of the low tide line and established this strip of land to be a state recreation area.

## Comprehensive Plan Review

Tillamook County's Comprehensive Plan provides the framework for the existing coastal erosion mitigation actions. This section identifies how the hazard has been included in the comprehensive plan and suggests ways to strengthen and improve its inclusion in support of mitigation strategies.

### Goal 7, Section 2.4 Erosion - Findings and Policies

**Comment** The findings in the erosion section come from DOGAMI report, Geologic Hazards Inventory of the Oregon Coast (Miscellaneous Report, 1974)<sup>14</sup>. These findings should be updated to reflect the new analysis found in the Risk Report and other more current documents. Furthermore, the risk of coastal erosion should be explicitly recognized as distinct from general erosive processes and stream erosion. In the policies section, setbacks from bluffs should be explicitly included in section a.7 and policy b. should be clarified to require a certified geotechnical report.

### Goal 18, Beaches and Dunes Element 4 Coastal Erosion

**CSC Comment:** The inventory and mapping of coastal erosion should be updated to reflect the finding of the Risk Report and DOGAMI mapping efforts. It is recommended that the comprehensive plan should adopt the DOGAMI Evaluation of Erosion Hazard Zones for the Dune-Backed Beaches of Tillamook County (Open-

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<sup>13</sup> Oregon Natural Hazards Mitigation Plan, 2015 pg 341

[https://www.oregon.gov/LCD/HAZ/docs/2015ORNHMP/2015ORNHMPApproved/Approved\\_2015ORNHMP.pdf](https://www.oregon.gov/LCD/HAZ/docs/2015ORNHMP/2015ORNHMPApproved/Approved_2015ORNHMP.pdf)

<sup>14</sup>Geologic Hazards Inventory of the Oregon Coast (Miscellaneous Report, 1974) accessed May 12, 2016 <http://www.oregongeology.org/pubs/MP/MP-17.pdf>

File Report O-14-02, 2014)<sup>15</sup> bluff or dune backed shoreline areas within high or active hazard zones as the coastal erosion natural hazard zone in which mitigation policies will be applied through a hazard overlay. It should be noted that maps are currently labeled within the comprehensive plan, but they are not visible in the online Goal 18 pdf file.

## Land Use Ordinance Policy Options

This section presents a toolbox of coastal erosion hazard mitigation strategies. Recommendations range from highly regulatory to incentive-based, and best practices are linked to specific case studies found in Appendix A, as appropriate. Within each strategy, best practices identified through policy analysis research form the basis for the recommendation. Location of applicable Land Use Ordinance sections related to the implementation of the strategy is identified and any model code language is presented for potential adoption. The implications of adoption are also discussed.

In the following section, model development code is **bold**

*For a complete list of the recommended comprehensive plan and land use ordinance policy options see Tables 2 through 7.*

## Countywide Coastal Hazards Overlay Zone

### Best Practice:

Currently, Tillamook County utilizes a coastal erosion hazards overlay zone only within the Neskowin area. This overlay applies only to the Neskowin area and does not provide consistent land use regulations for all areas susceptible to coastal erosions as defined in the [2014 DOGAMI Evaluation of Erosion Hazard Zones for the Dune-Backed Beaches of Tillamook County \(OFR O-14-02\)](#). A Coastal Erosions Hazard Overlay should be defined for unincorporated Tillamook County that utilizes an overlay zone that combines the High Hazard and Medium Hazard zones from the [DOGAMI OFR O-14-02](#) into a single regulatory trigger zone.<sup>16</sup> Precedent for using the DOGAMI Hazard zones to define an overlay is seen in the Newport Geological Hazard Overlay, see Appendix A: Case Studies.

### Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new

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<sup>15</sup> Evaluation of Erosion Hazard Zones for the Dune-Backed Beaches of Tillamook County (Open-File Report O-14-02, 2014) accessed May 12, 2016 <http://www.oregongeology.org/pubs/ofr/p-O-14-02.htm>

<sup>16</sup> DOGAMI Evaluation of Erosion Hazard Zones for the Dune-Backed Beaches of Tillamook County (OFR O-14-02), Accessed May 1, 2016 <http://www.oregongeology.org/pubs/ofr/p-O-14-02.htm>

section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

## Model Code Language:

The following code language is from the Model Coastal Erosion Overlay Zone. Precedent for using this model code language is seen in in the Tillamook Land Use Section 3.570 Neskowin Coastal Erosion Hazards Overlay Zone and in the Newport OR, Geologic Hazard Overlay. Model code below is representative of code that County should consider adopting but is not comprehensive or complete, full text of the Model Coastal Erosion Overlay Zone is available online.<sup>17</sup>

### Applicability of Coastal Hazard Overlay Zone

**The following areas are considered potentially geologically hazardous and are therefore subject to the requirements of this section:**

**(a) Bluff or dune backed shoreline areas within medium and high hazard zones identified in the Department of Geology and Mineral Industries (DOGAMI) Open File Report Evaluation of Erosion Hazard Zones for the Dune-Backed Beaches of Tillamook County (OFR O-14-02).**

...

**(d) Any other documented geologic hazard within or adjacent to hazard risk zones described in (a) above and on file in the office of the County of Tillamook Community Development Director. A “documented geologic hazard area” as used in this subsection means a unit of land, which is shown by reasonable written evidence to contain geological characteristics/conditions which are hazardous or potentially hazardous for the improvement thereof.**

## Implication for Tillamook County:

Tillamook County created the [Adapting to Coastal Erosion Hazards in Tillamook County: FRAMEWORK PLAN](#) (see appendix D) from which each community or area could develop its own set of regulations, however this Framework Plan was not adopted. Neskowin has been the only area to adopt development code regulations specific to coastal hazards. Implementing a Countywide Coastal Hazards Overlay Zone without regulations may be a first step in getting communities and areas to recognize that they are susceptible to chronic coastal hazards. The Community Advisory Councils (CACs) and the County may then determine what permit and development restrictions found in the following sections are appropriate for the County at large, and what may only be appropriate for specific communities and areas.

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<sup>17</sup> Model Coastal Erosion Overlay Zone, accessed May 12, 2016  
<https://www.oregon.gov/LCD/OCMP/docs/Publications/ModelCoastalHazardsOverlayZone.pdf>

## Coastal Hazard Area Permit

### Best Practice:

For all development that occurs within the proposed Countywide Coastal Hazards Overlay Zone, a specific development permit should be required. This permit is currently only required in the Neskowin Coastal Hazards Overlay Zone and identifies the proposed development, the chronic natural hazards that are present on the site, and an engineering certified geologist reports finding and required engineering remediation necessary to minimize risk to the structure.

### Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

### Model Code Language:

Model code below is representative of code that the County should consider adopting but is not comprehensive or complete, full text of the [Model Coastal Erosion Overlay Zone](#) is available online.

#### Coastal Hazard Area Permit

An application for a Coastal Hazard Area Permit shall include the following:

- (A) A site plan that illustrates areas of disturbance, ground topography (contours), roads and driveways, an outline of wooded or naturally vegetated areas, watercourses, erosion control measures, and trees with a diameter of at least 8-inches dbh (diameter breast height) proposed for removal;
- (B) An estimate of depths and the extent of all proposed excavation and fill work;
- (C) Identification of the bluff or dune backed hazard zone or landslide hazard zone for the parcel or lot upon which development is to occur. In cases where properties are mapped with more than one hazard zone, a certified engineering geologist shall identify the hazard zone(s) within which development is proposed based on the DOGAMI report referenced above;
- (D) An engineering geologic report prepared by a certified engineering geologist which meets the content requirements of subsection (5); and
- (E) If engineering remediation is required to make the site suitable for the proposed development, an engineering report, prepared by a registered civil engineer, geotechnical engineer, or certified engineering geologist (with experience relating to coastal processes), which provides design and construction specifications for the required remediation.

## Implication for Tillamook County:

A Coastal Hazard Area Permit allows the County to review all new development for its ability to minimize risk to chronic coastal hazards to an acceptable level. This permit has explicit conditions that allow developers to clearly understand the natural hazard risk and mitigation information that must be provide to the County. The permit process allows the County to review development proposals for their ability consistently and efficiently to reduce risk to chronic coastal hazards.

## Engineering Geologic Report Standards

### Best Practice:

The required Coastal Hazard Area Permit must have a site-specific analysis of natural hazards and associated mitigation conducted as the DOGAMI report that defines the overlay boundaries does not provide data at detailed enough scale to accurately assess the location and type of chronic coastal hazards at the site level. This report needs to be conducted by an appropriately qualified specialist, a certified engineering geologist, and needs to meet specific evaluation standards. Such a report and standards are currently required within the Neskowin Coastal Hazards Overlay Zone, but this does not apply outside of the Neskowin area.

### Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

### Model Code Language:

Model code below is representative of code that County should consider adopting but is not comprehensive or complete, full text of the [Model Coastal Erosion Overlay Zone](#) is available online

**(a) Engineering geologic reports required by this section shall be prepared consistent with standard geologic practices employing generally accepted scientific and engineering principles, and shall, at a minimum, contain the items outlined in the Oregon State Board of 7 DLCD/OCMP Model Overlay Coastal Hazard Code Geologist Examiners "Guidelines for Preparing Engineering Geologic Reports in Oregon", [insert date of issuance of current version of the published guidelines]. All Geologic Reports are valid as prima facie evidence of the information therein contained for a period of five (5) years.**

**Such reports are valid only for the development plan addressed in the report. The County assumes no responsibility for the quality or accuracy of such reports.**

**(b) Engineering geologic reports required by this section shall include a statement of the certified engineering geologist's professional opinion as to whether the**

**proposed development will be within the acceptable level of risk established by the community, considering site conditions and the recommended mitigation.**

**As used in this section, “acceptable level of risk” means the maximum risk to people and property from identified natural hazards deemed acceptable to the community in fulfilling its duty to appropriately protect life and property from natural hazards. For development subject to the provisions of this section, the acceptable level of risk is:**

- **Assurance that life safety will be protected from the identified hazard(s) for a time period which exceeds the life of the associated structure, considering site conditions and specified mitigation; and**
- **A [high likelihood] that the proposed structures will be protected from substantial damage from the identified hazard(s) for a period of [50-70] years, considering site conditions and specified mitigation.**

### **Implication for Tillamook County:**

The availability of Certified Engineering Geologists within Tillamook County needs to be assessed to determine the cost and time required for an Engineering Geologic Report to be conducted. The County should also consider allowing reports to be prepared by both an Oregon Registered Geologist and a qualified Oregon Registered Engineer. Site specific chronic coastal hazard analysis by a qualified professional is the best method for limiting the exposure of property and people to coastal natural hazards.

In addition to the conditions, requirements, and limitation imposed by the Certified Engineering Geologist in the Engineering Geologic Report all development should be subject to the following hazard mitigation requirements.

## **Bluff-Backed Shoreline Setback**

### **Best Practice:**

Development on bluff-backed shoreline lots should be set back from the bluff edge in accordance with both the expected lifetime of the structure and the average annual erosion rate. Such a setback is required in the Neskowin Coastal Hazards Overlay Zone, but outside of this area in the Beach and Dune Overlay development cannot occur in front of the Oceanfront Setback Line (OSL). Per the Beach and Dune Overlay, the OSL is landward of the crest of the active foredune and is approximately parallel to the Oregon Coordinate Line. In all cases, the OSL is measured from the most ocean ward point of a structure which is higher than three feet from existing grade. A scientifically determined bluff-backed shoreline setback provides site specific protection from expected erosion and better protects development than a fixed OSL setback requirement that does not recognize variations in erosion rate. An example of bluff-backed shoreline setbacks that utilize a 75-year setback is found in San Luis Obispo County, CA see Appendix A: Case Studies.

## Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

## Model Code Language:

Model code below is representative of code that County should consider adopting and is taken from the Neskowin Coastal Hazards Overlay Zone and recommended by the [Model Coastal Erosion Overlay Zone](#).

**In areas subject to the provisions of this section, the building footprint of all new construction or substantial improvement subject to a Coastal Hazard Area Permit shall be set back from the ocean shore in accordance with the following requirements:**

**(a) Of the following, the requirement that imposes the greatest setback shall determine the minimum oceanfront setback:**

**(A) A setback specified in a required geologic report;**

**(B) A setback that coincides with the Oceanfront Setback Line (OSL); or**

**(C) On bluff-backed shorelines, a setback from the bluff edge a distance of 50 times the annual erosion rate (as determined by an engineering geologist) plus 20 feet (or other distance determined to be an adequate buffer). The bluff edge shall be as defined in the required geologic report.**

**(b) On lots or parcels subject to the minimum oceanfront setback, the required yard setback opposite the oceanfront may be reduced by one foot for each one foot of oceanfront setback provided beyond the required minimum, down to a minimum of 10 feet.**

**(c) On lots or parcels created prior to the effective date of this section, where the application of the minimum oceanfront setback, together with any other required yards and/or setbacks, results in a building footprint area of less than 1,500 square feet, the minimum oceanfront setback may be reduced by an amount necessary to provide a building footprint of not more than 1,500 square feet.**

## Implication for Tillamook County:

Ninety-percent of the Tillamook County coast is composed of dune-backed and bluff-backed beaches, as such a site-specific setback for bluff-backed development sites would recognize that variation in erosion rates due to different geological and oceanographic conditions and provide a scientific rational setback requirement. The County should look to assess what is a reasonable lifetime for new construction on the coast that recognizes that the value of coastal property and the lack of alternative building sites can lead to buildings having longer lifespans on the coast than in other locations. The Neskowin Coastal Hazards Overlay Zone uses a 50-year

window of protection while in San Luis Obispo, CA a 75-year window is utilized with a recommendation from the California Coastal Commission to use a 100-year window, see San Luis Obispo Case Study in Appendix A.

## Moveable Structure Design

### Best Practice:

In the event that significant chronic coastal hazards threaten a building above and beyond the required setbacks stipulated in the previous section, moveable structure design allows buildings to be relocated further back on the site or even entirely removed from the site as conditions change. Construction standards that allow for building to be relocated in the event of a natural hazard should be recommended and possible required for high hazard areas. Moveable structure design is required in the Neskowin Coastal Hazards Overlay Zone but is not found outside of this overlay.

### Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

### Model Code Language:

Model code below is representative of code that County should consider adopting but is not comprehensive or complete, full text of the [Model Coastal Erosion Overlay Zone](#) is available online and a definition of how moveable structure design is defined is found on page 16.

**(a) New development [should/shall] be designed and sited in such a manner that improvements may be relocated in the event they are jeopardized by coastal hazards. Considerations shall include:**

**(A) Construction techniques that will render new buildings readily moveable [shall be used/should be considered]**

**(B) Properties shall possess access of sufficient width and grade to permit new buildings to be relocated or dismantled and removed from the site.**

### Implication for Tillamook County:

Moveable structure design allows buildings to be relocated when threatened by chronic coastal natural hazards limiting damage to people and property. The County should determine if a recommendation to use moveable structure design is sufficient or if there is development in especially high risk areas where moveable structure design should be required.

## New Infrastructure Requirement

### Best Practice:

Infrastructure associated with new development is susceptible to the same chronic coastal hazards as is the development itself. Buildings are required to be setback from the coast and for the same reasons new infrastructure should be located as far landward as is practicable to protect it from coastal erosion. Such a requirement is not found in the Neskowin Coastal Hazards Overlay Zone or anywhere else in the Tillamook Land Use Ordinance.

### Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

### Model Code Language:

Model code below is representative of code that County should consider adopting but is not comprehensive or complete, full text of the Model Coastal Erosion Overlay Zone is available online.

**All new infrastructure (e.g., roads, water, and sewer lines) shall be located landward of active and high hazard areas, whenever possible.**

### Implication for Tillamook County:

County review of Coastal Hazard Area Permits should assess whether new infrastructure has been sufficiently located landward of high hazard areas.

## Hazard Disclosure and County Liability Waiver

### Best Practice:

Property owners should formally acknowledge the chronic natural hazards that their property is subject to. A hazard disclosure statement documents the fact the property owner has been made aware of the natural hazard risk intrinsically found on their property and is responsible for the damage that may occur from chronic natural hazards. In conjunction with the hazard disclosure is a liability waiver that releases the County from all claims associated with natural hazards. The Neskowin Coastal Hazards Overlay Zone requires hazard disclosure but not a county liability waiver.

### Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new

section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

## Model Code Language:

Model code below is representative of code that the County should consider adopting but is not comprehensive or complete, full text of the [Model Coastal Erosion Overlay Zone](#) is available online.

### **Hazard Disclosure and Liability Waiver which sets forth the following:**

- (i) A statement that the property is subject to potential chronic natural hazards and that development thereon is subject to risk of damage from such hazards;**
- (ii) A statement that the property owner has commissioned an engineering geologic report for the subject property, a copy of which is on file with the jurisdiction, and that the property owner has reviewed the engineering geologic report and has thus been informed and is aware of the type and extent of hazards present and the risks associated with development on the subject property;**
- (iii) A statement acknowledging that the property owner assumes all risks of damage from natural hazards associated with the development of the subject property; and**
- (iv) A statement releasing the jurisdiction, its agents and employees from any and all claims which may arise as a result of damages, losses or injuries sustained by the property owner and his/her heirs, successors and assigns, from natural hazards.**

## Implication for Tillamook County:

Hazard disclosure and waiver of liability do not in and of themselves protect people or property from natural hazards, but the process of developing the hazard disclosure document and the requirement to sign a County liability waiver may cause people to choose stronger mitigation approaches to better protect their development.

## Safest Site Requirement

### Best Practice:

The existence of multiple hazards, complex topography and/or geology, and other site conditions such as streams mean that determining the safest site for development on a lot or parcel is more complex than simply utilizing a setback from a bluff edge or the crest of a bluff. A safest site requirement has a certified engineering geologist assess all site conditions and hazards to determine where best to locate development. Development in this area should be incentivized with relaxed yard or property line setbacks. A safest site requirement is found in the in the Neskowin Coastal Hazards Overlay Zone but is not found outside of this overlay.

## Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

## Model Code Language:

Model code below is representative of code that County should consider adopting but is not comprehensive or complete, full text of the [Model Coastal Erosion Overlay Zone](#) is available online. It is recommended that the County incorporate specific language into this code section containing the standards and requirements for variances which specifies that the reduction of risk from identified geologic hazards can constitute a circumstance justifying a variance from yard, setback, or similar dimensional standard. Representative examples of standards and requirements for variances are included, (A) and (B), from the Neskowin Coastal Erosion Hazards Overlay Zone.

**Proposed development on lots/parcels within the Coastal Hazard Overlay Zone must be located within an area most suitable for development as determined by a certified engineering geologist as part of an engineering geologic report prepared in accordance with subsection (5). As necessary to comply with this requirement, applicants shall consider seeking a variance to required yards or property line setbacks as authorized in section [insert code section authorizing the granting of variances to dimensional standards].**

**(A) Any required yard or setback may be reduced by up to 50%; and,**

**(B) The maximum building width may be increased to up to 90% of the distance between opposite side lot lines.**

## Implication for Tillamook County:

The coastline of Tillamook is susceptible to multiple overlapping hazard including coastal erosion, wildfire, flooding, tsunamis, sand inundation, and landslide. A safest site requirement recognizes that this means locating a development in the most appropriate location can be a complex and technical process that requires the skills of a certified engineering geologist. Utilizing a safest site requirement best minimizes risk to people and property from multiple natural hazards.

## Subdivision Standards

### Best Practice:

Preventing the creation of new lots or parcels without buildable areas outside of the hazard zone is a best practice in preventing development from occurring where life and property are at unacceptably high levels of risk. The County should require that a buildable site of 1,500 square feet be present in all new lots and parcels.

Such a subdivision standard is found in the in the Neskowin Coastal Hazards Overlay Zone but is not found outside of this overlay.

### Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

### Model Code Language:

Model code below is representative of code that County should consider adopting but is not comprehensive or complete, full text of the Model Coastal Erosion Overlay Zone is available online.

**All new lots and parcels shall have a building site located outside the Hazard Overlay Zone. Such a building site shall consist of a minimum of 1,500 contiguous square feet of area that complies with all required lot setbacks and is located landward of the area subject to the provisions of this section.**

### Implication for Tillamook County:

The lands most vulnerable to coastal hazards can be some of the most desirable sites for development and the County should conduct an economic assessment of development with the coastal hazard area and consider prohibiting the creation of new lots or parcels that would increase risk to people and property on areas where risks from chronic coastal hazards cannot be sufficiently mitigated.

## Residential Density Limitation

### Best Practice:

Limiting the amount of people and property in extreme coastal erosion risk areas should be a priority. If development has already occurred in these areas, then no new dwelling units should be allowed. Such a requirement is not found in the Neskowin Coastal Hazards Overlay Zone or anywhere else in the Tillamook Land Use Ordinance.

### Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

## Model Code Language:

Model code below is representative of code that County should consider adopting but is not comprehensive or complete, full text of the [Model Coastal Erosion Overlay Zone](#) is available online.

**Residential density limitation: Notwithstanding the residential density allowances of the underlying zone, on lots or parcels which are developed with an existing dwelling or dwellings, the construction of additional dwelling units within the [insert hazard areas deemed appropriate and could include active, high, and medium hazard zone areas] erosion hazard zone areas is prohibited.**

## Implication for Tillamook County:

The County should assess if there are specific high hazard area in which new dwelling units should be specifically prohibited. Such a prohibition can recognize that where development has historically occurred in extremely high hazard area no additional dwelling units should be allowed to minimize the amount of building value and residents at risk to chronic coastal hazards.

## Erosion Control and Stormwater Management Standards

### Best Practice:

Increased coastal erosion can occur during and after development that does not properly utilize sedimentation barriers and permanent plantings. Likewise, increased runoff from impervious surfaces can exacerbate coastal erosion and stormwater runoff should not be allowed to decrease the stability of bluff faces, foredune areas, known landslides, or other areas identified as unstable slopes prone to earth movement. Section 5.100 Neskowin Erosion Control and Stormwater Management proved erosion control and stormwater management standards for the Neskowin area, but is not found outside of this overlay and the county lacks a stormwater ordinance.

### Applicable Development Code:

This would be a new overlay found in 3.500 Overlay Zone that would supplant or replace Section 3.570 Neskowin Coastal Hazards Overlay Zone. Hereafter this new section is referred to as 3.500 Countywide Coastal Hazards Overlay Zone (proposed).

## Model Code Language:

Model code below is representative of code that County should consider adopting but is not comprehensive or complete. The following model code is taken from Section 5.100 Neskowin Erosion Control and Stormwater Management. Additional erosion control and stormwater management code sections are available in Attachment C: City of Newport Erosion Control Measures (page 23) and Attachment D: Astoria Erosion Control and Stormwater Management Code Language (page 25) of the [Model Coastal Erosion Overlay Zone](#) is available online.

Additionally, Appendix A contains a case study on the Newport Erosion Control Measures.

**EROSION CONTROL:** All applications for development subject to the provisions of this section shall include detailed plans for the control of erosion and sedimentation during the course of construction and/or other ground disturbing activities. Such plans shall, at a minimum, incorporate the following measures:

(a) Stripping of vegetation, grading, or other soil disturbance shall be done in a manner which will minimize soil erosion, allow the soil to be stabilized as quickly as practicable, and disturb the smallest practical area at any one time during construction;

(b) Development plans shall minimize cut or fill operations so as to prevent off-site impacts;

(c) Sedimentation barriers, as described in the Oregon Department of Environmental Quality publication "Best Management Practices for Stormwater Discharges Associated with Construction Activities" shall be placed to control sedimentation and minimize any sediment discharge from the site. Such barriers shall be installed prior to site clearing or grading activities;

(d) Temporary vegetation and/or mulching shall be used to protect exposed critical areas during development; and,

(e) Permanent plantings and any required structural erosion control and drainage measures shall be installed as soon as practical.

**(4) STORMWATER MANAGEMENT:** Applications for development subject to the provisions of this section shall include plans for the long-term management of stormwater that, at a minimum, conform to the following requirements:

(a) Provisions shall be made to effectively accommodate increased runoff caused by altered soil and surface conditions during and after development. The rate of surface water runoff shall be structurally controlled where necessary to prevent increased erosion; and

(b) Permanent drainage provisions adequate to convey surface runoff from the twenty-year frequency storm to suitable drainage ways such as storm drains, natural watercourses, or drainage swales shall be provided. In no case shall runoff be directed in such a way as to significantly decrease the stability of bluff faces, foredune areas, known landslides, or other areas identified as unstable slopes prone to earth movement, either by erosion or increase of groundwater pressure.

(c) A geologic report, required within the NESK CH Overlay Zone, shall address management of surface water runoff at or behind active foredunes and riprap structures in order to reduce erosion and structure failure potential.

## Implication for Tillamook County:

Tillamook County currently lacks a stormwater ordinance and developing one would be a lengthy and involved process. Adopting erosion control and stormwater management standards within the proposed Countywide Coastal Hazards Overlay Zone would be an efficient and effective way to prevent development from unduly increasing the rate, extend, and severity of coastal erosion.

## Model Ordinance and Codes

The following model ordinances and standards were identified during research on coastal erosion hazard mitigation. These documents have example language for specific mitigation strategies that could be implemented in Tillamook's development code.

### **Chronic Coastal Natural Hazards Model Overlay Zone** <sup>18</sup>

This model overlay zone was developed in 2008 by DLCDC and the Oregon Coastal Management Program (OCMP) to be used in conjunction with DOGAMI coastal hazard risk maps and analysis. The model overlay includes the hazard overlay code, example comprehensive plan amendments, and sample adopting ordinance language. This model code was heavily utilized in the Tillamook County Neskowin Coastal Hazards Overlay as well as within the Newport OR, Geologic Hazard Overlay.

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<sup>18</sup> Model Coastal Erosion Overlay Zone, accessed May 12, 2016  
<https://www.oregon.gov/LCD/OCMP/docs/Publications/ModelCoastalHazardsOverlayZone.pdf>

## CHAPTER 7: LANDSLIDE

This chapter identifies the risk landslide poses to unincorporated Tillamook County, the extent of risk, and the rate and location of development affected by landslide. Following are policy options the county can consider to strengthen the Tillamook County Comprehensive Plan, Land Use Ordinance, and Land Division Ordinance. Policy options are presented with descriptions of best practices, identification of the applicable county code sections, and details of implementing the policy.

### Extent of Risk

Landslides pose a significant threat to communities across Tillamook's rugged and varied topography. Geographic conditions combined with increasing development have led to increased landslide susceptibility. Reduction of landslide risk requires that communities understand landslide processes and occurrence, and initiate a more robust approach for developmental requirements and mitigation action at the local level.

### Development in Hazardous Areas

Landslide susceptibility determined by combined generalized geology and landslide inventory establishes classes of low, moderate, and high risk. Spatial statistics of the slope map determines classes of low, moderate, and high slopes prone to land sliding within each geologic unit. DOGAMI conducted an analysis in their report, O-16-02. The study suggests that over 33% of the unincorporated county is exposed to high or very high landslide risk. The Tillamook County Risk Report (2016, draft) indicates that 10% of buildings in unincorporated areas including Neskowin, Oceanside, Netarts, and Pacific City are located within High Susceptible areas (Table 12), and 23% are located within Very High Susceptibility areas (Table 13).

**Table 12: High Susceptibility Landslide Exposure Analysis**

Community	Total Number of Buildings	Total Estimated Building Value (\$, in thousands)	High Susceptibility		
			Number of Buildings	Building Value (\$, in thousands)	Ratio of Exposure Value
Unincorporated County (rural)	15,015	\$ 1,282,436	4,933	\$ 95,872	8%
Neskowin	653	\$ 118,436	132	\$ 22,834	19%
Oceanside and Netarts	1,701	\$ 203,363	738	\$ 45,647	22%
Pacific City	1,707	\$ 212,062	183	\$ 24,888	12%
<b>Total</b>	<b>19,076</b>	<b>\$ 1,816,324</b>	<b>5,986</b>	<b>\$ 189,240</b>	<b>10%</b>

Source: Risk Report, 2016 (modified by CSC), Table A-6

**Table 13: Very High Susceptibility Landslide Exposure Analysis**

Community	Total Number of Buildings	Total Estimated Building Value (\$, in thousands)	Very High Susceptibility		
			Number of Buildings	Building Value (\$, in thousands)	Ratio of Exposure Value
Unincorporated County (rural)	15,015	\$ 1,282,436	3,680	\$ 353,459	28%
Neskowin	653	\$ 118,436	8	\$ 1,353	1%
Oceanside and Netarts	1,701	\$ 203,363	446	\$ 55,589	27%
Pacific City	1,707	\$ 212,062	2	\$ 42	0%
<b>Total</b>	<b>19,076</b>	<b>\$ 1,816,324</b>	<b>4,136</b>	<b>\$ 410,443</b>	<b>23%</b>

Source: Risk Report, 2016 (modified by CSC), Table A-6

There are six (6) essential facilities within the unincorporated county that are exposed to the high or very high landslide susceptibility hazard.

**Table 14: Essential Facilities Exposed to Landslide Threat**

Community	Exposed Essential Facility
Unincorporated County (rural)	Nestucca Fire and Rescue Station #87
	Nestucca High School
	Fire Mountain School
	Nestucca RFPD #84
	Nestucca Valley Elementary
Neskowin	Neskowin Valley School
Oceanside and Netarts	Oceanside RFPD #62

Source: Risk Report, 2016 (modified by CSC), Table 7.

## Existing Programs and Resources

### National

#### United States Geological Survey Landslide Hazard Program (LHP)

The USGS Landslide Hazard Program (LHP) provides scientific information to minimize loss of life and property from landslides, improve understanding and increase mitigation action. The LHP conducts landslide hazard assessments, pursues landslide investigations and forecasts, provides technical assistance to respond to landslide emergencies, and engages in outreach activities.

### State

#### Oregon Senate Bill 12

Specifically addresses rapidly moving landslides and delegates various mitigation responsibilities to statewide agencies such as DOGAMI, DLCD, Oregon Department

of Transportation (ODOT), and Oregon Department of Forestry (ODF). The bill requires local governments to "regulate through mitigation measures and site development standards the siting of dwellings and other structures designed for human occupancy in further review areas where there is evidence of substantial risk for rapidly moving landslides."

## Oregon Senate Bill 1211

A precursor to Senate Bill 12, authorizes the ODF to prohibit forest operations on certain landslide-prone areas above homes and busy roads in the interest of public safety. The bill also created the Interim Task Force on Landslides and Public Safety.

## County

There are currently no landslide mitigation programs in Tillamook County.

## Comprehensive Plan Review

Tillamook County's Comprehensive Plan provides the framework for the existing landslide mitigation actions. This section identifies how the hazard has been included in the comprehensive plan and suggests ways to strengthen and improve its inclusion in support of mitigation strategies.

## Landslides- Findings and Policies Goal 7, 2.1

Current code language within the comprehensive plan primarily focuses on landslides in terms of the uniform building code, as well as engineering standards for excavation, fills/drainage, and vegetation removal.

**CSC Comment:** Existing language that relates to geologic hazards does not comprehensively address and define the extent and characteristics of at-risk areas. Zoning regulations, standards, and requirements related to development within hazardous areas are contingent on the designation of concise spatial parameters. The comprehensive plan should adopt DOGAMI's landslide susceptibility index to determine the specific locations that will be impacted by regulatory landslide mitigation actions.

## Land Use Ordinance Policy Options

This section presents a toolbox of landslide hazard mitigation strategies. Recommendations range from highly regulatory to incentive-based, and best practices are linked to specific case studies found in Appendix A, as appropriate. Within each strategy, best practices identified through policy analysis research form the basis for the recommendation. Location of applicable Land Use Ordinance sections related to the implementation of the strategy is identified and any model code language is presented for potential adoption. The implications of adoption are also discussed.

In the following section, model development code is **bold**

*For a complete list of the recommended comprehensive plan and land use ordinance policy options see Tables 2 through 7.*

## **Establish a Geologic Hazard Overlay Zone**

### **Best Practice:**

Establish a Geologic Hazard Overlay zone based on recent county LIDAR data to form a regulatory trigger zone. Current land use code provides standards for geologically hazardous areas, however, the extent of these areas are not defined and without specific boundaries, there is a lack of accountability that can be attributed to development. Development standards based on geologic characteristics should reflect information that is outlined in the DOGAMI [Landslide Susceptibility Overview Map of Oregon](#) (Open File Report O-16-02, 2016), as well as data available through mapping services provided by the [Statewide Landslide Information Database \(SLIDO\) version 3.2](#). Replace 1972 and 1973 landslide DOGAMI Bulletins 74 and 79 maps to provide consistent land use regulations for countywide landslide hazard areas to best protect people and property. Current code revolves around outdated mapping that does not supply sufficient coverage for highly susceptible areas. Looking at both the degree of hazard threat and exposure and sensitivity analysis provided by the Risk Report, the county should specifically target mapping projects in Nehalem, Wheeler, Manzanita, Neskowin (unincorporated), and Oceanside/Netarts (unincorporated).

### **Applicable Development Code:**

The County should consider moving Section 4.130.1 Development Requirements for Geologic Hazard Areas to 3.500 Geologic Hazard Overlay.

### **Implication for Tillamook County:**

Further analysis of county LIDAR data is required to properly define this overlay zone with support from the FEMA Risk MAP program. Defining Geologic Hazard Areas based on DOGAMI Bulletins 74 and 79 relies on data that is over thirty years old and does not accurately represent current conditions. Additionally, the more recent mapping outlined in DOGAMI O-16-02 and the Risk Report addresses landslide hazard at a state and county level, which can generalize many geologic anomalies and features.

## **Development Requirements for Geologic Hazard Areas**

### **Best Practice:**

For all development in or partially in the Geologic Hazard Overlay a Geologic Hazard Area Permit and *geologic assessment* or *geologic report* prepared by an engineering geologist is required. A geologic report created by a certified geologist includes very clear stipulations that are site specific and are determined based on the unique geologic characteristics of the surveyed area.

## Applicable Development Code:

Section 3.500 Geologic Hazard Overlay (proposed)

## Implication for Tillamook County:

Existing development standards included in the geologic hazard report are not specific and do not assure effective mitigation actions. This section should be amended to include more concise and explicit requirements for each standard. It is essential that the code contain language that provides straightforward guidance that will inform development within geologic hazard areas. A Geologic Hazard Area permit and report provides site and development specific hazard analysis and details engineering requirements to minimize the risk posed by geologic hazards.

## Geologic Hazard Point-Based Assessment System

### Best Practice:

A point-based system quantifies development site landslide risk and triggers either a *geologic assessment* or a *geologic report*. The following is adopted from the Marion County Comprehensive Land Use Plan (See Appendix).

## Applicable Development Code:

The County should consider moving Section 4.130.1 Development Requirements for Geologic Hazard Areas to 3.500 Geologic Hazard Overlay.

## Model Code Language:

**Model Code Language: Building plans and development applications will be evaluated based upon a point system that combines the landslide risk exhibited by the subject property (a function of soil types, slopes, underlying geological conditions, etc.) with the intensity of the proposed use.**

**Table 15: Geologic Hazard Point-Based Assessment System Steps**

Landslide Risk Assessment		
Step 1*	Earthquake-induced landslide susceptibility based points*	
Step 2*	Water-induced landslide susceptibility based points*	
Step 3	Slope based points	
Step 4	Development and type of proposed use based points	
Step 5	Calculate cumulative score	
Step 6	Determine requirements category	
Category A: Low Risk	Category B: Moderate Risk	Category C: High Risk
No Requirements	Geologic Assessment	Engineering Geology Report

Source: Marion County Comprehensive Plan (modified by CSC)

\* Further data collection and analysis is needed to inform point allocation and rating system for Steps 1 and 2.

## Implication for Tillamook County:

Considerations for point allocations include geology, slope, and proposed development type. Modeled after Marion County (see Appendix B), this requirement creates a quantitative evaluation of both the geologic and structural variables that threaten the area. Different degrees of hazard are thus distinguished and are then translated into a permit request process. Quantitative evaluation defines degree of hazard and a more regulated permit request process discourages construction in high-risk areas.

## Buffer Zone Requirement

### Best Practice:

Through the expert guidance supplied by the geological report, a buffer zone in a highly susceptible area can be defined and used to determine the safest site for development. The following code is borrowed from the King County, WA Development Code (See Appendix A).

### Applicable Development Code:

Section 3.005 Geologic Hazard Overlay (proposed)

## Model Code Language:

**A buffer zone is based on a critical area report prepared by a geotechnical engineer or geologist. If a critical area report is not submitted to the department, the minimum buffer is fifty feet with an additional 15-foot building setback requirement. If the structure has a vertical rise that is significantly higher, setback should be increased.**

## Implication for Tillamook County:

Currently, Tillamook County's development code does not include provisions related to the area surrounding structures proposed within a high-risk landslide area. It is in the County's best interest to reduce the potential damage to these structures through a buffer zone regulation. The amended code would include language modeled after King County's example. The responsibility falls on the developer to fulfill the buffer requirement. The zone defines an area contiguous to a steep slope or landslide hazard area intended to protect slope stability, attenuation of surface water flows, and landslide hazards.

## Revegetation Standards

### Best Practice:

Certain plant species are valuable landslide mitigation tools, contributing complex root systems that bind to the soil and increase slope stability. Existing code mentions revegetation however; this requirement is deficient and lacks the specificity needed to mandate a level of accountability. Determine which trees may be cut and removed, while stipulating which species, stumps, and root systems must be left undisturbed. Set requirements for revegetation to compensate for damaged or removed plants. The following code is adopted from the City of Mukilteo Municipal Code (See Appendix A).

### Applicable Development Code:

Section 3.005 Geologic Hazard Overlay (proposed)

## Model Code Language:

**Certain tree types may be cut and removed in a method determined by planning director and public works director. Stumps and root systems must be left undisturbed to protect the slope from erosion. Certain deep rooted bushes or ground cover shall be planted around the stump to establish erosion control functions. Certain tree types cannot be cut down, except with the submittal of a geotechnical report. Trimming must preserve a minimum of sixty percent of original canopy/foilage. "Windowing", "interlimbing", or "skirting-up" trimming practices may be utilized, but must adhere to requirements based on type of trimming practice.**

## Implication for Tillamook County:

Section 2.1 “Landslides” of the Comprehensive Plan stipulates that vegetation removal in areas of mass movement topography shall be engineered to minimize sliding (7-17). Section 4.130-2 instructs the documentation of “minimum removal of vegetation to accommodate use” within an associated geologic hazard report. Including more specific and direct vegetation standards within the development code increases stabilization of soils and reduce the risk of landslides. The city of Mukilteo, WA addresses landslide threat by incorporating a comprehensive description of regulated landscape practices within geologically sensitive areas.

## Non-Regulatory Geologic Hazard Abatement District

### Best Practice:

A Geologic Hazard Abatement District (GHAD) necessitates voluntary community involvement, forming a district of residents within the determined boundary, and requiring homeowners to contribute a fixed monthly amount to a community fund for ongoing hazard reduction efforts that can also be utilized for post emergency event funding. To form a GHAD, City Council must adopt a resolution to initiate formation and set a date for a public hearing. The following is informed by the City of San Ramon (See Appendix A).

### Model Code Language:

**The primary mission of the Geologic Hazard Abatement District (GHAD) is the prevention, mitigation, abatement, and/or control of geologic hazards within its boundaries that have damaged, or that pose a significant threat of damage to site improvements within the developed areas of the projects. Communities elect to establish an abatement district and allocate an agreed-upon quantity of funding each month that is set aside for ongoing reduction efforts, as well as a contribution to an emergency pool that can be utilized in the case of an emergency event.**

## Implication for Tillamook County:

Following the practices set forth by San Ramon’s example, Tillamook County could adopt a Landslide Hazard Abatement District. The district would provide the protection of life and properties from landslide risk through ongoing mitigation projects. As a resident, the GHAD is beneficial as it provides a type of insurance and security, as well as management and maintenance.

## Model Ordinance and Codes

The following model ordinances and standards were identified during research on landslide mitigation. These documents have example language for specific mitigation strategies that could be implemented in Tillamook’s development code.

## **City of Mukilteo Vegetation Standards for Geologic Sensitive Areas**

[City of Mukilteo Vegetation Standards for Geologic Sensitive Areas](#) Ordinance 17.52A.070 outlines specific regulations for vegetation management on steep slopes. Includes prohibitions for landscape alteration and removal of certain species, as well as stipulations related to trimming practices.

## **King County Title 21A.24 – Critical Areas**

[King County Title 21A.24- Critical Areas](#) Ord. 10870 § 176, 1993: Provides stringent regulations and buffer zone requirements for proposed development within a high landslide risk area. The zone is based on a critical area report prepared by a geotechnical engineer or geologist. If a critical area report is not submitted to the department, the minimum buffer is fifty feet with an additional 15-foot building setback requirement.

## **Marion County, Oregon Geologically Hazardous Overlay Zone Ordinance**

The [Marion County Geologically Hazardous Overlay Zone Ordinance](#) assigns point values to particular development activities on certain properties that reflect landslide risk. Depending on the level of risk, the applicant for a proposed development activity is required to submit a geological assessment, geotechnical report, and/or apply for permitting.

## **San Ramon Geologic Hazard Abatement District:**

Under authority of the California Public Resources Code (Division 17, commencing with Section 26500), the City of San Ramon, in 1990, adopted Resolution No. 90-106 forming the West Branch Geologic Hazard Abatement District (“GHAD” or “District”) 1990-01. Assessment is a vital component for the management of an abatement district. To properly and appropriately allocate funding, it is essential that the district be fully informed on the current conditions that may impact hazard threat levels. A funding program provides concise organization and structure for the distribution and collection of finances.

## CHAPTER 7: WILDFIRE

This chapter identifies the risk wildfire poses to unincorporated Tillamook County, the extent of risk, and the rate and location of development affected by wildfire. Following are policy options the county can consider to strengthen the Tillamook County Comprehensive Plan, Land Use Ordinance, and Land Division Ordinance. Policy options are presented with descriptions of best practices, identification of the applicable county code sections, and details of implementing the policy.

### Extent of Risk

Wildfires are a natural and necessary component of many ecosystems across the country. Historically, wildfires have shaped the forests and wildlands valued by residents and visitors. These ecosystems are significantly altered due to fire prevention efforts, modern suppression activities and a general lack of large-scale fires, resulting in overgrown forests and wildland-urban interfaces (WUI) with dense fuels that burn more intensely than in the past. Wildfires can be divided into three categories: interface, wildland, and firestorms.

Interface fires occur where wildland and developed areas meet (the wildland-urban interface). In these locations, both vegetation and structural development combine to provide fuel. The wildland-urban interface can be divided into three categories: classic wildland-urban interface, mixed wildland-urban interface, and occluded wildland-urban interface.

Classic wildland-urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas.

Mixed wildland-urban interface is found in areas of exurban or rural development: isolated homes, subdivisions, resorts and small communities situated in predominantly wildland settings.

Occluded wildland-urban interface where islands of wildland vegetation exist within a largely urbanized area.

The growth in development in interface areas increases the risk of wildfires. Fire has historically been a natural wildland element and can sweep through vegetation adjacent to combustible homes. There is potential for losses due to wildland-urban interface fires in Tillamook County. The forest comprises approximately 90% of Tillamook County (draft Risk Report 2016). Tillamook County's forests play an important role in the local economy, as well as surrounding its resident's homes and businesses (draft Risk Report 2016).

### Development in Hazardous Areas

There is minimal exposure to wildfire within the unincorporated communities of Tillamook County. The countywide exposure is approximately \$13 million for moderate threat and \$2.3 million for high threat (draft Risk Report, 2016) throughout the entire county. Focusing on the unincorporated areas, analysis

indicates a minimal level of building exposure. Less than 1% of buildings in Neskowin, Oceanside, Netarts, and Pacific City are located within areas of moderate or high threat (Risk Report).

The 2010 Tillamook CWPP outlines perceived risk to fire threat. Tillamook fire districts were asked to use a numerical rating system (1-3) to determine the amount of risk associated with a given site. 1 represents extreme, 2 represents moderate, and 3 represents low threats. These were broken out into three different categories based on fire behavior potential, values at risk, and Infrastructures. The results are indicated in the table below:

**Table 16: Communities-at-Risk Matrix**

Community/Area	Risk Factor 1: Fire Behavior Potential Situation Level	Risk Factor 2: Values At-Risk Situation Level	Risk Factor 3: Infrastructure Situation Level
Beaver	2	2	2
<b>Blaine</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>Cloverdale</b>	<b>1</b>	<b>1</b>	<b>1</b>
Hebo	1	2	2
Sandlake	2	2	1
Tierra Del Mar	2	2	2
<b>Neskowin</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>Netarts/Oceanside</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>Beachfront Oceanside to Netarts Bay</b>	<b>1</b>	<b>1</b>	<b>1</b>

Source: Tillamook County Community Wildfire Protection Plan, 2010

Almost all the unincorporated communities evaluated were categorized as presenting extreme or moderate risk to all three categories. Blaine, Hebo, Neskowin, and Netarts/Oceanside indicated an extreme risk for fire potential, values, and infrastructure exposure.

**Table 17: Wildfire Exposure Analysis for Unincorporated Areas**

Community	Total Number of Buildings	Total Estimated Building Value (\$, in thousands)	High Risk		
			Number of Buildings	Building Value (\$, in thousands)	Ratio of Exposure Value
Unincorporated County (rural)	15,015	\$ 1,282,436	383	\$ 22,892	1.8%
Neskowin	653	\$ 118,463	2	\$ 288	0.2%
Oceanside and Netarts	1,701	\$ 203,363	0	\$ -	0.0%
Pacific City	1,707	\$ 212,062	3	\$ 226	0.1%
<b>Total</b>	<b>19,076</b>	<b>\$ 1,816,324</b>	<b>388</b>	<b>\$ 23,406</b>	<b>1.3%</b>

Source: Risk Report, 2016 (modified by CSC), Table A-8.

## Existing Programs and Resources

There are several wildfire mitigation programs at the National, State, and County level that are in effect within Tillamook County. While non-regulatory in nature, they provide useful guidance to the County's decision makers, residents, and developers. These programs provide frameworks for outreach, education, and coordination regarding the mitigation of wildfire risk. This section outlines the general programs, state programs, and county programs that are in effect in Tillamook County.

### National

#### Healthy Forests Restoration Act: Community Wildfire Protection Plans

In 2003, the US Congress passed the Healthy Forests Restoration Act that directed federal agencies to collaborate with communities in the wildland urban interface to create Community Wildfire Protection Plans (CWPP). CWPPs allow communities to identify and prioritize areas needing hazardous fuels treatment. CWPPs provide consistent analysis of existing fuels and WUI conditions along with recommendations and priorities for hazardous fuels reductions treatments on public and private lands. Community Wildfire Protection Plans allow communities to set wildland urban interface (WUI) boundaries and conducted risk assessments for each community.

#### National Fire Protection Association

The National Fire Protection Association (NFPA) is a national non-profit organization that sets national fire safety codes and standards. The codes that NFPA provides are standards that range from building, process, service, design, and installation. Besides providing national fire safety codes and standards, the NFPA provides training and education about fire safety and standards.

#### NFPA 1141: Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas

This standard provides guidance on the development of the community infrastructure necessary to eliminate fire protection problems that result from rapid growth and change.

#### NFPA 1144: Standard for Reducing Structure Ignition Hazards from Wildland Fire

This standard provides guidance on individual structure hazards. It requires a new spatial approach to assessing and mitigating wildfire hazards around existing structures and includes improved ignition-resistant requirements for new construction.

## International Wildland-Urban Interface Code (2012)

This comprehensive wildland-urban interface code establishes minimum regulations for land use and the built environment in designated wildland-urban interface areas using prescriptive and performance-related provisions. It is founded on data collected from tests and fire incidents, technical reports, and mitigation strategies from around the world.

## Firewise Communities

Firewise Communities USA is a program that nationally recognized communities that have taken an organized approach to wildfire preparedness. Firewise Communities educate community members on how live with the threat of wildfire and encourage neighbors to work together and act to prevent loss of property and life. Typically, Firewise Communities have defensible space, well- marked evacuation routes, and community cohesion.

## State

### Oregon Senate Bill 360

The Oregon Department of Forestry (ODF) supplies information about fuel reduction standards to property owners. ODF mails each property owner a certification card, which may be signed and returned to ODF after the fuel reduction standards have been met. Certification relieves a property owner of liability of fire suppression costs if a fire were to occur on the property.<sup>19</sup> If a certification card has not been received by OFD, the state of Oregon may seek to recover certain fire suppression costs from a property owner if a fire originates on the owner's property, the fuel reduction standards have not been met, and ODF incurs extraordinary suppression costs. The cost-recovery liability under the Oregon Forestland Urban Interface Fire Protection Act is capped at \$100,000<sup>20</sup>.

### Oregon Ready, Set, Go!

Oregon Ready, Set, Go! is an online wildfire assessment tool that provides awareness and educational materials to property owners in Wildland Urban Interface. The website allows property owners to enter their home address and identify structural and vegetative information to calculate a wildfire risk score. Based on the score, information will be provided to help reduce the home's risk including building materials or outside landscaping. This is an educational tool for

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<sup>19</sup> Oregon Forestland-Urban Interface Fire Protection Act Property Evaluation and Self-Certification Guide. July 2006. Oregon Department of Forestry. State of Oregon. Available at: [http://www.oregon.gov/ODF/FIRE/SB360/docs/guide/guide\\_0106.pdf](http://www.oregon.gov/ODF/FIRE/SB360/docs/guide/guide_0106.pdf)

<sup>20</sup> Oregon Forestland-Urban Interface Fire Protection Act Property Evaluation and Self-Certification Guide. July 2006. Oregon Department of Forestry. State of Oregon. Available at: [http://www.oregon.gov/ODF/FIRE/SB360/docs/guide/guide\\_0106.pdf](http://www.oregon.gov/ODF/FIRE/SB360/docs/guide/guide_0106.pdf)

homeowners that can help protect their life and property as well as keep First Responders safe when fighting fires.<sup>21</sup>

## Comprehensive Plan Review

Tillamook County's Comprehensive Plan provides the framework for the existing wildfire mitigation actions. This section identifies how the hazard has been included in the comprehensive plan and suggests ways to strengthen and improve its inclusion in support of mitigation strategies.

### Forest Lands Fire Protection- Goal 4, Section 4.10

#### Findings

*Fire protection agencies are concerned about residential development in forested areas because many developments lack proper controls or consideration for fire safety measures and are creating a design for disaster. Every little consideration for fire protection has been given so far in the land use planning process and that as the demand and need for developments in forest areas increase, comprehensive land use planning becomes more necessary*

#### Policy

*Tillamook County recognizes the significant fire hazard and potential public costs that result from improper residential development in rural forested areas. Further development in the Forest zone shall not be approved unless provision has been made for fire safety measures in accordance with the guide published by the Northwest Inter-Agency Fire Prevention Group entitled Fire Safety Considerations for Development in Forest Areas.*

**CSC Comment:** It is important that the county continue to uphold stringent requirements for proposed development within the Fire zone. The fire safety measures outlined in the Northwest Inter-Agency Fire Prevention Group guide provide the necessary framework and standards to best mitigate wildfire risk.

## Land Use Ordinance Policy Options

This section presents a toolbox of wildfire hazard mitigation strategies. Recommendations range from highly regulatory to incentive-based, and best practices are linked to specific case studies found in Appendix A, as appropriate. Within each strategy, best practices identified through policy analysis research form the basis for the recommendation. Location of applicable Land Use Ordinance sections related to the implementation of the strategy is identified and any model code language is presented for potential adoption. The implications of adoption are also discussed.

In the following section, model development code is **bold**

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<sup>21</sup> Ready, Set, Go! > Home. Accessed June 8, 2015. <http://www.wildlandfirersg.org>.

*For a complete list of the recommended comprehensive plan and land use ordinance policy options see Tables 2 through 7*

## **Firewise Standards or Firewise Recognition**

### **Best Practice:**

Achieve Firewise Standards or Firewise Recognition. [Firewise](#) is a non-regulatory program managed by the National Fire Protection Association (NFPA) that provides principles or standards that include many NFPA 1141 ([Standards for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas](#)) and 1144 ([Standard for Reducing Structure Ignition Hazards from Wildland Fire](#)) standards. These represent industry standards that reduce wildfire ignition to the home through fire resistant building materials and the creation of defensible space around structures. Communities can receive Firewise Recognition by following five steps that include: a wildfire hazard assessment, creating a community task force, holding an annual Firewise Day, spending \$2 per capita on Firewise projects, and submitting an annual report to Firewise documenting the community's progress.

### **Implication for Tillamook County**

We recognize that a highly regulatory approach to wildfire mitigation may not be a necessary action for current conditions in Tillamook County. Taking a more voluntary approach to reduction of wildfire risk may be sufficient and offers a more individualized strategy that provides communities with the opportunity to make efforts that most appropriately address their specific needs. Firewise provides guidance for small scale mitigation and is highly effective at the neighborhood and community level (See Appendix C, Ashland). Through ongoing projects, education, and available services, areas that opt to adhere to Firewise standards greatly reduce their risk to wildfire.

## **Creation of Wildfire Hazard Overlay**

### **Best Practice:**

The County should consider creating a new overlay zone based on the rural fire protection districts (see Figure 1), the Wildland-Urban Interface<sup>22</sup> (WUI) extent (see Figure 2), and Risk MAP findings to form a regulatory "trigger zone". The existing Forest zone does not include developable areas within the unincorporated communities, as such these areas do not need to comply to the residential wildfire standards of the Forest zone. A basic wildfire overlay zone, defined by the current WUI extent, would allow the residential wildfire protection standards of the Forest zone to cover the unincorporated communities within the WUI area. An expanded

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<sup>22</sup> The Wildland-Urban Interface (WUI) is the area where humans and their development meet or intermix with wildland fuel. The WUI is defined within the Tillamook County Community Wildfire Protection Plan (CWPP).

overlay zone would include the rural fire districts (see Figure 1), and the high threat fire areas defined by the draft Risk Report, in addition to the WUI area.

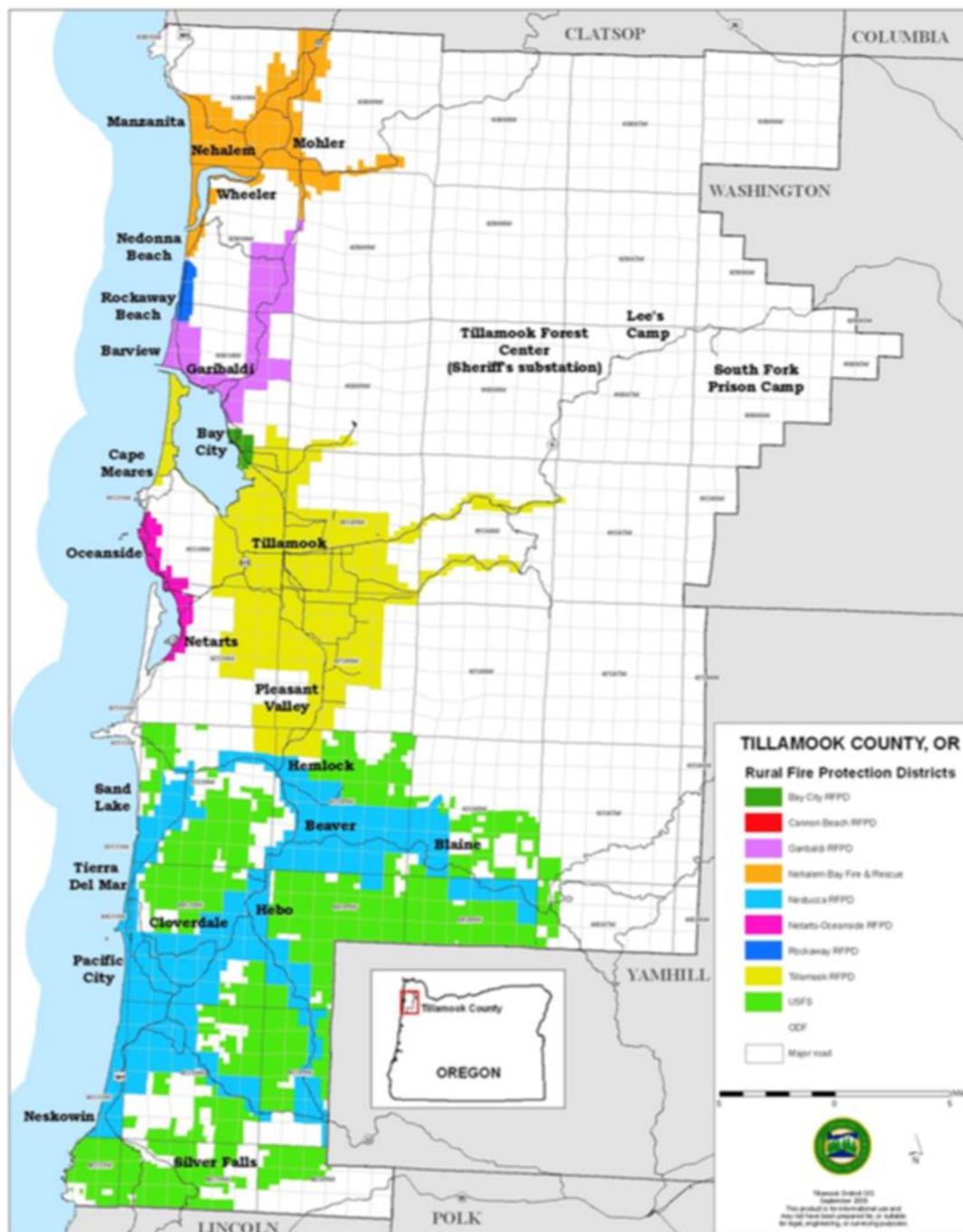
### **Applicable Development Code:**

Section 3.500 Wildfire Hazard Overlay (proposed)

### **Implication for Tillamook County:**

Specific components of the Forest (F) Zone that should be included in the proposed wildfire hazard overlay include: water supply requirements for fire protection requirements (4,000gal minimum or continuous streamflow), road access to dwellings, and prohibition of development on steep slopes (>40%). One of the most salient and effective requirements set forth in the Forest Zone relates to 'fuel break standards', also known as defensible space. The code clearly outlines concise conditions for a defensible space based on the slope of the development site, and includes a mandate to include additional distance when building down slope.

**Figure 1: Tillamook Rural Fire Districts**

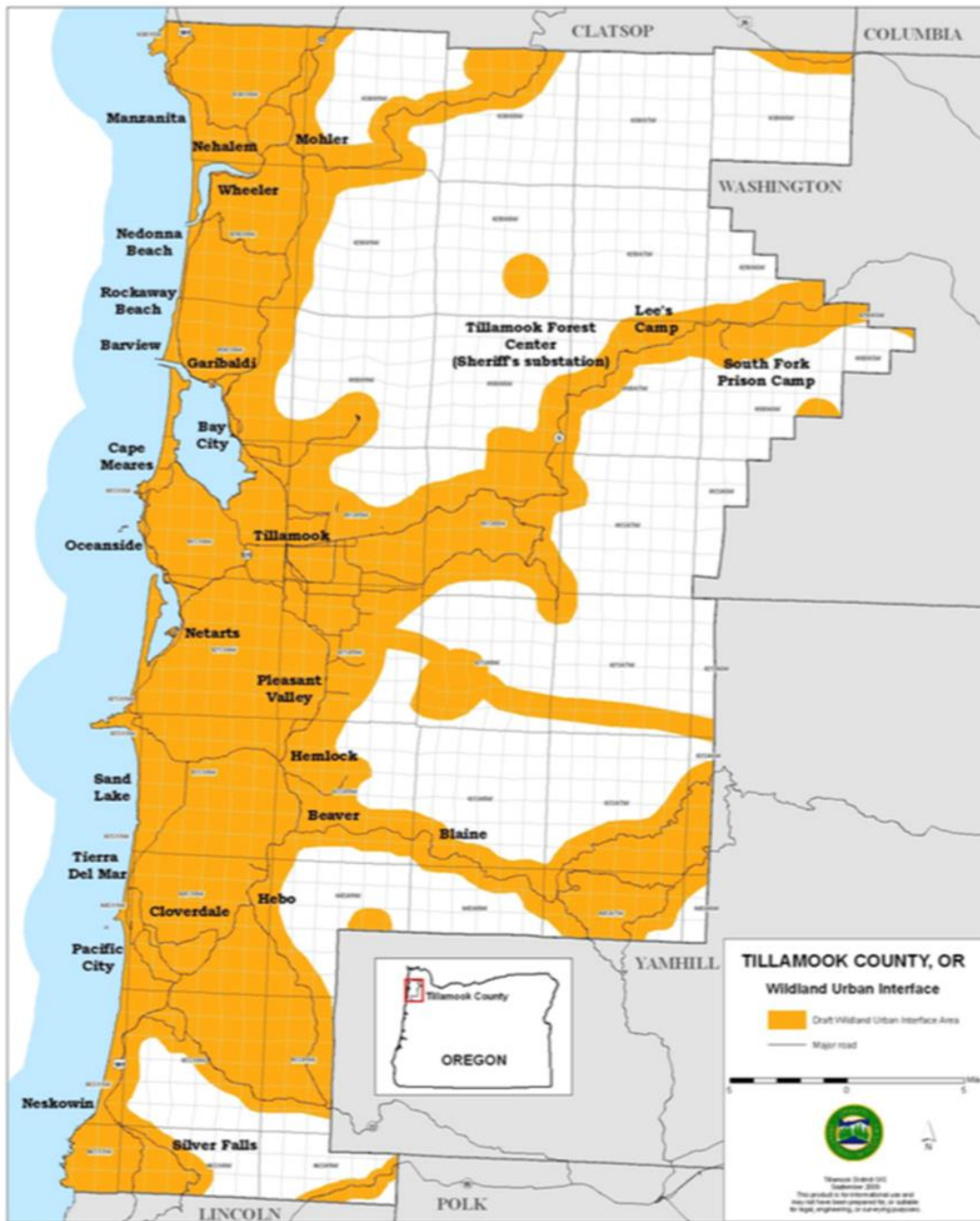


Source: Tillamook County Community Wildfire Protection Plan. 2006  
<https://www.oregon.gov/ODF/Documents/Fire/CWPP/Tillamook.pdf>

The Community Wildfire Protection Plan (CWPP) outlines Tillamook County's nine (9) rural fire protection districts. When evaluating the extent of a revision to the Forest zone, the County should consider future development areas and other areas that may be currently excluded from existing wildfire protection. Tillamook County's WUI (see Figure 2) encompasses all incorporated areas along the coast and cuts across the county towards the eastern boundary through Blaine and Lee's

camp. Integrating the fire protection standards of the residential areas of the Forest zone into the high-risk areas of the WUI should be considered.

**Figure 2: Tillamook Wildland-Urban Interface Extent**



Source: Tillamook County Community Wildfire Protection Plan. 2006  
<https://www.oregon.gov/ODF/Documents/Fire/CWPP/Tillamook.pdf>

## **Require Class A Roofing Materials in Wildfire Hazard Zone**

### **Best Practice:**

The most vulnerable part of a house to firebrands is the roof. If the roof is constructed of combustible materials such as untreated wood shakes and shingles, the house is in jeopardy of igniting and burning. Roofing materials are defined by ASTM E108 and tests conducted at UL Inc., FM Global, or any other certified testing laboratory. Class A roof requirements can be found in the Colorado Springs Development Code Section 8.4.105 (See Appendix).

### **Applicable Development Code:**

3.500 Wildfire Hazard Overlay (proposed)

### **Model Code Language:**

**A minimum of a Class A roof covering (excluding solid wood roofing products) shall be installed on all Residential Occupancies within Overlay Zoning Code**

### **Implication for Tillamook County**

Current roof material requirements include code language that is not sufficiently specific. Detailing stringent roof material requirements more effectively reduces a structure's risk to wildfire. Class A, the highest fire-resistance rating for roofing as per ASTM E-108, indicates roofing can withstand severe exposure to fire originating from sources outside the building. Applying this standard to all new development and when roofs are substantially improved will provide the greatest protection.

## **Road Identification and Address Marking Requirements**

### **Best Practice:**

The International Wildland-Urban Interface Code section 403.4 and 403.6 provide specific language addressing road and address marking. The International Wildland-Urban Interface Code section 403.6 includes specific standards for address identification signs that could help emergency responders quickly and easily locate a residence in danger.

### **Applicable Development Code:**

3.500 Wildfire Hazard Overlay (proposed)

### **Model Code Language:**

**All buildings shall have a permanently posted address, which shall be placed at each driveway entrance and be visible from both directions of travel along the road. In all cases, the address shall be posted at the beginning of construction and shall be maintained thereafter, and the address shall be visible and legible from the road on which the address is located.**

## Implication for Tillamook County:

Clearly identifiable signage for roads and residences helps emergency responders quickly locate and identify residences in time-sensitive situations (c) The owners of the dwellings and structures shall maintain a primary fuel-free break area surrounding all structures and clear and maintain a secondary fuel-free break area on land surrounding the dwelling that is owned or controlled by the owner in accordance with the provisions in "Recommended Fire Siting Standards for Dwellings and Structures and Fire Safety Design Standards for Roads" dated March 1, 1991, and published by the Oregon Department of Forestry and shall demonstrate compliance with Table (10)(c)1

## Require Fire Protection Proof for Subdivisions

### Best Practice:

Proof of Fire Protection is a best practice found in the Jefferson County, CO Land Development Regulation Section 4.C.18 (See Appendix). Requiring proof of fire protection from a fire district to serve the development will help ensure that emergency responders will adequately be able to service the property.

### Applicable Development Code:

3.500 Wildfire Hazard Overlay (proposed)

### Model Code Language:

**Require a written statement from the appropriate fire district indicating that they will serve the property. If the property is not within a fire district, a contract with the district would need to be established indicating that fire protection to the property will be provided.**

## Implication for Tillamook County:

The Tillamook County Code does not currently require proof of fire protection for subdivisions; however, the county does require Fire Chief input. If a property is not currently provided fire protection service a contract, or annexation into a fire district, will help ensure fire protection can be provided. This policy could be restrictive to developers and cause service problems for fire districts however; it will ensure that adequate protection can be provided before property is developed

## Wildland Fire Hazard Assessment

### Best Practice:

Wildland Fire Hazard Assessments were initially introduced through Senate Bill 360. Assessments can be used to measure the hazard rating and applicable requirements necessary for each parcel. The following assessment is modeled from the Seven Basins Community Wildfire Risk Assessment.

## Applicable Development Code:

3.500 Wildfire Hazard Overlay (proposed)

## Model Code Language:

**Building plans and development applications will be evaluated based upon a point system. The hazard rating (low, moderate, high and extreme) refers to the potential for damage from a wildfire, and is dependent on the combined effect of these environmental factors and how they affect fire behavior. The fire hazard rating includes the combined values for vegetation and landscape factors.**

## Implication for Tillamook County:

The county should consider including language stating the fire hazard risk would be determined by a wildland fire hazard assessment. A Wildland Hazard Assessment initiated before development would identify the level of risk to a property and ensure adequate mitigation standards are obtained before construction and occupancy.

## Model Ordinance and Codes

The following model ordinances and standards were identified during research on wildfire mitigation. These documents have example language for specific mitigation strategies that could be implemented in Tillamook's development code.

### National Fire Protection Association

The National Fire Protection Association (NFPA) is a national non-profit organization that sets national fire safety codes and standards. The codes that NFPA provides are standards that range from building, process, service, design and installation. Besides providing national fire safety codes and standards, the NFPA provides training and education about fire safety and standards.

### **NFPA 1141: Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas**

[This standard](#) provides guidance on the development of the community infrastructure necessary to eliminate fire protection problems that result from rapid growth and change.

### **NFPA 1144: Standard for Reducing Structure Ignition Hazards from Wildland Fire**

[This standard](#) provides guidance on individual structure hazards. It requires a new spatial approach to assessing and mitigating wildfire hazards around existing structures and includes improved ignition-resistant requirements for new construction.

## International Wildland-Urban Interface Code (2012)

This comprehensive [\*wildland-urban interface code\*](#) establishes minimum regulations for land use and the built environment in designated wildland-urban interface areas using prescriptive and performance-related provisions. It is founded on data collected from tests and fire incidents, technical reports, and mitigation strategies from around the world.

## CHAPTER 8: SAND INUNDATION

This chapter identifies the risk coastal erosion poses to unincorporated Tillamook County, the extent of risk, and the rate and location of development affected by coastal erosion. Following are policy options the county can consider to strengthen the Tillamook County Comprehensive Plan and Land Use Ordinance. Policy options are presented with descriptions of best practices, identification of the applicable county code sections, and details of economic, administrative, health, or environmental impacts of implementing the policy.

### Extent of Risk

Sand inundation is the naturally occurring process of sand movement caused by wind and gravity. Sand accumulation causes damage to structures, buries lawns and septic systems, can block driveways and roads, and can prevent access to buried water lines, water meters, and fire hydrants. Sand inundation does not pose a short-term episodic risk to people and property, but the long-term chronic risks can be significant. Sand inundation is usually a chronic issue faced within a small geography and residents of these areas must continually work to prevent and remove sand buildup.

### Development in Hazardous Areas

Sand inundation occurs in active dune areas where there is considerable movement of sand. The draft Risk Report does not analyze the risk of sand inundation in Tillamook County, but the Tillamook County Comprehensive Plan does indicate that sand inundation occurs along Sunset Drive in unincorporated Pacific City, as well as within foredune lots of the unincorporated areas of Nedonna, Tierra del Mar, and Neskowin. The county is providing for emergency sand removal in Tierra de Mar, Pacific City, and Neskowin indicating significant sand accumulation in these areas that is currently threatening building stability and access.

Development on active foredune areas is not allowed under state Goal 18 Implementation Requirement number 2, but the County is has taken exemption to this in Cape Meares, Tierra del Mar, Pacific City, and Neskowin. The Ocean Shore Data Viewer<sup>23</sup> produced through the Oregon Coastal Management Program is a parcel level mapping of Goal 18 exemptions within the county and shows which lots are have been exempted and may be susceptible to sand inundation.

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<sup>23</sup>Ocean Shores Data Viewer, accessed May 28, 2016  
<http://www.coastalatlantis.net/index.php/tools/planners/67-ocean-shores-viewer>

# Existing Policies and Programs

## State

### Goal 18: Beaches and Dunes

Statewide planning goal 18 addresses the beaches and dunes of Oregon and prohibits development on active foredunes unless specific conditions are met. Goal 18 stipulates that “grading or sand movement necessary to maintain views or to prevent sand inundation may be allowed for structures in foredune areas only if the area is committed to development or is within an acknowledged urban growth boundary and only as part of an overall plan for managing foredune grading.” Additional specifications for foredune grading plans are provided within Goal 18 and such plans have been successfully implemented in communities along the Oregon Coast.

### House Bill 1601

Known as the Oregon Beach Bill, HB 1601 passed in 1967 and defined the ocean shore area to be all wet sand within sixteen vertical feet of the low tide line and established this strip of land to be a state recreation area. Alternations to this strip of land require an Oregon Parks and Recreation Department Ocean Shore Alteration Permit.

### Oregon Department of State Lands – Removal-Fill Law and Permit

The purpose of Oregon’s 1967 Removal-Fill Law (ORS 196.795-990) is to protect public navigation, fishery, and recreational uses of the waters. “Waters of the state” are defined as “natural waterways including all tidal and nontidal 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 that is in the boundaries of this state.” The law applies to all landowners, whether private individuals or public agencies.

Oregon’s Removal-Fill Law requires people to obtain a permit from the Department of State Lands (DSL) who plan to remove or fill material in waters of the state, including activities between extreme low-tide elevation seaward to the limits of the territorial sea, which is three nautical miles into the Pacific Ocean. Note that this area does not include the beach which is defined as the area between extreme low tide (lowest estimated tide) and the “line of statutory vegetation” or “actual vegetation line” whichever is further inland. The beach is regulated through the Oregon Parks and Recreation’s Ocean Shore Permit Program.

Many projects that require a DSL removal-fill permit also will require a federal permit from the U.S. Army Corps of Engineers, however DSL and the Corps use a joint permit application form.

## Oregon Parks and Recreation Department – Ocean Shore Permit

The Oregon Parks and Recreation Department (OPRD) has been charged with the protection and preservation of the recreation, scenic, and natural resource values found on Oregon's ocean shore. To help accomplish this, ocean shore alterations include the construction of shoreline protective structures, beach access ways, dune grading and other sand alterations, the routing of pipelines and cables beneath the ocean shore, and other natural product removal require an Ocean Shore Permit.

## House Bill 3030 – Sand Control Districts

The Oregon governor signed House Bill 3030 in June 2015 authorizing the formation of sand control districts for the purposes of controlling drifting sand. Sand control districts are voluntary districts that must be approved by voters within their boundaries. A district board composed of three members has the power to pass taxes to fund an account that can be drawn from for sand control activities and further manages the district. Additionally, sand control districts may issue general obligation bonds to fund sand management controls. House Bill 3030 does not form any sand control districts, instead it provides the legal framework for them to be formed. At this time, there are no sand control districts in Oregon, but Bayshore has expressed interest in utilizing this new sand management tool.

## County

### Nedonna Beach Foredune Management Plan

Passed in 1987, the Nedonna Beach Foredune Management Plan consists of a Technical Report that analyzes the factors that affect dune stability in the management area, a Grading Plan that details when and how grading may occur, and a Management Plan which recommends other regulations to enhance the stability of the foredune. The County considers this foredune management plan to be a framework that can be utilized for further management plans.

### Pacific City Foredune Management Plan

Passed in 1998, the Pacific City Foredune Management Plan is composed of a Technical Report, Grading Plan, and Management plan for grading activities the specified management area.

## Comprehensive Plan Review

Tillamook County's Comprehensive Plan provides the framework for the existing sand inundation mitigation actions. This section identifies how this hazard has been included in the comprehensive plan and suggests ways to strengthen and improve its inclusion in support of further mitigation strategies. In the following sections Comprehensive Plan text is italicized, suggested edits are in **bold**, and suggested text removals are ~~crossed-out~~.

## Goal 18 Beaches and Dunes 2.2b, Active Foredunes (FDA)

**CSC Comment:** The Comprehensive Plan identifies areas of sand inundation within the County, however this information is not updated. This section should be critically reviewed for consistency with current sand inundation occurring in the County. Sand inundation occurs throughout Pacific City not just along Sunset Drive, and it is recommended that the comprehensive plan be revised to reflect the extent of the risk.

*In the Nedonna, Pacific City, and Neskowin areas, severe wave erosion necessitated the placement of riprap. ~~In the Pacific City area, sand inundates several houses along Sunset Drive every year.~~ In the Pacific City area, sand inundates houses along the entire coast including the Sunset Drive area.*

## Goal 18 Beaches and Dunes 3., Foredune Management

**CSC Comment:** The Comprehensive Plan currently acknowledges the Nedonna Beach Foredune Management Plan. The Pacific City Foredune Management Plan should also be acknowledged in this section of the Comprehensive Plan.

*Although undeveloped foredunes in the County remain protected by Goal 18, many active foredune and conditionally stable foredune areas were platted for residential subdivisions before the unsuitability of such areas for development was realized. In the Necarney City, Nedonna, Tierra del Mar, Pacific City and Neskowin areas sand periodically inundates houses on foredune lots. The County is providing for sand removal under emergency conditions in the Tierra del Mar, Pacific City, and Neskowin areas.*

*Necarney City is within the city of Manzanita urban growth boundary area, however their Comprehensive Plan does not provide for foredune grading. Nedonna is within the City of Rockaway Beach urban growth boundary and a Foredune Management Plan pursuant to Goal 18 implementation requirement 7, is included in the City's Comprehensive Plan to allow foredune grading.*

*The Nedonna Beach Foredune Management Plan consists of three parts: a Technical Report analyzes the factors affecting the stability of the dunes in the area, a Grading Plan which specifies how and when grading may occur in Nedonna Beach, and a Management Plan which recommends how other alterations should be regulated to enhance the stability of the foredune. While this foredune study focused on the Nedonna/Rockaway Beach shoreline, many of the management recommendations, standards for foredune grading, and general information on coastal processes can be applied to the Tierra del Mar, ~~Pacific City~~, and Neskowin foredune areas, when the County develops Foredune Management Plans for these areas.*

***The Pacific City Foredune Management Plan was created in 1998 and guides grading activities within the Pacific City Foredune Management area units A-H as defined in the report.***

## Goal 18 Beaches and Dunes 3.3, Foredune Management Policies

**CSC Comment:** In this section of the Comprehensive Plan, the need for dune management studies for view maintenance in Pacific City, Tierra del Mar, and Neskowin is identified. Additionally, Pacific City has an existing Foredune Management Plan that should be listed. Both the existing foredune management plans in Nedonna Beach and Pacific City are over 15 years old and should be reviewed and updated. The need for updated foredune management plans in these areas should be identified in this section of the Comprehensive Plan.

**Tillamook County strongly urges that the Department of Land Conservation and Development initiate studies of dune management for view maintenance in the communities of ~~Pacific City~~, Tierra del Mar, and Neskowin. Additionally, the dune management studies previously conducted for Pacific City and Nedonna Beach should undergo a review and update process.**

## Land Use Ordinance Policy Options

This section presents a toolbox of wildfire hazard mitigation strategies. Recommendations range from highly regulatory to incentive-based, and best practices are linked to specific case studies found in Appendix A, as appropriate. Within each strategy, best practices identified through policy analysis research form the basis for the recommendation. Location of applicable Land Use Ordinance sections related to the implementation of the strategy is identified and any model code language is presented for potential adoption. The implications of adoption are also discussed.

In the following section, model development code is **bold**

*For a complete list of the recommended comprehensive plan and land use ordinance policy options see Tables 2 through 7*

## Updated Beach and Dune Landform Report and Maps

### Best Practice:

Beach and dune landforms are dynamic landforms that change over time and the current inventory referenced in the Comprehensive Plan and utilized in the Section 3.530 Beach and Dune Overlay is from the 1975 “Beaches and Dunes of Oregon Coast” report. Up-to-date GIS maps of beach and dune landforms should be developed to apply overlay requirements consistently and accurately.

### Applicable Development Code:

Section 3.530 Beach and Dune Overlay (BD) (2)(a) Foredune Grading

## Implication for Tillamook County:

The County will need to identify funding sources, possible through FEMA, and work in collaboration with DOGAMI to have an updated beach and dune form study conducted for the county. The new mapping would then need to be formally adopted by the County. Accurate mapping allows for consistent and legally prudent application of the Beach and Dune Overlay requirements.

## Foredune Management Plans for All Areas of Sand Inundation

### Best Practice:

Foredune Management Plans should be developed for all areas where considerable sand inundation is occurring to guide grading in accordance with state regulations and environmental best practices. Foredune management plans are composed of a Technical Report that analyzes the factors that affect dune stability in the management area, a Grading Plan that details when and how grading may occur, and a Management Plan which recommends other regulations to enhance the stability of the foredune.

### Applicable Development Code:

Section 3.530 Beach and Dune Overlay (BD) (2)(a) Foredune Grading

## Implication for Tillamook County

The Tillamook County Comprehensive Plan identifies four areas for Dune Management Plans: Nedonna Beach, Pacific City, Tierra del Mar, and Neskowin. Plans exist for Nedonna Beach and Pacific City, however these plans and their technical reports are from 1987 and 1998 respectively and they should be reviewed and updated. Foredune management plans should be created for Tierra del Mar and Neskowin. The County should develop the technical reports, grading plan, and management plans that compose a foredune management plan. DOGAMI may be an option to provide technical assistance. Funding may come from a variety of sources including FEMA.

## Grading Type Specific Permits

### Best Practice:

Grading of the foredune occurs for multiple reasons from viewshed protection to removal of sand physically inundating a structure. The grading permit process should be specific to the type of grading that is occurring and should recognize the differences between grading type requirements in a clear and easy to understand manner. Currently, Tillamook County utilizes a single set of general grading permit conditions that are not specific to the type of grading and grading specification are dispersed and challenging to differentiate in the Foredune Grading code section.

## Applicable Development Code:

Section 3.530 Beach and Dune Overlay (BD) (4)(C).(2) Foredune Grading

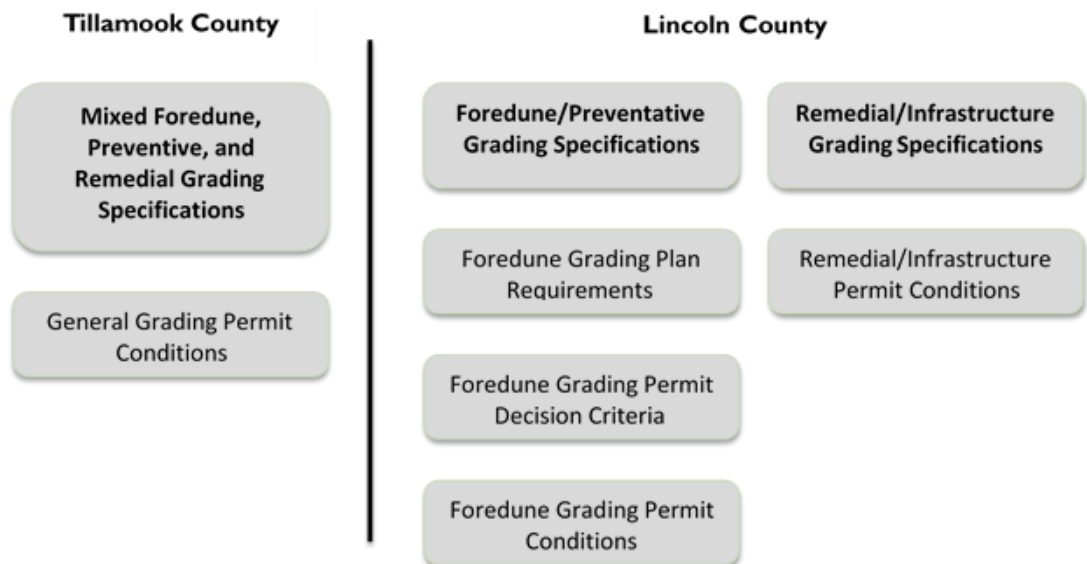
## Model Code Language:

[Lincoln County's Zoning Code Section 1.1385 Foredune Management Overlay Zone](#) provides clear and comprehensive grading permits for distinct types of grading.<sup>24</sup> The Lincoln County Overlay Zone is a model code that includes practices that could strengthen Tillamook County's Foredune Grading code section. Specific code language from this overlay is found in the following sections.

## Implication for Tillamook County

The Foredune Grading section of the Beach and Dune Overlay has a mixed set of requirements for various types of grading followed by general grading permit conditions. The format and structure of this section makes determining grading specifications and permit requirements challenging and does not represent the most comprehensive or clear foredune grading requirements. The following diagram summarizes the structural differences between the Tillamook County and Lincoln County code sections.

**Figure 3: Comparison of Tillamook and Lincoln County Foredune Review Procedure**



Source: Community Service Center

<sup>24</sup> Zoning Code Section 1.1385 Foredune Management Overlay Zone  
[http://www.co.lincoln.or.us/sites/default/files/fileattachments/county\\_counsel/page/384/2013-lcc-chapter-01.pdf](http://www.co.lincoln.or.us/sites/default/files/fileattachments/county_counsel/page/384/2013-lcc-chapter-01.pdf)

## Foredune Grading Definitions

To provide clarity and to improve the readability the following definitions from Lincoln County should be adopted within a “definitions” section of the Tillamook County Foredune Grading section of the Land Use Code. Currently, the Tillamook County Foredune Grading section provides only a single definition for foredune grading that does not distinguish between grading for view protection, preventive grading, infrastructure grading, and remedial grading.

### Model Code Language:

- (a) “Dune nourishment” means augmentation of the natural sediment supply within a foredune area.**
- (b) “Foredune grading” means alteration of the foredune area through sand transfer or removal of sand by mechanical means in order to accomplish view grading and/or preventative grading.**
- (c) “Infrastructure grading” means removal of sand which is physically inundating roadways, beach accesses, septic systems, and underground utilities, thereby causing damage, impeding vehicular and pedestrian movements, and otherwise interfering with service provision and operations related to the impacted infrastructure systems.**
- (d) “Management Unit” means a discrete segment of foredune area identified, described and numbered as a Management Unit in an approved Foredune Management Plan.**
- (e) “Preventative grading” means the removal of sand which threatens to inundate a structure from the immediate vicinity of the structure.**
- (f) “Qualified Professional” means either an Oregon Registered Geologist or Certified Engineering Geologist, with experience working on Pacific Northwest beaches.**
- (g) “Remedial grading” means removal of sand from a developed lot which is physically inundating a structure and causing damage or preventing access to the structure, or removal of sand from a vacant lot which is threatening to inundate adjoining lots.**
- (h) “Sand Removal” means the mechanical movement of sand to alternative disposal areas outside the Foredune Management Area.**
- (i) “Sand Transfer” means the mechanical or natural movement of sand within and between management units.**
- (j) “View grading” means grading of dune areas for the purpose of restoring, obtaining, or maintaining views from existing structures.**

## Foredune Grading Plan Requirements

### Best Practice:

The Tillamook County Foredune Management code should clearly identify the requirements for a Foredune Grading Plan in a single location within the code.

### Model Code Language

In the following tables, current Tillamook code is *italicized*, model Lincoln County code is **bold**, and model code that is substantively different than the existing code is both **bold and underlined**. The leftmost column of the table shows the Foredune Grading subsection where the Tillamook County requirement is found. It should be noted that these requirements are currently dispersed through the code section, and some are found in list format while others are found as sentences in paragraph sections.

**Table 18: Foredune Grading Plan Requirement Comparison**

(4)C.2	Tillamook County Requirement	Lincoln County Requirement
e.1.	<i>Description of the proposed work, including location and timing of activities, and equipment to be used.</i>	(A) Narrative describing the proposed work;
e.2.	<i>Plan view and elevations of existing conditions in the grading area;</i>	(B) Plan view and elevations <u>expressed in NAVD 88</u> of existing conditions in the work area;
e.3.	<i>Plan view and elevations of proposed modifications in the grading area.</i>	(C) Plan view and elevations <u>expressed in NAVD 88</u> of proposed modifications in the work area, <u>demonstrating general consistency with grading profiles for the Management Unit(s) in which the work is to be performed;</u>
-		(D) Identification of needed remedial and/or <u>infrastructure grading within the project area and a description of how such grading will be integrated into the proposed work;</u>
d.	<i>Outline requirements for future monitoring.</i>	(E) <u>Surveyed profiles for subarea grading designs sufficient to establish a baseline for monitoring;</u>
-		(F) <u>Revegetation plans consistent with the specific Management Unit recommendations;</u>
d.	<i>Outline requirements for future monitoring.</i>	(G) <u>Monitoring and maintenance plan for the work area consistent with the requirements of this section;</u>
e.4.	<i>Identity of the individual(s) responsible for supervising the project, and for conducting monitoring and maintenance activities.</i>	(H) Identification of the person(s) responsible for supervising the project;

Source: Community Service Center

## Foredune Grading Permit Decision Criteria

### Best Practice:

The Tillamook County Foredune Management code should clearly identify the Foredune Grading Permit Decision Criteria in a single location within the code.

## Model Code Language:

**Table 19: Foredune Grading Permit Decision Criteria Comparison**

(4)C.2	Tillamook County Requirement	Lincoln County Requirement
e.	<i>All grading plans shall cover all or at least a 500 foot portion of a Management Unit plan contained in the Management Strategy and shall have approval of 60% of the property owners in the area covered.</i>	(A) The proposed grading, restoration, monitoring and maintenance plan encompasses an entire Management Unit or a contiguous segment of not less than 500 feet, as measured along the statutory vegetation line;
d.	<i>Grading in foredune crest areas shall only be allowed where the dune elevation is more than four feet above the base flood elevation.</i>	(B) The proposed grading will not reduce the height of any foredune below four feet above the V-zone Base Flood Elevation.
-		(C) <u>The plan incorporates, to the extent practicable, all needed remedial and infrastructure grading within the project area; and</u>
e.	<i>Administrative Review of the plan shall be confined to determining consistency with the approved Foredune Management Plan.</i>	(D) The proposed grading, restoration, monitoring and maintenance plan is consistent with the policies and requirements for the affected Management Units as set forth in approved Foredune Management Plans.

Source: Community Service Center

## Foredune Grading Permit Conditions

### Best Practice:

The Tillamook County Foredune Management code should clearly identify the Foredune Grading Permit Conditions in a single location within the code.

## Model Code Language:

**Table 20: Foredune Grading Permit Conditions Comparison**

(4)C.2	Tillamook County Requirement	Lincoln County Requirement
b.	<i>Sand graded from foredune lots shall be relocated either to the beach, to low and narrow dune areas on the site, or to alternative beach and dune areas as specified in an approved Foredune Management Plan.</i>	(A) <u>Sand removal is prohibited.</u> Transfers between and within Management Units is permitted in accordance with the approved Foredune Grading Plan;
d.	<i>Grading in foredune crest areas shall only be allowed where the dune elevation is more than four feet above the base flood elevation</i>	(B) No foredune shall be reduced in height to less than four feet above the V-zone Base Flood Elevation;
d.	<i>Define the appropriate timing for grading actions.</i>	(C) Grading shall be conducted <u>only between February 1 and April 1, or between October 1 and October 31;</u>
-		(D) <u>Upon completion of authorized grading activities, revegetation shall be accomplished in accordance with the approved Foredune Grading Plan;</u>
-		(E) <u>Within 30 days of completion of the initial grading and revegetation, the permittee shall submit to the director a written statement from a qualified professional that the project has been completed in conformance with the provisions of the Foredune Grading Plan;</u>
d.	<i>Outline requirements for future monitoring</i>	(F) <u>Within one year of completion of the initial grading and revegetation, and annually thereafter during the time within which the permit remains valid, the permittee shall submit a monitoring report prepared by a qualified professional</u>

Source: Community Service Center

## Remedial/Infrastructure Grading Plan Requirements

### Best Practice:

The Tillamook County Foredune Management code should clearly identify the remedial/infrastructure grading plan requirements in a single location within the code.

### Model Code Language:

**Table 21: Remedial/Infrastructure Grading Plan Comparison**

(4)C.2	Tillamook County Requirement	Lincoln County Requirement
-		(A) All remedial and infrastructure grading activities shall be performed in a manner that avoids alteration of the existing height of the foredune and does not significantly damage existing vegetation;
c.	<i>Inundating sand shall be disposed of seaward of existing structures and distributed in a manner that shall not impact adjacent dwellings or adversely impact the public beach .</i>	(B) All sand removed from a property during remedial grading shall be moved up and over the foredune seaward of the building and shall be accomplished in a manner that minimizes disturbance to existing dune height, vegetation, and the beach;
-		(C) <u>Only one disposal access shall be allowed on the property for the purpose of pushing sand up and over the foredune seaward of the structure. The access shall be limited to the minimum width necessary to accommodate the equipment being used and in no case wider 94 feet. Upon completion of the project, the access shall be re-contoured to the height of the existing adjacent dune;</u>
-		(D) <u>On properties where the foredune has been previously lowered below the undisturbed foredune height on the rear (seaward) yard, the foredune shall be allowed to build up and no grading is allowed;</u>
c.	<i>Areas graded between November and April shall be replanted with beachgrass or other appropriate vegetation approved by the Department. If grading occurs between the months of May and October, approved temporary stabilization measures, such as mulching with ryegrass straw or matting shall be employed.</i>	(E) Permanent stabilization of any portion of the foredune disturbed by remedial sand removal activities shall be accomplished through planting, fertilization, and maintenance of European beachgrass. <u>Beach grass shall be planted at a spacing of 18 inches and carried out between November 1 and April 1. After initial planting and fertilization, stabilization shall include follow-up fertilization. Planting shall also include the re-contoured area used for the disposal access road. Documentation of revegetation efforts shall be provided to the Planning &amp; Development Department within 10 days after planting has been completed;</u>
	<b>Comment:</b> In the Planning Commission workshops, concern was expressed over the use of European beach grass as it can over stabilize a dune to the point that natural ocean processes are disrupted. Native vegetation is often out competed by European Beachgrass that is already an extensive species on Oregon's foredunes. Managing European Beachgrass is extremely challenging given its deep root system and ability to regrow after being cut. Tillamook County should assess the extent and severity of European Beachgrass and determine an appropriate strategy for managing it and for replacing it with native vegetation.	

Source: Community Service Center

**Table 21: Remedial/Infrastructure Grading Plan Comparison (continued)**

(4)C.2	Tillamook County Requirement	Lincoln County Requirement
		<p><u>(F) Remedial grading adjacent to structures shall be limited to the following:</u></p> <p><u>(i) Rear yard: (Rear yard is the yard seaward of the structure). Sand may be removed to the level of the top of the sill of the foundation within 10 feet of the building, or the base of an existing deck. From the 10-foot line, all grading shall slope upward to where it intersects the ground surface of the existing dune at a ratio of 2:1 (horizontal:vertical).</u></p> <p><u>(ii) Side yards: Sand may be removed to the level of the top sill of the foundation within 10 feet of the building (if possible). From the 10-foot line, sand grading shall slope upward at a ratio of 2:1.</u></p> <p><u>(iii) Front yard: All sand that is landward of the building may be removed down to the sill level of the foundation, provided removal does not create slopes of more than 2:1 with adjacent properties. Grading may not lower the front yard below the level of adjacent streets or roads except to clear sidewalks or driveways;</u></p>
		<p><u>(G) Remedial grading on vacant lots shall conform to the following requirements:</u></p> <p><u>(i) Vacant lots shall, at a minimum, be graded to alleviate sand sloughing hazards to adjoining properties by grading the slopes of the vacant lots so they do not exceed gradients of 2:1 (horizontal:vertical). Such minimal grading is expected to require regular maintenance to maintain a maximum slope of 2:1.</u></p> <p><u>(ii) Vacant lots should optimally be graded to elevations that are similar to adjoining lots but in no case shall be lowered below an elevation which is 4 feet above the BFE for the relevant management unit.</u></p> <p><u>(iii) A site-specific plan should be prepared specifying where the sand will be placed on the beach or lower seaward side of the foredune.</u></p> <p><u>(iv) Vegetation Stabilization: Graded areas shall be stabilized with vegetation after completion of grading.</u></p> <p><u>1. Planting and fertilization for vacant lots and associated disposal areas shall be carried out during rainy months between November 1 and April 1 in accordance with specifications in approved Foredune Management Plans, except that approved disposal areas within the typical tidal range need not be vegetated.</u></p> <p><u>2. Barriers should be constructed around graded vacant lots to prevent trampling of the planted areas.</u></p>

Source: Community Service Center

## **Sand Control Districts**

### **Best Practice:**

Sand control districts are voluntary sand management programs in which residents may vote to form a district that funds sand management through taxes and general obligation bonds. In 2015, [House Bill 3030](#) legalized the formation of sand control districts in Oregon and provides regulations for the formation and operation. At this time, no sand control districts have been formed through this new process.

The Tillamook Land Use Ordinance should recognize the existence of this new sand management tool and its implications for foredune grading permits should be assessed.

### **Applicable Development Code:**

Section 3.530 Beach and Dune Overlay (BD) (2)(a)

### **Implication for Tillamook County:**

Sand control districts have the potential to leverage much larger sums of money for sand control than under Foredune Management Plans or as a single property owner. There is the potential for an increase in the number and scale of foredune grading permit applications if sand control districts are formed. The County should look to adopt grading type specific permit requirements, as detailed in the previous sections, prior to the formation of sand control districts in the county to ensure that all sand grading follows best practices and minimizes risk to people, property, and the environment.

## **Model Ordinance and Codes**

The following model ordinances and standards were identified during research on sand inundation mitigation. These documents have example language for specific mitigation strategies that could be implemented in Tillamook's development code.

### **Lincoln County, OR Foredune Management Overlay Zone**

Lincoln County utilizes a specific overlay zone for foredune management. In this overlay zone, specific requirements for foredune grading by type of grading are provided for foredune and preventive grading and for infrastructure and remedial grading.

## CHAPTER 9: MULTI-HAZARD

This section identifies natural hazard mitigation strategies and policies that unincorporated Tillamook County should consider using to limit risk to future development within natural hazard prone areas. These recommendations are not particular to a single hazard; instead they apply to high-risk property whether from a single natural hazard or due to the cumulative impacts of multiple natural hazards. Multi-hazard mitigation tool options are presented with descriptions of best practices, applicability to unincorporated Tillamook County, and identification of how such a program could be implemented within the County.

### Transfer of Development Rights

Transfer of Development Rights (TDR) programs effectively prohibit development within areas highly susceptible to hazards, and alternatively encourage development in an area that is less susceptible and can better serve the community. TDR is a program that allows landowners to sell development rights of land that may be in a highly-impacted area to an interested party who then can use those rights to increase the density of development on a different property. The definition of a highly-impacted area can range from development in a hazard prone area to development in preservation areas. Existing TDR programs in Oregon are limited to a few jurisdictions, specifically the City of Portland, Deschutes County, and Douglas County.

### TDR Program in Tillamook County

By allowing landowners to enter a Transfer of Development Rights Program, the consumption of government emergency resources is reduced; thereby decreasing costs to local government. Additionally, prohibition of development helps to protect residents from high-risk and dangerous areas.

As local government develops a TDR program they need to explore development incentives to provide tax relief for encumbered sending areas. In doing so, local government should add a program component that provides methods to transfer property ownership conservatorship. Conservatorship might be biased toward preservation of open spaces.

### Model Code Language:

The following information comes from [\*the Douglas County Model Transfer of Development Rights Guide\*](#):

**TDR programs have several features each of which can be used to gauge the impact or effectiveness of focused development.**

**1) Ease of Understanding:** To have an effective TDR program, a program should be simple and easy for all parties to understand (e.g., landowners and the public). Citizens and leadership of a community entering into a TDR program must be totally committed to the process.

**2) Managed Growth:** TDR programs should be incorporated into Tillamook’s comprehensive plan. The county, municipality, or regional planning area must also utilize zoning ordinances and overlays that support TDR programs.

**3) Adequate Incentives:** Developers need adequate incentives to sell their development rights. Also, receiving areas must be attractive enough for developers to want to purchase rights.

**4) Careful Management:** Trained planning staff must manage the program to identify and authorize the use of a development credit. Jurisdictions should be aware when parcels are determined not buildable (by a geotechnical report) they should remove it from the buildable lands inventory.

## **Property Acquisition**

In a situation where hazard threat is too high to justify improvement funding or mitigation action, the acquisition of property can be an effective way to move people and property away from high-risk areas. FEMA’s Hazard Mitigation Grant Program (HMGP) may provide funding for voluntary selling of property in such areas. FEMA also offers the following mitigation grant programs: the Flood Mitigation Assistance Grant Program (FMA) and the Pre-Disaster Mitigation Grant Program (PDM). An acquisition can apply to a single piece of property or an entire neighborhood. After dialogue and collaboration, the purchase of damaged property is made through an agreement between the local government and the property owner. Under these grant programs, once an acquisition project is approved by the state and FEMA, the community uses Federal funds to purchase the home or building, and the land is restricted to open space, recreation, or wetlands in perpetuity. Alternatively, the local government can use their own funding sources, such as fundraising, assets liquidation, and the general fund, to purchase property.

### **Property Acquisition in Tillamook County**

Property acquisition can be most effective for reducing exposure and vulnerability of property and people, especially in areas highly susceptible to flood, landslide, and coastal erosion. Though FEMA funding may be available to facilitate the acquisition of high-risk properties, the most important element of this mitigation strategy is political will. Successful property acquisition hinges on the willingness of the residents and community to recognize the danger associated with the property in question, and collaboration with government agencies to determine fair compensation.

## **Post-Disaster Building Moratorium**

Post-disaster building moratoriums include two key components. The first is a proactive ordinance that establishes the conditions and framework under which a building moratorium will be imposed. The second is reactive ordinance that is adopted immediately following a disaster that is tailored to the specific event and defined community area in which the event occurred. Such a building moratorium provides affected areas with an often-overlooked period of reflection on the extent and severity of the natural hazard prior to making decisions concerning rebuilding

and redevelopment. This window of time can be used to formulate thoughtful planning in hazard areas that ensure appropriate measures are taken to avoid repetitive losses.

## Post-Disaster Building Moratorium in Tillamook County

Tillamook County has considerable development in high hazard areas as highlighted in the preceding individual hazard sections. Additionally, development has occurred in Goal 18 exemptions areas where inherent site conditions pose risk to development. For these reasons Tillamook County should consider adopting a proactive Post-Disaster Building Moratorium Ordinance that established the conditions that may trigger a moratorium and details the requirements that must be addressed in a post-disaster moratorium.

Some communities may choose to adopt a tiered approach to development activities restricted under a moratorium. For example, the [Hillsborough County, Florida ordinance](#) establishes different timelines following a disaster for destroyed structures, major damaged structures, minor damaged structures, new development, previously issued building permits, development orders, and site plan reviews.<sup>25</sup>

When considering a Post-Disaster Building Moratorium in Tillamook County, the following model code from the [Planning for Hazards: Land Use Solutions for Colorado guide](#) produced by the Colorado Department of Local Affairs may provide guidance and clarification on what such an ordinance specifies.<sup>26</sup>

### Model Code Language

**The purpose of this ordinance is to:**

**A. Authorize the implementation of a building moratorium when the following actions or findings occur:**

**The [municipality or county] is declared a disaster area by the Governor of Oregon or the President of the United States;**

**The [City Council, Board of County Commissioners, or equivalent] declares a local state of emergency; or**

**The [municipality or county] is unable to maintain acceptable levels of service following an event as determined by the [City Council, Board of County Commissioners, or equivalent].**

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<sup>25</sup> Redevelopment and Mitigation Ordinance, Hillsborough County FL, accessed June 7, 2016 <http://www.hillsboroughcounty.org/DocumentCenter/Home/View/1051>

<sup>26</sup> Post-Disaster Building Moratorium Model and Commentary, Planning For Hazards Land Use Solutions for Colorado, accessed June 7, 2016 <http://planningforhazards.com/post-disaster-building-moratorium-model-and-commentary>

**B. Foster appropriate response during and after a disaster, which often require extraordinary actions.**

**C. Modify development approval procedures to allow property owners to build, repair, or rebuild in a timely, safe, and responsible manner.**

Any moratorium imposed shall be subject to review by the [City Council, Board of County Commissioners, or equivalent] at the earliest possible time, but no later than [90 days] after it begins. At that time, the [City Council, Board of County Commissioners, or equivalent] shall extend, terminate, or modify the moratorium.

**A. Public Notice**

Notice of any moratorium shall be posted in the defined location for all other public notices and shall identify the geographic area for which the moratorium is in effect and the review and permitting procedures impacted by such moratorium.

**B. Suspension of Development Activity**

The [City Council, Board of County Commissioners, or equivalent] shall have the authority to temporarily suspend the issuance of land use and development permits they administer under the land use code, building code, and any other ordinance where suspension of such permit is deemed necessary and reasonable to protect the public health, safety, and welfare of the community.

The suspension of permits may also include applications currently under review. If an application under review is suspended, the applicable review timeframes shall also be suspended until the development activity suspension has been terminated.

**C. Deconstruction or Demolition of Damaged Structures**

Any deconstruction or structure demolition requires the appropriate permit from the [building official, planning director, city/county engineer, city/county manager, or equivalent]. The [building official, planning director, city/county engineer, city/county manager, or equivalent] may waive any or all permitting requirements depending on the type of work and the extent of the disaster.

**E. Emergency Repairs**

Emergency repairs necessary to prevent imminent danger to life or property is exempt from this section except that the property owner shall notify the [building official, planning director, city/county engineer, city/county manager, or equivalent] within [72 hours/one week/10 days/other timeframe] of the work conducted and shall apply for any required permit as deemed necessary by the [building official, planning director, city/county engineer, city/county manager, or equivalent].

## Post-Disaster Recovery Plans

Post-disaster recovery is defined as developing a set of strategies including a management strategy to assist a community to rebuild after a disaster occurs. It involves making decisions in advance that provide alternatives for the early return to normalcy, reduction of future vulnerability, and opportunities to improve the community. The framework for creating Post-Disaster Recovery Plans was developed in 2008 by the Oregon Natural Hazards Workgroup (now the Oregon Partnership for Disaster Resilience) at the University of Oregon's Community Service Center.<sup>27</sup> The purpose of these plans is to better prepare coastal communities in the Cascadia Region for the short-term recovery and long-term reconstruction efforts communities may face because of a catastrophic Cascadia Subduction Zone event. Experts say that the Oregon coast has a 10-20% chance of facing a region wide catastrophic Cascadia Subduction Zone earthquake and tsunami in the next 50 years, and research indicates that communities can recover more easily if they identify ahead of time strategic priorities for how they will rebuild, restore, improve, and grow in the aftermath of a catastrophic disaster.

### Post-Disaster Recovery Plans in Tillamook County

Tillamook County currently has no Disaster Recovery Plans in place to help guide the rebuilding, restoration, improvement, and growth of its communities and areas in the event of a catastrophic disaster. Tillamook County has considerable property and life exposed to numerous natural hazards as detailed in the previous natural hazard chapters and the County should look to develop strategies and build capacity prior to a large-scale catastrophe (a Cascadia Subduction Zone earthquake and tsunami).

The process of creating Post-Disaster Recovery Plans is complex and there are no recovery plans in Oregon. The South Coast Post Disaster Recovery Frameworks (Curry, Coos, Douglas, and Lane) provide a template for developing a Post-Disaster Recovery Plan. Additional Post-Disaster Recovery resources developed by the Oregon Natural Hazards Workgroup are provided below. Lastly, a link is provided to FEMA's Planning for Post Disaster Recovery and Reconstruction guide that introduces community planners to policies for rebuilding and recovery after disasters and provides guidance on how to plan for post-disaster reconstruction.

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<sup>27</sup> Community Post Disaster Recovery Planning Forum Process, University of Oregon, accessed June 7, 2016  
[https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/5570/CREW\\_Report\\_07.17.06.pdf?sequence=1&isAllowed=y](https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/5570/CREW_Report_07.17.06.pdf?sequence=1&isAllowed=y)

**Table 22: Post-Disaster Recovery Plan Resources**

Resource	Description
Coos County Post Disaster Recovery Framework	Coos County developed this Post-Disaster Recovery Framework in an effort to better prepare for the aftermath of catastrophic disasters, understand their response capabilities and limitations, and to establish comprehensive long-term recovery and rebuilding strategies
Community Post Disaster Recovery Planning Forum Process	The purpose of this report is to describe the process used to conduct a community post-disaster recovery-planning forum aimed at addressing a catastrophic disaster event. The report highlights methods used to implement and document the forum process in Cannon Beach and findings from a post-forum participant evaluation.
Catastrophic Post-disaster Long-term Recovery Planning: A Capacity and Needs Assessment of the Oregon Coast	In order to identify what opportunities and challenges coastal communities currently face in planning for catastrophic post-disaster long-term recovery a capacity and needs assessment was conducted of the thirty-two incorporated cities along the Oregon coast.
Cannon Beach Case Study Report	The purpose of this report is to document the community post-disaster recovery planning forum outcomes from Cannon Beach.
Planning for Post-Disaster Recovery and Reconstruction	This FEMA document equips planners and others involved in post-disaster reconstruction at all levels of government with the tools needed to create (or re-create) communities that will withstand natural disasters.

Source: Community Service Center

## Stormwater Management / Low Impact Development

Low Impact Development (LID) is development that preserves natural resources and allows for the management of stormwater runoff. The Puget Sound Partnership defines LID as “a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.”<sup>28</sup> Low Impact Development standards may be used to enhance existing stormwater management practices.

### Stormwater Management / Low Impact Development in Tillamook County

The Puget Sound Partnership in the State of Washington has been a national leader in developing LID standards and has published extensive guidance documents aimed to assist jurisdictions implement these standards. The process for this and

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<sup>28</sup> Low Impact Development in Western Oregon: A Practical Guide for Watershed Health. Green Girl LLC. 2016 <http://www.greengirlpdx.com/Publications.htm>

further details related to LID standards is outlined in a case study which can be found in Appendix A of this report.

At the time of publishing there are no adopted LID regulatory standards in use in the State of Oregon, but there are some communities, small businesses, and non-profit organizations that are working to encourage its use in the future. There are examples of LID being used to manage stormwater as a voluntary practice by a property owner. The ocean-friendly garden installed at Seven Devils Brewery in Coos Bay, is an example of a local government and property owner collaborating to utilize LID practices that go above and beyond the regulatory stormwater management minimum standards, on a voluntary basis. Tillamook County staff can encourage the use of LID by offering incentives to property owners or by entering public-private partnerships.

Tillamook County also has the option take a more regulatory approach to LID and stormwater management. By formalizing the use of LID into its Land Use Ordinance as an alternative to conventional stormwater management practices, the County can require developers to think more critically about the impact they have on public infrastructure. The Oregon Department of Environmental Quality has published [Low Impact Development in Western Oregon: A Practical Guide for Watershed Health](#) to offer local governments with a template to LID regulations. The guide, created in partnership with Green Girl Land Development Solutions LLC, a consultancy working to advance the use of cost-effective green infrastructure, provides jurisdictions with all the information needed to implement an LID strategy, including model code language.

# CHAPTER 10: IMPLEMENTATION AND RECOMMENDATIONS

## Implementation

This chapter identifies possible implementation strategies and provides recommendations for how unincorporated Tillamook County can achieve natural hazard mitigation. Implementation is considered from both a County process perspective as well as from a public outreach and education perspective as both are critical to achieving reductions in risk from natural hazards. Policy options are presented with descriptions of the most affected community, the type of process required, and a matrix table of the complete mitigation toolbox.

### County Process

Implementation of any of the recommendations made within this report will require some level of formal adoption or acknowledgement by staff, the Planning Commission, or the Board of County Commissioners. The administrative process for each recommendation will vary depending on its level of regulation. The Tillamook County Land Use Ordinance Section 10.040 provides the structure for review required in each decision. All land use applications and decisions are reviewed using one of four review types, ranging from Type I Ministerial Review to Type IV Legislative Review. Due to the nature of the recommendations within this report, changing or adding ordinance language, many of the recommendations will warrant a Type IV Legislative Review. Type IV reviews are considered by the Planning Commission, who makes a recommendation to the Board of Commissioners. The Board of County Commissioners makes the final decision on a legislative proposal through the enactment of an ordinance. Type IV reviews are subject to public notice requirements of Tillamook County Land Use Ordinance Section 10.090, as well in accordance with Oregon Revised Statute 215.503.

**Table 23: County Administrative Process**

Review Type	Decision	Appeal
Type I	Director	Planning Commission/Board of County Commissioners
Type II	Director	Planning Commission/Board of County Commissioners
Type III	Planning Commission	Board of County Commissioners
Type IV	Board of County Commissioners	Land Use Board of Appeals (LUBA)

Source: Tillamook County Land Use Ordinance (Modified by CSC)

## Public Outreach

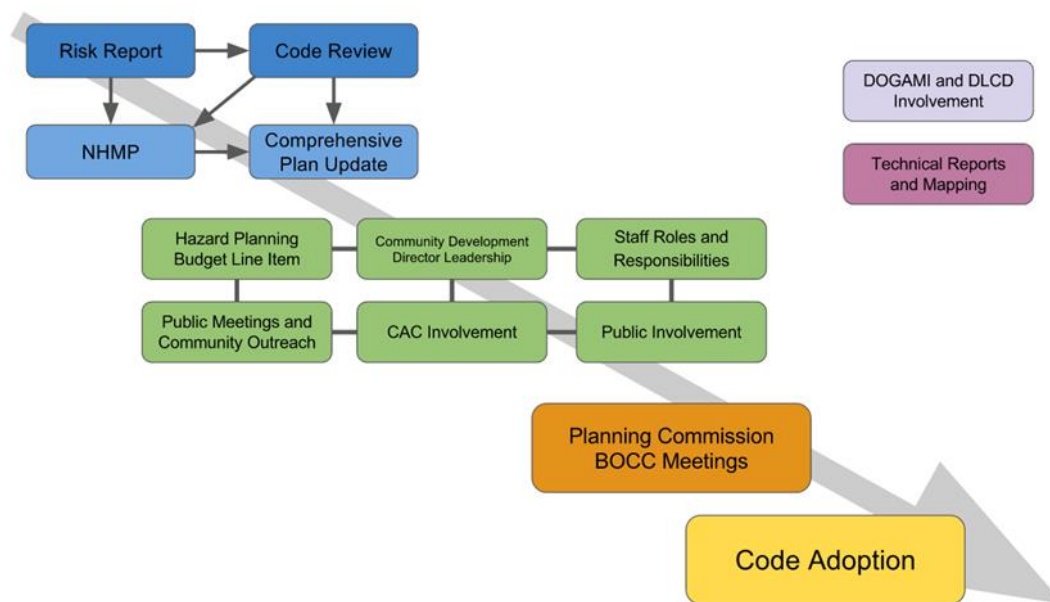
Public outreach is an essential component of plan implementation. To address hazard risk most appropriately, each community in the unincorporated county should be involved in the mitigation process. Public outreach is a twofold process. On one hand, collaborating with the community provides planners with a better understanding of the conditions that may not be evident in data. Discussion can illuminate unforeseen problems or circumstances that may impact the feasibility of the proposed plan. On the other hand, public outreach serves to educate the community and offer them insight into the legislative work and processes that are underway. Public education can be used to spread awareness and empower community members, ultimately increasing the efficacy of actions and catalyzing change. Some examples of public outreach include surveys, public hearings, focus groups, or media projects such as newspaper articles, radio shows, podcasts, or blogs.

This report's toolbox of regulations for mitigating risk from natural hazards could be intimidating to property owners within the County. To foster positive community response, County staff should present new regulations to affected communities in meetings that involve citizen advisory committees (CACs) and community champions in an open and transparent process. The County could look to the Neskowin Coastal Erosion Hazards Overlay Zone community participation process as a model to be implemented elsewhere. The process should determine if proposed development requirements would apply in the form of an overlay zone, to specific parcels, or a combination of both. It is possible that the degree of regulations could differ by community or area. Any development regulations should be developed in collaboration with community members, formally written by county staff, and approved by the appropriate commission or board.

## Hazard Mitigation

While code adoption represents the final step in achieving reduction in risks from natural hazards in the Tillamook County Land Use Ordinance, there is a complex and interconnected chain of events that is occurring, and that will need to occur, prior to final comprehensive plan and development code updates and adoption. In order to facilitate this process a general implementation framework illustrating major reports, actors, and steps has been developed. To supplement this implementation framework, implementation processes specific to each individual hazard are also provided.

**Figure 4: General Implementation Framework**



Source: Community Service Center

In this general implementation framework, the four blue boxes at the upper left of the diagram show the connections between the current Risk Report project, this code review project, the Natural Hazard Mitigation Plan (NHMP) update, and the County Comprehensive Plan update. The Risk Report informed the recommendations made in this report, and it is informing the ongoing NHMP update. This report will inform the ongoing NHMP update and provides recommendations for the Comprehensive Plan update.

The connected green boxes represent critical steps that County planning staff will need to take to secure funding for developing formal land use ordinance natural hazard mitigation code changes. The Community Development Director will need to provide strong leadership in this process and should clearly define staff roles and responsibilities to the project. Public meetings in which member of the public have their comments and feedback heard and considered will need to be held. Community outreach is required to let people know about these meetings and to ensure the meetings have appropriate times and locations. Comments and feedback should also be solicited in this outreach for those unable to attend public meetings. Community advisory committees (CACs) should have representatives present at all meetings and discussions, and they should report back to their areas and communities. It is important to emphasize that public involvement in this process should go beyond the traditional comment and feedback gathering activities. The public needs to be engaged and involved in the process, this may look like having property owners, business owners, and community champions consulted and brought into meetings from the beginning of the process all the way through to its conclusion.

On the top right of the diagram, the two purple boxes represent involvement of two state groups, DOGAMI and DLCD, who will need to be relied on to provide technical reports and mapping for some hazard mitigation strategies. Details of

their potential involvement, and funding opportunities, are identified in the individual hazard implementation sections below.

Once County planning staff, in cooperation with local communities, community groups, and other members of the public, develop mitigation strategy code changes the proposed changes will face review by the Planning Commission and Board of County Commissioners as shown in the orange box. Through the formal administrative process, comprehensive plan and development code changes will be adopted and the natural hazard mitigation best practices will better protect people and property from the risks of natural hazards in Tillamook County.

## **Flooding**

### **Description of hazard mitigation**

Flood hazard mitigation in Tillamook County primarily revolves around strategies that lessen the risk to life and property during and after a flooding event. Many of these strategies are implemented through Land Use Ordinance standards that regulate where and what type of developments can be built within the floodplain. However, some strategies are non-regulatory in nature such as geographically defining the floodplain, which is dependent on maintaining up to date mapping techniques. The following implementation strategies address necessary steps in establishing a framework for flood hazard mitigation, followed by the individual actions that carry out certain standards in conjunction with the adoption of new language within the county's land use ordinance.

### **What communities are affected?**

Nearly all communities within Tillamook County are exposed to damage from flooding. Much of this exposure is related to riverine flooding caused by raised water levels in local rivers, streams, and creeks. However, portions of the County are subject to coastal flooding risk, communities such as Neskowin, Oceanside-Netarts, and Rockaway Beach. Per the Risk Report, Neskowin has the greatest sensitivity and highest exposure to flood within unincorporated Tillamook County. In Neskowin, 33% of building value is exposed to the 100-year flood and 17% of permanent residents are at risk of being displaced. Only one critical facility is located within the 100-year floodplain within unincorporated Tillamook County, the Nestucca Fire and Rescue Station #87 in Hebo.

### **Type of processes required**

#### **Adopt new FIS and FIRMs**

A Flood Insurance Study (FIS) is an in depth scientific report that details factors catalytic to flooding, flood patterns, and floodplain changes over time. The Flood Insurance Rate Map (FIRM) is the geographic representation of the FIS and shows, on a map, where the floodplain exists. FEMA also uses these maps to determine which properties are located within the floodplain and are therefore required to have a flood insurance policy. Updates to Tillamook County's FIS and FIRMs will be

submitted to the County for review in Summer 2016. After a period of review, the County will adopt the updated FIS and FIRMs in late 2017.

## **Review and update floodplain management practices and standards**

Upon adoption of the updated FIS and FIRMs, the County will enter a review of its floodplain management practices and standards. During this process, the County will have the opportunity to review its existing floodplain management practices to determine if they are consistent with updated information or to adopt other mitigation strategies listed as recommendations in this report. This review process is an opportune time to also consider adopting any model code language created by the [\*Department of Land Conservation and Development related to the National Marine Fisheries Service's Biological Opinion\*](#) and its "Prudent and Reasonable Alternatives" to the National Flood Insurance Program's Minimum Standards.

## **Re-enter the NFIP's Community Rating System**

Concurrent with the above recommendations, the County should consider re-entering the Community Rating System (CRS) offered by the National Flood Insurance Program (NFIP). This voluntary program offers flood insurance premium discounts to policyholders within jurisdictions who implement floodplain management strategies that are above and beyond the NFIP minimum standards. Prior to 2012, Tillamook County was part of the CRS but was removed for noncompliance issues. As of the 2007 CRS Coordinator's Manual, the County was categorized as a Class 6 jurisdiction. Re-entering the CRS at this classification would provide flood insurance policy holders within the County a 20% premium discount.

## **Consider adopting Community Rating System's Higher Regulatory Standards**

At the time of the flood ordinance review and update, Tillamook County should consider adopting the additional higher regulatory standards outlined in this report. The standards reviewed in the flood section of this report are national best practices that are not included in the existing code. Not only would implementation of these standards mitigate the risk to life and property within Tillamook County, but they would also net the County additional CRS points, potentially further discounting premiums for local flood insurance policyholders.

# **Tsunami**

## **Description of hazard mitigation**

Tsunami hazard mitigation in Tillamook County primarily revolves around strategies that lessen the risk to life and property during a tsunami event. Mitigation of tsunami risk in Tillamook County largely focuses on the utilization of a Tsunami Hazard Overlay and then reducing risk to areas within the zone through regulatory standards. Defining at risk areas that are subject to tsunami inundation decreases the severity and probability of damage to both people and structures involved in future development projects. The following implementation strategies address

necessary steps in establishing a framework for the introduction of the proposed overlay, followed by the individual actions that carry out certain standards in conjunction with the adoption of new language within the county's land use ordinance.

## **What communities are affected?**

Tsunamis originate in the ocean and terminate along the ocean shore, therefore only communities along the coastline and bays are affected by the hazard. Per the Risk Report, Neskowin and Pacific City are the communities in the unincorporated county that have the greatest sensitivity and degree of exposure to tsunami. In Neskowin, 69% of building value is exposed to the Medium-sized Cascadian Subduction Zone 9.0 tsunami, putting 58% of the community's permanent residents at risk of being displaced. During the Large-sized Cascadian Subduction Zone 9.0 tsunami, 73% of the building value in Neskowin is exposed. In Pacific City, 39% of building value is exposed to the Medium-sized tsunami, potentially displacing 41% of Pacific City's residents. During the Large-sized Cascadian Subduction Zone 9.0 tsunami, 70% of the building value in Pacific City is exposed.

## **Type of processes required**

### **Adopt the Tsunami Inundation Maps**

The Department of Oregon Geologic and Mineral Industries (DOGAMI) is in the process of updating Oregon's Tsunami Regulatory Maps (SB 379 maps). The SB 379 maps are the official maps for implementing Oregon Revised Statutes (ORS) 455.446 and 455.447 which limit, through the Oregon Building Code, construction of certain critical and essential facilities in the tsunami inundation zone. These regulatory maps have not been updated since 1995, and are based on the best available data and scientific tools in that year. While there is no estimated date for the completion of this project, the County should be ready to adopt the report and map as regulatory standards within the Land Use Ordinance.

DOGAMI has also produced Tsunami Inundation Maps (TIMs) that provide inundation mapping for communities based on a range of tsunami event sizes. These sizes range from "small" to "XXLarge" and are based on location and extent of tsunami inducing earthquakes. It is recommended by DLCD, that if, and when, local governments adopt policies and standards related to tsunami hazard mitigation, they use the TIM corresponding to the "large" tsunami inundation. This is to ensure that should Senate Bill 379 rulemaking identify the "large" tsunami inundation line, which is thought of as most likely, local governments will already comply.

### **Create a new Tsunami Hazard Overlay**

As noted above, the statewide Senate Bill 379 tsunami regulatory maps and TIM's are in the process of being updated. Using these updated maps, the County should consider the creation of a new Tsunami Overlay Zone to better protect citizens and properties within inundation areas. It is recommended that Tillamook County adopt a Tsunami Hazard Overlay Zone with area defined by DOGAMI's "large" tsunami

inundation line, which would serve as a trigger zone that would then mandate specific standards for future development. Within this new overlay, model code language from DLCD's Tsunami Land Use Guide can be applied to ensure mitigation best practices are being utilized. Clatsop County was the first county in Oregon to use this Land Use Guide for tsunami hazard overlay regulations. While the final adoption of the ordinance was tabled due to community concerns of overregulation, Clatsop County's process offers learning opportunities for Tillamook County's future processes. Other counties are currently nearing completion of implementing the model ordinance offered by DLCD. Curry County is the furthest along in this process. Should Curry County adopt the ordinance, Tillamook County can use it, in conjunction with the DLCD guidance, to adopt similar overlay regulations.

## **Landslide**

### **Description of hazard mitigation**

Mitigation of landslides in Tillamook County primarily revolves around the utilization of a Geologic Hazard Overlay and then reducing risk to areas within the zone through regulatory standards. Adopting regulations pertaining to at-risk areas of landslide inevitably decreases the severity and probability of damage to both people and structures involved in future development projects. The following implementation strategies address necessary steps in establishing a framework for the introduction of the proposed overlay, followed by the individual actions that carry out certain standards in conjunction with the adoption of new language within the county's land use ordinance.

### **What communities are affected?**

Per the Risk Report, the communities of Oceanside/Netarts and Neskowin have the greatest sensitivity and degree of exposure to landslide. In Oceanside/Netarts, 49% of building value is highly susceptible to landslide risk, including one essential facility (Oceanside RFPD Station #62), and 39% of permanent residents reside in highly susceptible areas. In Neskowin, 21% of building value is highly susceptible to landslide risk, including one essential facility (Neskowin Valley School), and 28% of the city's residents reside in highly susceptible areas.

### **Type of processes required**

**Request funding to assess and map landslide risk at a more detailed level.**

Current mapping presented in DOGAMI's Open File Report O-16-02 "Landslide Susceptibility Overview Map of Oregon" and the Risk Report assess landslide susceptibility at a large scale. The report includes data analysis and maps that evaluates slope, lithology, historic landslide locations, and other significant geologic features. The existing map products primarily examine landslide risk at a level (state and county) that generalizes the threat and do not address specific topographic nuances and features. To best determine the extent of a geologic

hazard overlay, the county should consider requesting funding (possibly through Risk MAP) to initiate future mapping that would more closely examine the areas included within the currently defined “highly susceptible areas”.

## **Create a new Geologic Hazard Overlay**

Based on new mapping products, combined with geologic reports, geotechnical advice, and collaboration with planning staff, the creation of a new Geologic Hazard Overlay would serve as a trigger zone that would then mandate specific standards for future development.

## **Consult a certified ecologist regarding revegetation species**

If the county chooses to adopt revegetation standards, a certified state ecologist may be required to supply the necessary relevant information regarding specific plant species that need to be included in the code language. Certain native species have higher levels of performance and will more effectively increase slope stability. It is important to include specific and stringent requirements that stipulate both the preservation and introduction of these species, as well as prohibit the removal of these species.

## **Create a Geologic Hazard Point Based Assessment System**

Marion County and the City of Salem have both employed a point based assessment system that characterizes degree of hazard based on results from a quantified measurement. If Tillamook chooses to include a similar assessment, the county should determine how points will be allocated and prioritize variables.

## **Public outreach regarding Geologic Hazard Abatement Districts**

The formation of a Geologic Hazard Abatement District hinges on a high degree of public involvement and willingness of the community to participate in mitigation projects, as well as allocate monthly funding towards an insurance pool that can be utilized in the instance of a severe disaster event. Initiating a GHAD program necessitates first a series of educational meetings that inform the community on the impending hazard/risk. Additionally, it is important to gain feedback regarding attitudes towards implementation of such a program and how the district can be adopted to address community needs most appropriately.

# **Coastal Erosion**

## **Description of hazard mitigation**

Mitigation of coastal erosion in Tillamook County primarily revolves around the utilization of a countywide Coastal Erosion Overlay that reduces risk to areas within the zone through regulatory standards. The following implementation strategies address necessary steps in establishing a framework for the introduction of the proposed overlay, followed by the individual actions that carry out certain standards in conjunction with the adoption of new language within the county’s land use ordinance.

## What communities are affected?

Coastal erosion affects the entire coastline of Tillamook County, however, per the Risk Report Pacific City and Neskowin have the greatest sensitivity and degree of exposure. While the unincorporated county outside of these communities currently has little building value exposed to coastal erosion, the County should consider a proactive approach to adopting development code regulations for areas susceptible to coastal erosion prior to significant development occurring.

## Type of processes required

### Create a Countywide Coastal Erosion Hazard Overlay Zone and attach overlay regulations

A county wide coastal erosion hazard overlay zone would be physically defined by the 2014 DOGAMI [Evaluation of Erosion Hazard Zones for the Dune-Backed Beaches of Tillamook County \(Open-File Report O-14-02\)](#) high and/or active hazard zones. Adoption of this report and its associated maps would occur in Section 3.500 Overlays of the Tillamook County Land Use Ordinance. Such an overlay zone could either supplant or replace the Section 3.570 Neskowin Coastal Erosion Hazards Overlay Zone that currently exists within the code. Adoption of this mapping product to define the overlay zone without attaching specific development code regulations may allow the County to emphasize to communities and areas that coastal erosion is a present and serious natural hazard that needs to be properly mitigated to best protect people and property. The Countywide Coastal Erosion Hazard Overlay code language would need to be formally written by County staff, approved by the Planning Commission, and then would be adopted by the Board of County Commissioners.

This top down definition of the hazard overlay zone would then be paired with a bottom up community and area based assessment of permit and develop requirements as discussed in the following sections. This process would allow the County to create an overlay zone while relying upon the community advisor committees CACs to define the regulations with staff assistance.

### Require a Coastal Hazard Area Permit for development

A specific develop permit should be required for development within the Countywide Coastal Erosion Overlay Zone as is currently required in the Neskowin Coastal Hazard Overlay Zone. Such a permit would require a site- specific hazard analysis and hazard risk minimizations recommendation to be developed by a certified engineering geologist. This permit process, review, and associated requirements would be drawn from the Oregon Chronic Natural Hazards Model Overlay Zone in conjunction with meetings with effected communities and areas. The Coastal Hazard Area Permit code language, as suggested in the [Model Coastal Erosion Overlay Zone](#), would need to be formally written by County Staff, approved by the Planning Commission, and then adopted by the Board of County Commissioners.

# Wildfire

## Description of hazard mitigation

Reducing wildfire risk for people and property in Tillamook is directed through the utilization of a Wildfire Hazard Overlay that brings a regulatory approach to the standards established in both the Community Wildfire Protection Plan (CWPP) combined with the requirements set forth in the Forest (F) Zone. Implementation of wildfire mitigation strategies necessitates further study to specify areas of development that are not currently protected by rural fire protection districts and are not covered by the Oregon Department of Forestry (ODF) in the Forest Zone. Feasibility of an overlay hinges on this analysis of wildfire protection coverage, and if it is determined that a highly regulatory action is unnecessary and current zoning is sufficient, the county should recognize the value of public education and take a more voluntary approach. Forming Firewise Communities allows residents and neighborhoods to effectively reduce their risk to wildfire through small scale improvement projects and local services.

## What communities are affected?

Forest characteristics and fire protection infrastructure determine wildfire risk. The Risk Report addresses wildfire risk through sensitivity assessment and location of essential facilities. The CWPP measures risk by acknowledging areas that lack protection services such as available water supplies, evacuation routes, and location of historic fires. To determine highest degree of community impact more accurately, the county should anticipate information from the West Wide Wildfire Risk Assessment as well as an updated CWPP. Based on the available research, the areas most affected by wildfire risk are Blaine, Cloverdale, and Oceanside/Netarts.

## Type of processes required

### Create a Wildfire Hazard Overlay

The introduction of a new overlay requires collaboration and communication between representatives from the rural fire protection districts, the Oregon Department of Forestry, and land use planners. Mapping and discussion between planners and forest management should determine whether there are populations that are not protected under current standards. If there is a significant population at risk to wildfire that is not currently protected, the utilization of a wildfire hazard overlay will protect these at-risk communities. The overlay should utilize information from the West Wide Risk Assessment and the CWPP and should assess the WUI extents. This overlay will serve as a trigger zone for mitigation actions stipulated in the associated code language.

### Establish Firewise Communities

To be recognized as Firewise Community, the first step is to survey different sites and engage with the public. The success of this voluntary program hinges on a high level of community involvement and active participation. The Firewise agency and

NFPA have defined five necessary steps that include: a wildfire hazard assessment, creating a community task force, holding an annual Firewise Day, spending \$2 per capita on Firewise projects, and submitting an annual report to Firewise documenting the community's progress. Once these tasks are completed, ongoing reduction projects, services, information, and events should be documented.

## **Sand Inundation**

### **Description of hazard mitigation**

Sand inundation is primarily managed by physically removing sand from a specific location through grading. Fore-dune Management Plans are used to guide the sand grading process. Clearer and more comprehensive requirements for these plans should be added to the Fore-dune Grading Permit requirements in the Beach and Dune Overlay. Fore-dune Management Plans should be updated or created for all areas of Tillamook County that are undergoing sand inundation.

### **What communities are affected?**

Sand inundation is not a natural hazard covered in the Risk Report. However, the Comprehensive plan designates Necarney City, Nedonna, Tierra del Mar, Pacific City, and Neskowin to be areas and communities that are experiencing sand inundation of houses and infrastructure on fore-dune lots. In Pacific City sand inundates houses throughout the community (particularly along Sunset Drive). Additionally, The County is providing for remedial sand removal under emergency conditions in the Tierra del Mar, Pacific City, and Neskowin areas.

### **Type of processes required**

#### **Update mapping of dune and beach forms**

The County should have more accurate and up to date data and mapping of dune and beach conducted to replace the 1975 "Beaches and Dunes of the Oregon Coast" report as beach and dune forms are dynamic and change over time. This mapping could be conducted by DOGAMI. Funding resources that can be explored include the FEMA Risk MAP program. New studies, data, and maps would then need to be adopted into the Comprehensive Plan Goal 18: Beaches and Dunes and the Land Use Code Beach and Dune Overlay.

#### **Conduct Dune Management Studies for Tierra del Mar and Neskowin and updates for Nedonna Beach and Pacific City**

The County should look to have Dune Management Studies for Pacific City, Tierra del Mar, and Neskowin conducted possibly by DLCD or DOGAMI. Funding may be available through the FEMA Risk MAP program. The need for the studies should also be included as a mitigation action within the Natural Hazard Mitigation Plan (NHMP) in order to underscore the need for such reports and provide further rationale for funding grant requests.

## **Develop Foredune Management Plans for Tierra del Mar and Neskowin and acknowledge in Comprehensive Plan**

Dune Management Studies developed in the previous process would form the basis for new Foredune Management Plans that would be developed directly with the affected communities. The Foredune Management Plans would likely need to be contracted out to an outside consultant. The Foredune Management Plans would need to be acknowledged in the Comprehensive Plan.

## **Adopt more comprehensive and clear Foredune Grading Permit requirements in the Beach and Dune Overlay**

This report's toolbox of recommendations for restructuring and strengthening the Foredune Grading section of the Tillamook County Land Use Ordinance should be critically reviewed by County staff. Staff recommended code language would need to be approved by the Planning Commission, and then adopted by the Board of County Commissioners.

## Case Studies

### **TSUNAMI**

Tsunami Hazard Overlay Project (Clatsop County, OR) .....	109
A Land Use Guide for Oregon Coastal Communities .....	112

### **COASTAL EROSION**

Blufftop Setbacks (San Luis Obispo, CA) .....	115
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### **LANDSLIDE**

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### **MULTI-HAZARD**

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## Introduction

The purpose of this case study is to evaluate Clatsop County's use and implementation of a Tsunami Hazard Overlay (THO). This study will briefly discuss the history of tsunami planning in Oregon and how that relates to Clatsop County's efforts to mitigate tsunami risks. An examination of the Clatsop County Tsunami Hazard Overlay project's best practices, model ordinances, and implementation rationale will be conducted in order to offer policy recommendations for Tillamook County.

## Context

Clatsop County is located north of Tillamook County along the northern Oregon Coast. As with Tillamook County, and every county on the coast, Clatsop County is susceptible to tsunami and ocean flooding hazards that pose serious risks to life and property. The State of Oregon has many policies and regulations to help communities mitigate natural hazards, including tsunami. In 1995, the Oregon Legislature passed Senate Bill 379 creating Tsunami Regulatory Maps, which indicate a single tsunami inundation line on U.S. Geological Survey topographic maps. They show the best estimate of tsunami inundation from a typical or most likely tsunami originating from earthquakes on the Cascadia subduction zone fault. Tsunami Regulatory Maps are the official State maps for implementation of Oregon Revised Statutes (ORS) 455.446 and 455.447, limiting, through the Oregon Building Code, construction of certain critical and essential facilities in the

## Case Study Significance

The Clatsop County Tsunami Hazard Overlay Zone highlights the challenges of tsunami planning and provides important lessons for Tillamook County.



Signage indicating tsunami inundation zone

“The primary purposes of this project [was] to develop a comprehensive knowledge of tsunami hazards within the county, identify what strategies and options apply in Clatsop County, and to determine what level of detail [was] necessary to adequately implement those options and strategies within the Clatsop County land use planning program.”

- Clatsop County, OR

tsunami inundation zone. In 2013 the Oregon Department of Geology and Mineral Industries (DOGAMI) completed a multi-year process to update these maps using improved technology. A new Tsunami Inundation Map for Clatsop County was adopted in June 2013, and as a result the County began the Tsunami Hazard Overlay Project. The primary purposes of the project were to develop a comprehensive knowledge of tsunami hazards within the county, identify what strategies and options apply in Clatsop County, and to determine what level of detail is necessary to adequately implement those options and strategies within the Clatsop County land use planning program. The project resulted in amendments to the Comprehensive Plan and Land and Water Development and Use Ordinance.

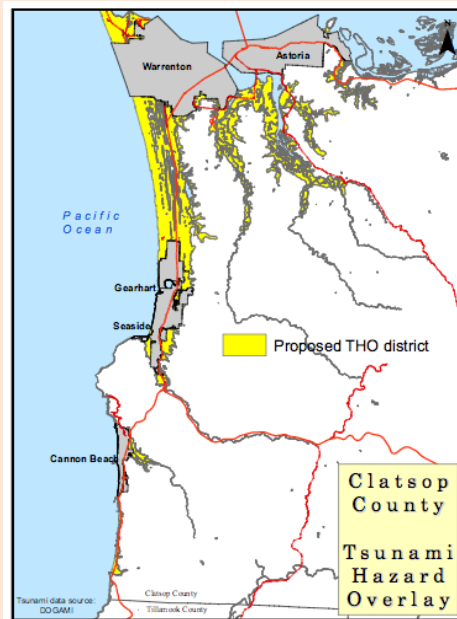
## Current Programs

The Clatsop County Tsunami Hazard Overlay Project set forth to create a more concrete set of policies and standards for which types of development could, or could not, take place within the tsunami inundation zone. To fund the project, the County received a \$7,000 technical assistance grant from DLCD to help offset the costs of materials, published notices, mailed notices and staff time, allowing them to propose text amendments to both the Comprehensive Plan and the County's Development Ordinance.

Updates to the Comprehensive Plan include amending Goals 7 (Hazards), 11 (Public Facility and Services), and 12 (Transportation). The most extensive amendments were made to the Goal 7 (Hazards) section, adding tsunami related language to the General Policies, and adding new tsunami specific sections such as Evacuation Policy Concepts, Reducing Development Risk in High Tsunami Risk Areas, Hazard Mitigation Planning,

Tsunami Awareness Education and Outreach, Debris Management, and Hazardous Materials.

Enforcement of these policies would have been established through the implementation of a new Tsunami Hazards Overlay that was outlined as the fourth policy listed in the Goal 7 Hazards General Policies section of the Comprehensive Plan. The concept is codified in the County's Land and Water Development and Use Ordinance as Section 4.500 Tsunami Hazard Overlay (THO) District. The outlined purpose of the Tsunami Hazard Overlay District is to increase the resilience of the community to a local source tsunami by establishing standards, requirements, incentives, and other measures to be applied in areas subject to tsunami hazards. The standards established by this section are intended to limit, direct and encourage the development of land uses within areas subject to tsunami hazards in a manner that will reduce loss of life, reduce



Location of proposed [Clatsop County Tsunami Hazard Overlay](#) within unincorporated county lands

damage to private and public property, reduce social, emotional, and economic disruptions, and increase the ability of the community to respond and recover.

## Key Takeaways for Tillamook County

Due to its location along the coast of the Pacific Ocean, a significant portion of the communities in Tillamook County are susceptible to tsunami hazards. Communities such as Rockaway Beach, Pacific City, and Neskowin are particularly vulnerable to tsunamis due to low-lying coastal developments. In a simulated scenario, Rockaway Beach has 80% of its building value exposed to tsunami inundation. While tsunami hazards cannot be prevented, steps can be taken to lessen the impact that a tsunami event might have on the development of the Tillamook County coastal communities. One tool that the county can use to mitigate the risk to life and property, is to implement a Tsunami Hazard Overlay outlining development restrictions on new developments occurring within the areas that would be most impacted by a tsunami event.

A Tsunami Hazard Overlay is a large regulatory task to take on at the county level, one that can be politically charged and controversial. However, the current status of the Tillamook County Land Use Ordinance does little to regulate development within the DOGAMI Tsunami Inundation Zone, putting lives and private property at risk. Following the practices set forth by Clatsop County, a Tsunami Hazard Overlay throughout the at risk areas of unincorporated Tillamook County would ensure that future development is conducted with an eye towards the safety and resiliency of the county.

## Key Resources

Source	Description
<a href="#">Clatsop County</a>	Tsunami Hazard Overlay Project
<a href="#">Department of Land Conservation and Development</a>	Land Use Guide Model Ordinance
<a href="#">DOGAMI</a>	Tsunami Mapping and Scientific Research



## Introduction

The purpose of this case study is to evaluate the Department of Land Conservation and Development's (DLCD) *Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities* as a model land use ordinance to mitigate risk from tsunami. This study briefly describes the need for such a model code and how it can best be implemented. Specific code language significant for the Tillamook County context is highlighted and the implications of implementing such an overlay in the County are discussed.

## Context

The Oregon Coast is within a zone vulnerable to earthquake and tsunami. Scientific evidence suggests a potential large scale earthquake and tsunami event is likely to occur in the future and will impact many coastal communities. These large earthquakes will occur under the ocean just offshore of the Oregon coast and can cause destructive tsunamis that can strike the coast 15 to 20 minutes after the earthquake. It is likely that in most Oregon coast communities, the only warning will be the earthquake itself. To help communities better prepare for such an event, DLCD teamed with public and private officials to create a land use guide to be used to mitigate the risk to life and property that these tsunamis pose.

The Land Use Guide provides coastal communities examples of comprehensive plan language and development code

## Case Study Significance

The model Tsunami Hazard Overlay in *Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities* uses historic and scientific tsunami inundation information to formulate code that protects people and development from the dangers of tsunami.



Cascadia Subduction Zone and its proximity to the Oregon Coast

***“The Japan earthquake and tsunami are what we can expect here in Oregon. This is a serious threat to our coast and we need to prepare now.”***

- Mark Barnes, Planning Director for the City of Cannon Beach

provisions that can serve to help communities reduce their risk to tsunami hazards. These examples are intended to provide general guidance allowing communities to tailor land use policies and regulations appropriate to their individual circumstances. The guide is focused on land use planning approaches to reduce tsunami hazard risk, and is not intended to address the full range of efforts needed for overall disaster preparedness.

To inform the creation of this guide, DLCD and the Advisory Committee studied the events of the 2011 earthquake and tsunami in Japan. The Japan 2011 event is a close parallel to what the Oregon Coast will face in a Cascadia event, and impacts to the Oregon coast and its communities will be similarly devastating. As part of Japan's recovery, communities and government entities are turning to land use planning options that will increase resilience to the next catastrophic event of this type.

## Current Programs

Before using the Land Use Guide, community staff and citizen volunteers should have a good understanding of the community's land use and development program and the specific tsunami risk for the area. Communities should first review the DOGAMI Tsunami Inundations Maps (TIMs) to get a better sense of areas and key facilities at risk of tsunami inundation. This can help evaluate relative risk and exposure in the community based on the various inundation scenarios in order to lead future community discussions on risk tolerance and potential mitigation tools. As a second preliminary step, the guide urges the appointment of an advisory committee. This committee can be appointed by the County Commissioners and should include some of the stakeholders in the community, including

a mix of public and private leaders. This committee would make recommendations to the County Commission concerning tsunami hazards and are subject to public meeting laws.

After research and correlated preliminary steps have been completed, local governments can choose to use the Land Use Guide in whole or in part depending on the community's exposure to tsunami inundation, and geographic situation. Using the Land Use Guide may result in comprehensive plan and development code amendments to be adopted by the local jurisdiction and be administered within the local land use planning program. The Guide offers a model Tsunami Hazard Overlay Zone ordinance, which provides a mechanism to apply an additional tier of regulations on new development specifically addressing tsunami risk. As with any model code, not all of the approaches or standards in the Land Use Guide will be suitable for use in every community. It is up to the individual jurisdiction to carefully consider the community's unique challenges and opportunities, in order to tailor the model ordinance to ensure the best fit.

The Tsunami Hazard Overlay zone is designed to serve as the principal implementation mechanism for land use measures addressing tsunami risk. It is designed to be applied in the form of an overlay zone based on scientific inundation mapping, such as DOGAMI's TIMs or any other generally adopted inundation line. The model overlay focuses on three main approaches to reducing risk:

- Placing restrictions and limitations on certain categories of uses. Applying mainly to uses listed as serving an essential function during or after a disaster event such as hospitals, schools, or emergency response facilities.

- Integrating the development of evacuation infrastructure into the land use and development review process. Providing a consistent evacuation planning program throughout the jurisdiction.
- Providing incentives for development designs which reduce risk and increase resiliency. Offer modifications to development code standards that would improve risk reduction on a per development basis.

## Key Takeaways for Tillamook County

Because the risk of tsunami inundation is high in Tillamook County a Tsunami Hazard Overlay could help to mitigate that risk. The Land Use Guide produced by DLCD offers a model ordinance that is in depth enough to be adopted outright by the County. However, it is important to note that there are many unique aspects of Tillamook County's tsunami risk that need to be considered.

A Tsunami Hazard Overlay for the entire county of Tillamook would be would be a large regulatory task that may be controversial, but the Land Use Guide provides a framework that the County can use to balance citizen concerns while also dealing with the increasing reality of a tsunami event. Tillamook County should also actively involve the Community Advisory Committees (CACs) when designing their Tsunami Hazard Overlay.

The Oregon Model Tsunami Overlay Zone is specifically designed to be used in conjunction with DOGAMI Tsunami Inundation Maps and its model overlay code language could be applied to Tillamook County. Clatsop County, OR was the first to attempt implementing the DLCD Tsunami Hazard Overlay model. That discussion was later tabled due to concerns of overregulation, however Coos

County and Curry County are now both in the process of adopting a Tsunami Overlay Zone utilizing the Tsunami Land Use Guide and their processes should inform Tillamook County. The adoption of a countywide or high hazard area overlay would demonstrate that Tillamook County takes seriously the threat of natural hazards in the unincorporated community.

## Key Resources

Source	Description
<a href="#">DOGAMI</a>	Tsunami Mapping and Scientific Research
<a href="#">National Tsunami Hazard Mitigation Program</a>	Provides national framework for tsunami mitigation.
<a href="#">Douglas County</a>	Tsunami Overlay Code in Douglas County.
<a href="#">Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities, Department of Land Conservation and Development, 2015</a>	Provides coastal communities examples of comprehensive plan language and development code provisions that can serve to help communities reduce their risk to tsunami hazards.



## COASTAL EROSION: BLUFFTOP SETBACKS SAN LUIS OBISPO COUNTY, CA

### Introduction

The purpose of this case study is to evaluate the San Luis Obispo County, California's Coastal Zone Land Use Ordinance. In particular, the adoption of a blufftop setback that protects structures for 75 years of erosion minimizing the need for shoreline protective devices and protecting the actual structure from coastal erosion. This study briefly describes the context of the setback in San Luis Obispo County. Then the specific code requirements pertaining to the setback are highlighted, and the implications for adoption of a similar setback in Tillamook County are discussed.

### Context

San Luis Obispo County is located on the central coast of California roughly equidistant from San Francisco and Los Angeles. The county has 96 miles of coastline that range from rugged headlands and rocky shorelines to sheltered coves and sand beaches. A number of small incorporated and unincorporated communities dot the coast.

California utilizes a Coastal Commission that is guided by the 1976 California Coastal Act to oversee coastal development permitting. Local Coastal Programs (LCPs) are local government planning tools that must be consistent with the policies of Coastal Act and protect public access and coastal resources. LCPs are reviewed by the Coastal Commission prior to the transfer

### Case Study Significance

San Luis Obispo County utilizes a countywide blufftop setback requirement that is designed to protect development for a period of 75-years.



Cynthia Lambert, The Tribune

Eroding bluff near development in Pismo Beach, San Luis Obispo County.

*“New development  
[should] minimize  
risks and neither  
create nor contribute  
to erosion or require  
construction of  
protective devices.”*

*- California Coastal Commission*

of coastal permitting authority from the state to the local government. San Luis Obispo LCPs was first approved in 1984 and has undergone periodic review and updates with the latest review and recertification occurring in 2001.

## Current Programs

The San Luis Obispo County Development Code utilizes a distinct Coastal Zone Land Use Ordinance that applies to all land use and development activities within the unincorporated areas of the county that are located in the California Coastal Zone as established by the California Coastal Act. Section 23.04.118 of the land use ordinance stipulates blufftop setbacks within the Coastal Zone that apply to new development or expansion of existing uses proposed to be located adjacent to a beach or coastal bluff.

### Land Use Ordinance Section 23.04.118

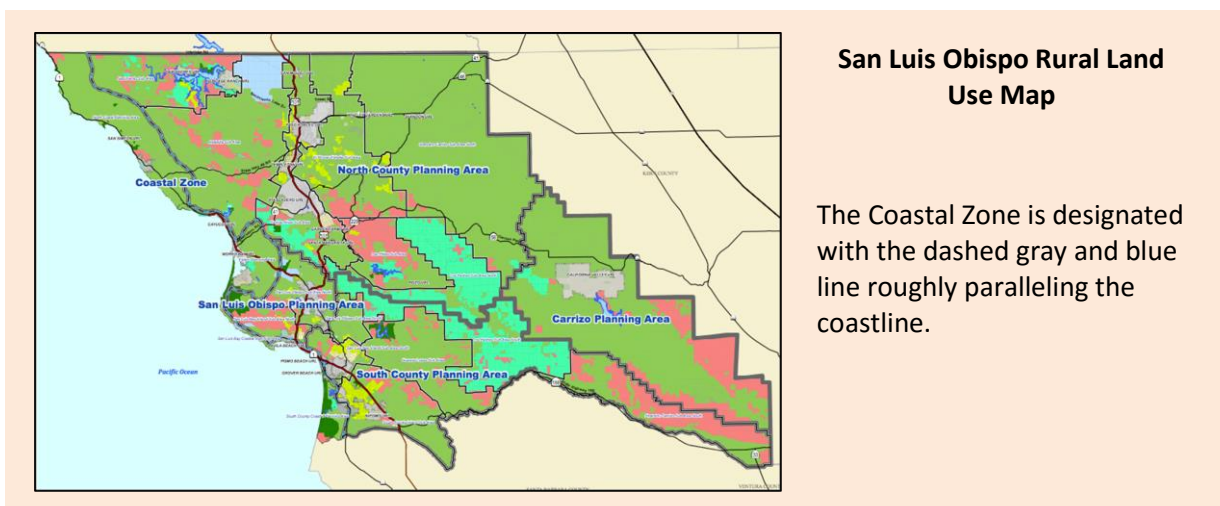
New development or expansion of existing uses on blufftops shall be designed and set back from the bluff edge a distance sufficient to assure stability and structural integrity and to withstand bluff erosion and wave action for a period of 75 years without construction of shoreline protection structures that would in the opinion of the Planning Director require substantial alterations to the natural

landforms along bluffs and cliffs. A site stability evaluation report shall be prepared and submitted by a certified engineering geologist based upon an on-site evaluation that indicates that the bluff setback is adequate to allow for bluff erosion over the 75-year period according to County established standards.

## LCP Periodic Review

In 2001 San Luis Obispo County's Local Coastal Program underwent review by the California Coastal Commission. The Coastal Commission encouraged the county to increase the blufftop setback period from 75 years to 100 years. This recommendation was made in light of the commissions finding that "the 75-year economic life may not reflect the actual lifetime of a structure or the length of time a coastal site will be occupied" as the "value of coastal land and the lack of alternative coastal locations" make it unlikely for buildings to be retired after 75 years. Further consideration for increased erosion rates and/or events from rising sea level and increased wave action provide further rational for a larger setback.

After 75 years the setback will likely have eroded to the point of endangering the structure and either coastal relocation of the structure or armoring of the shoreline



**San Luis Obispo Rural Land Use Map**

The Coastal Zone is designated with the dashed gray and blue line roughly paralleling the coastline.

will have to occur. In particular, shoreline armoring is explicitly to be avoided by the Coastal Act regulation.

The commission ended up modifying this suggestion after receiving comments from the county in favor of the county in favor of adding a requirement to incorporate a safety factor either as a multiplier or as a set distance, as developed through an Area Wide Shoreline Management Plan.

## Key Takeaways for Tillamook County

A blufftop setback requirement does not currently exist in Tillamook County outside of the Neskowin Coastal Hazards Overlay Zone that requires a 50-year setback protection. Tillamook County would benefit from conducting an analysis of the economic lifespan of development along the coast. Similar to the analysis in the periodic review process, Tillamook should consider how impact of land value and availability is possibly increasing building life when determining an appropriate blufftop setback for the county.

A blufftop setback requirement for the entire county of Tillamook would have to be drafted and adopted in the County Land Use Ordinance and this process would likely be controversial, but when citizens are properly informed and aware of coastal erosion hazards mitigation requirements such as this can be passed. Tillamook County should actively involve the Community Advisory Committees (CACs) when drafting this and all other code change recommendations.

The Oregon Model Coastal Erosion Overlay Zone provides example code language. In addition, the Neskowin Coastal Hazards Overlay Zone provides a local example of how the Oregon model overlay was modified to fit the Tillamook

context. Adoption of a countywide blufftop setback would protect people and property within Tillamook County from the chronic and episodic effects of coastal erosion.

## Key Resources

Source	Description
<a href="#">San Luis Obispo Coastal Zone County Land Use Ordinance</a>	Describes the regulatory land use requirements for development in the Coastal Zone
<a href="#">San Luis Obispo County Zoning Maps</a>	Shows the extent of the Coastal Zone in San Luis Obispo County
<a href="#">California Coastal Commission</a>	Provides regulatory review of county's Coastal Zone regulations
<a href="#">San Luis Obispo County's Local Coastal Program Periodic Review</a>	The California Coastal Commission's review and recommendations for San Luis Obispo County



## Introduction

The purpose of this case study is to evaluate Newport, Oregon's Geologic Hazards Overlay code and its utilization of the Oregon Department of Geological and Mineral Industries (DOGAMI) mapped bluff or dune backed shoreline areas within high or active hazard zones. This study briefly describes the need for such an overlay in Tillamook County. The specific code requirements pertaining to coastal erosion are highlighted and the implications of this hazard overlay for Tillamook County are discussed.

## Context

Newport is a coastal community of 10,000 located in central Lincoln County where the Yaquina River meets the Pacific Ocean. As with all coastal communities in Oregon, coastal erosion threatens life and property in coastal Newport. In 2004, DOGAMI completed maps of both landslide and coastal erosion risks within the community, and in 2010 the city planning department took the initiative to adopt these maps as the city's municipal code Geologic Hazard Overlay boundaries.

The public drafting of the ordinance was met with strong opposition, particularly due to concerns of decreased property values from "readily removable" building stipulations in high hazard areas, proposed hazard disclosures, and liability waivers that were proposed as part of the comprehensive review of the Geologic Hazard Areas Section of the Zoning

## Case Study Significance

The Geological Hazard Overlay code in Newport, OR uses DOGAMI hazard mapped zones to implement their hazard overlay code that protects people and development from the dangers of coastal erosion.



An eroding cliff side in Newport, OR threatens coastal development.

*Newport is very courageous in stepping out front, and they've bent over backwards to make sure the local population is able to join in that conversation.*

- George Priest, DOGAMI Geologist

Ordinance (Section 2-4-7) and development code (chapter 14.21). A lengthy public comment and review process mitigated citizen concerns, and in 2011 and City of Newport Planning Commission and its Citizens

Advisory Committee submitted their code change requests. These were adopted by Newport with city ordinance No. 2017. The significant end result of this process is the Geologic Hazards Overlay, Chapter 14.21 of Newport's current municipal code.

## Current Programs

The Newport Geological Hazard Overlay borrows language heavily from the Oregon Model Coastal Erosion Overlay Zone and DOGAMI mapped active or potential landslide areas, prehistoric landslides, or other landslide risk areas, as well as bluff or dune backed shoreline areas within high or active hazard zones are utilized for the Geologic Hazard Overlay Maps. For any property within, or partially within, the mapped hazard zones the following major requirements are applied.

- A geologic report prepared by a certified engineering geologist is required to establish that the site is suitable for the proposed development.
- The engineering report must detail any site remediation that is necessary to make the site more suitable for development.
- Erosion control measure are stipulated by the engineering geologist for the construction process.
- Structures that conform to the Zoning Ordinance that incur damage for any reason may be replaced with a building or structure of up to the same size provided a Geologic Report is prepared by a certified engineering geologist.

Additionally, the city subdivision ordinance was amended to include a requirement that new undeveloped lots in land divisions must include a minimum of 1000 sq. ft. of buildable site outside of active/high risk areas. Further text amendments were made to the Natural Features Chapter of the Newport Comprehensive Plan to ensure consistency between the comprehensive plan and the development code.



## Key Takeaways for Tillamook County

In 2014, DOGAMI produced an *Evaluation of Erosion Hazard Zones for the Dune-Backed Beaches of Tillamook County* (Open-File Report O-14-02) that uses the same bluff backed shoreline erosion hazard ranking and mapping as found in the Newport DOGAMI report, although the methodology between the reports differs slightly.

A Geological Hazard Overlay for the entire county of Tillamook would be a large regulatory task that may be controversial, but Newport's overlay code adoption process demonstrates the ability to balance citizen concerns while also dealing with the inescapable reality of the documented risks. Newport actively involved its Citizens Advisory Committee in reviewing the proposed code changes and their recommendations helped to create an overlay with development requirements that were not overly restrictive. Tillamook County should actively involve the Community Advisory Committees (CACs) when designing their Geologic Hazard Overlay.

The Oregon Model Coastal Erosion Overlay Zone is specifically designed to be used in combination with DOGAMI Coastal Hazard Risk Zone Maps. Newport and Neskowin serve as examples of

communities that have adopted and adapted the model overlay code language to fit their communities. The coastal erosion hazard is detailed and mapped in the Tillamook wide DOGAMI O-14-02 report. The report should therefore be utilized to protect people and property with Tillamook County. The adoption of a countywide or high hazard area overlay would demonstrate that Tillamook County takes seriously the threat of natural hazards in the unincorporated community.

## Key Resources

Source	Description
<a href="#">Newport Geologic Hazards Overlay</a>	Section 14.21 of the Newport OR Development Code
<a href="#">DOGAMI O-04-09</a>	Defines the Newport Geologic Hazard Overlay
<a href="#">DOGAMI O-14-02</a>	Could be used for a costal erosion overlay in Tillamook County
<a href="#">Oregon Model Coastal Erosion Overlay Zone</a>	Model code language used extensively in the Newport Geologic Hazards Overlay



## Introduction

The purpose of this case study is to evaluate Astoria's Erosion Control and Stormwater Development Code regulations. This study briefly describes the need for such regulations in Astoria. The specific code requirements pertaining to coastal erosion are highlighted and the implications of this type of development code section are considered for Tillamook County are discussed.

## Context

Located on the south shore of the Columbia River in far North West Oregon, Astoria has gone through numerous boom and bust economic cycles and has remade itself most recently as "little San Francisco."

With 10,000 residents, Astoria relies heavily on its deepwater port to support the local economy and the community has taken measures to protect its water resources from potential negative effects during development. Stormwater runoff, both during and after construction, can contribute to and exacerbate coastal erosion by eroding and channelizing ocean cliffs, bluffs, and dunes.

Astoria has sought to prevent the transport of sediment and other soil borne pollutants into the Columbia River estuary and its tributaries, wetlands and riparian areas by adding an Erosion Control and Stormwater Management section to their development code.

## Case Study Significance

Astoria utilizes an Erosion Control and Stormwater Development code section for any proposed clearing, grading, filling, stripping, or excavating (regulated activity) within 100 feet of a known geologic hazard.



Image from Doug Kerr, Flickr

The Columbia River as seen from the Astoria Column just outside of Astoria, OR.

*"Minimize the erosion of land during clearing, excavation, grading, construction and post-construction activities."*

*Erosion Control and Stormwater Development Code*

## Current Programs

Astoria's Erosion Control and Stormwater Development Code regulations are applied to any proposed clearing, grading, filling, stripping, or excavating (regulated activity) within 100 feet of a known geologic hazard. The regulations seek to;

1. Minimize impacts associated with excavation and grading.
2. Minimize the erosion of land during clearing, excavation, grading, construction and post-construction activities.
3. Prevent the unnecessary clearing, excavation, and stripping of land; and
4. To reduce the amount of soil exposure during construction.

To achieve these goals, a permit is required to clear, grade, excavate, strip, or fill land. Permits are obtained from the Engineering Department. All permits are reviewed and approved by both the Astoria Engineering Department and Community Development Department for compliance with this Ordinance and other City codes and building codes. Permits are subject to numerous conditions including cut and fill standards and the following requirements:

- Natural vegetation shall be retained and protected wherever possible.
- Sedimentation barriers shall be placed to control sedimentation from entering the river, bay, streams, wetlands, adjacent property or City streets and storm sewers. The barriers shall be installed prior to site clearance or grading activities.
- The City Engineer or Building Official may require areas to be temporarily stabilized with straw mulch, sod, mat or blanket in combination with seeding, or other acceptable sediment control method. Prior to the completion of construction, such areas

shall be permanently stabilized by seeding or other vegetative ground cover.

- Stormwater catch basins, inlets or culverts shall be protected by sediment traps or filter barriers such as "bio bags."
- Soil storage piles or fill shall be located so as to minimize the potential for sedimentation of streams, wetlands, adjacent property or City streets or storm sewers. The City Engineer or Building Official may require temporary stabilization of soil storage piles or fill.
- Temporary sedimentation control, not in conjunction with a structure, shall be required in any situation where the City Engineer or Building Official determine that sedimentation or erosion may affect streams, wetlands, adjacent property, City streets or storm sewers.
- Erosion and sedimentation control measures shall be continually maintained during the period of land disturbance and site development in a manner that ensures adequate performance. Soil that has been transported by any means to a street or any area where stormwater flows to a storm drain or surface water, shall be cleaned up to prevent transport to the drain or surface water. All temporary erosion and sedimentation control measures shall remain in place until the disturbed area is stabilized with permanent vegetation.
- Sediment trapped by sediment control methods shall be redistributed onsite, removed, or permanently stabilized to prevent further erosion and sedimentation.
- The City shall make periodic inspections to ascertain that erosion and sediment control measures as proposed have been implemented and are being effectively maintained. The City Engineer or the Building Official

are authorized to place an immediate “stop work” order on any project that does not meet the standards imposed in this ordinance.

Through these requirements and permit process, Astoria is able to effectively mitigate the erosive effects of stormwater to better protect both hillsides and water quality.

## Key Takeaways for Tillamook County

Astoria’s Erosion Control and Stormwater Development Code regulations are contained as an appendix to the Oregon Model Coastal Erosion Overlay Zone for reference and use by other communities. Tillamook County currently lacks a stormwater management development code section and as a first step the County should look to adopt erosion control permits and requirements similar to Astoria for areas of high risk to coastal erosion and landslide.

Tillamook County currently applies a limited set of Erosion Control and Stormwater Management development regulations within the Neskowin Community Boundary and Neskowin Coastal Hazard Overlay Zone through the Neskowin Erosion Control and Stormwater Management code section (5.100). This code and the Astoria code

both serve as examples for an Erosion Control and Stormwater Management code section for all areas of the county that are at risk to coastal erosion and landslide.

Providing consistent and clear erosion control and stormwater management development code regulations for all areas of unincorporated Tillamook County that are at risk of landslide and coastal erosion is important for protecting both people and property as well as for preserving water quality.

## Key Resources

Source	Description
<a href="#">Astoria, OR Development Code</a>	Section 3.300 is the Erosion Control and Stormwater Management code section
<a href="#">Do I Need a Grading and Erosion Control Permit?</a>	Astoria’s informational flyer on the Grading and Erosion Control Permit process
<a href="#">Model Coastal Hazards Overlay Zone</a>	Appendix D: Astoria Erosion Control and Stormwater Management Code Language, page 25
<a href="#">Tillamook County Article 5: Special Uses and Standards</a>	Section 5.100 is the Neskowin Erosion Control and Stormwater Management code section



## Introduction

The purpose of this case study is to evaluate the City of San Ramon's use of a Geologic Hazard Abatement District (GHAD). This study will provide a brief description of the community's unique geologic setting, analyze the history of the program, and examine locally applicable best practices. Examination of implementation strategies will be identified and discussed, ultimately illustrating the feasibility and relevancy to Tillamook County's goal of natural hazards mitigation.

## Context

Located within Contra Costa County, the city of Sam Ramon is surrounded by rolling hills, the Diablo Mountain Range, and the SanRamon Valley. Slides and earth flows pose a serious hazard to the city. The city is located 25 miles south of the Oakland and serves as a bedroom community for employees traveling to San Francisco, Silicon Valley, and San Jose. The population is 74,378, with an expected build-out population of approximately 90,000, making it the fourth largest city in the county.

In January 1982, the President declared a major Disaster Declaration under PL 93-288, indicating severe damages in the hills of Contra Costa and six other surrounding counties. Federal and state damage estimates indicate a high level of destruction:

- 6300 Damaged Structures

## Case Study Significance

For over fifteen years, California has utilized Geologic Hazard Abatement Districts to engage communities in geologic mitigation actions.

The city of San Ramon has demonstrated the efficacy of local voluntary programming, gathering the necessary economic and social support to addresses the unique conditions that influence landslide threat.



2011 Landslide in Contra Costa County

## What is an Abatement District?

Abatement districts vary in specific characteristics, however, they all aim to reduce the damage caused by a specific hazard. To lessen the impact threat, communities come together to combine funding through monthly required fees. The fees vary based on the requirements set forth in a district agreement. Funding is put towards a variety of mitigation actions and also set aside for an emergency event.

- 231 Destroyed Structures
- 33 Deaths
- \$109 million total damages

Source: [\*National Weather Service, 1982\*](#)

Following this incident, state and county officials became increasingly concerned with the threat of landslide hazard, eventually prompting discussion regarding response efforts. The integration of Geologic Hazard Abatement Districts became increasingly attractive after a disaster of such magnitude. The 1979 Beverly Act provided for the establishment of Geologic Hazard Abatement Districts (GHADs) as independent public agencies to oversee geologic hazards in defined geographic areas. There are currently over 35 GHADs in California working to prevent, mitigate and abate geologic hazards (California Association of GHADs, 2016).

Under authority of the California Public Resources Code (Division 17, commencing with Section 26500), the City of San Ramon, in 1990, adopted Resolution No. 90-106 forming the West Branch Geologic Hazard Abatement District ("GHAD" or "District") 1990-01. The primary mission of the GHAD is the prevention, mitigation, abatement, and/or control of geologic hazards within its boundaries that have damaged, or that pose a significant threat of damage to site improvements within the developed areas of the projects. (Revised Plan of Control 2009) As a resident, the GHAD is beneficial as it provides a type of insurance and security, as well as management and maintenance.

## Current Programs

### Assessment

Assessment is a vital component for the management of an abatement district. To property and appropriately allocate

funding, it is essential that the district be fully informed on the current conditions that may impact hazard threat levels. The assessment is a legal document that states how the district should be maintained and prevents damage resulting from earth movement by identifying and monitoring potential geologic hazards and undertaking improvements as appropriate. GHAD assessment can be easily collected since the assessment can be collected along with the general property tax. This avoids requiring separate collection by a private entity. Assessments are updated and approved annually by the GHAD Board. The primary purpose of the assessment is to fund maintenance activities and projects defined within the Plan of Control. The Certified Engineering Geologist (CGE) prepares the plan "which describes in detail a geologic hazard, its location and the area affected thereby, and a plan for the prevention, mitigation, abatement, or control thereof" (Section 26509).

### Funding

A funding program provides concise organization and structure for the distribution and collection of finances. This pool of money serves preemptive reduction actions and also acts as insurance for residents in the event of an emergency event. Each fiscal year, the District Engineer prepares an Engineer's Report to outline budgetary allowances, costs, monitoring, and maintenance fees that are needed. Funds are utilized for all services included within the GHAD boundary. Volatile and at-risk areas are determined by the results of the assessment. Additionally, a reserve fund is set aside to mitigate and repair large landslides and other disastrous events. All property owners contribute an equal payment for annual assessment.

The proposed assessment for fiscal year 2014/15 is \$141 per residential unit and \$0.0451 per square foot of nonresidential area. Without the majority of consent of the property owners, the assessment rate cannot rise above \$250 per residential unit and \$0.10 per square foot of nonresidential structures (GHAD No. 1990-01 Brochure).

## Key Takeaways for Tillamook County

Tillamook County contains a significant portion of preexisting developments that exist in high-susceptibility regions. In all unincorporated areas, 35% of building structures are exposed and the resulting destruction would cost close to \$500,000,000. In the unincorporated county, there are six public facilities located in landslide high susceptibility regions; four schools and two fire departments (Tillamook Multi-Hazard Risk Report, 2016 draft).

Geologic Hazard Abatement Districts resolve issues related to all aspects of the disaster cycle. Through planning programs, rapid response initiatives, recovery aid and services, and mitigation funding and practices, the districts address both potential and actual geologic hazards. GHADs also serve as documentation for property conditions, maintenance and repairs. However, it is important to consider the disadvantages of GHADs, especially in relation to community politics. GHADs can be added to by a vote of 51% of the adjacent property owners, which places a burden on reticent parties and forces residents to comply. GHADs are an entity that can be enjoined in legal action by disgruntled members or adjacent parcel owners, increasing operating cost. It is important to consider the demographics and interests of the residents within the

proposed district boundary and collaborate to minimize unrest.

A Geologic Hazard Area has been defined in the development code in 4.130, however, the code lacks enforceable monitoring or regulatory measures. Following the practices set forth by San Ramon's example, Tillamook County could adopt a Landslide Hazard Abatement District. The district would provide the protection of life and properties from landslide risk. An abatement district would mitigate hazard and be very beneficial throughout the unincorporated county. Moving forward, the cities should determine whether a GHAD would be politically viable in their community.

## Key Resources

Source	Description
<a href="#">California Geologic Hazard Abatement Districts</a>	Provides information related to GHADs in the state of California.
<a href="#">San Ramon Plan of Control</a>	Establishes the key components of San Ramon's district.
<a href="#">San Ramon GHAD Staff Report</a>	Assessment includes economic analysis, monitoring of ongoing projects, as well as discussion of new development.
<a href="#">GHAD Brochure</a>	An educational public outreach packet that provides key information regarding the role of the district and how the district impacts residents.



## Introduction

The purpose of this case study is to analyze the strengths of a point-based geologic hazard overlay system modeled by Marion County and Salem. A partnership between the City, County, and DOGAMI produced a hillside development ordinance that is based on landslide hazard maps. This case study will evaluate the use of maps to inform development patterns through a quantitative allocation scheme to determine if these best practices would be effective for landslide mitigation in Tillamook County.

## Context

Salem is the capital of Oregon and serves as the seat for Marion County. The city is the third most populous, after Portland and Eugene, and is home to over 150,000 residents. The metropolitan area serves as an employment center for a variety of both public and private sector jobs. The transportation infrastructure includes Interstate 5, Oregon Route 99E, and Oregon Route 22, connecting coastal and inland communities.

Troubling high rain events have prompted increased landslide mitigation efforts. Four separate flooding events in 1996/1997 involving heavy rains and landslides caused severe damage and led to Federal Disaster Declarations for Marion County and other counties in the State.

From November 1998 through January 2000, representatives from DLCD, DOGAMI, and a Landslide Hazard Advisory

## Case Study Significance

Geologic hazard threat is determined based on a point-based system that gives a value to the site based on certain geologic, topographic, and development characteristics.

Salem and Marion County's assessment scheme provides a way to classify different proposed development sites and then mandates geologic report requirements based on the assessment score.



Heavy rains flood Salem in December, 2015

Step 6. Determine Landslide Hazard Risk

PART VI			
Total Risk Assessment Policy Provision			
Category A - Low Landslide Risk	Category B - Moderate Landslide Risk	Category C - High Landslide Risk	Risk
(4 or less point value)	(5 - 8 point value)	(9 or greater point value)	
No Requirements.	Geologic Assessment *	Engineering Geology Report Geotechnical Report	
	* If the Geologic Assessment indicates landslide hazards on the site, the Planning Director or Building Inspection Official shall specify the requirements of a High Landslide Risk Assessment.		

Step 6 from the hazard assessment table in the Marion County Land Use Code determines appropriate course of action based on combined point values.

Committee (LHAC) worked together to review landslide hazard issues, hillside development and other hazard ordinances from jurisdictions around the country. They developed a framework for landslide hazard regulations and draft landslide hazard ordinance provisions that were reviewed and refined by the LHAC, Oregon State Board of Geologic Examiners, members of the State Board of Engineering and Land Survey, and the staff of various city and county departments.

### Salem Landslide Code

The city’s ordinance is based on landslide hazard data and maps produced by DOGAMI. Building plans and development applications are evaluated based upon a point system that combines the landslide risk exhibited by the subject property (a function of soil types, slopes, underlying geological conditions, etc.). The accumulated point value guides specific action.

- For combined point values that represent Low Landslide Risk, no additional requirements are placed on the applicant beyond those otherwise associated with the development application.
- For combined point values that exhibit Moderate or High Landslide Risk, the applicant is required to submit a geological assessment performed by a Certified Engineering Geologist that examines the soil and geological conditions of the site to determine if mitigation strategies will need to be used to ensure safe development.

A geotechnical report provides concise information regarding the adequacy of the proposed development from an engineering standpoint, as well as conclusions regarding the effect of geologic conditions on the proposed development, and any recommended design and building features necessary to

mitigate landslide hazard risks.

Ideally, geological assessments and/or geotechnical reports will be performed at the subdivision level, where a developer can submit one report for the entire subdivision.

### Key Takeaways for Tillamook County

A point-based method to landslide mitigation may be an effective approach to addressing the landslide risk that persists throughout the entire county. Current mapping and susceptibility evaluation is primarily at the state or county scale, which may not be sufficient for accurately capturing site-specific characteristics and details that impact landslide threat. A point based assessment system and stipulations for a geotechnical report brings a more informed opinion that can supplement development proposals and guide better informed decisions regarding future land use practices at a local level.

### Key Resources

Source	Description
<a href="#">Marion County Land Use Code</a>	Contains the Geologically Hazardous Areas Overlay Zone Ordinance.
<a href="#">DLCD Natural Hazards Model Ordinances</a>	DLCD has evaluated a series of hazard ordinances and outlined the successes and best practices that might be adopted in other areas.



## Introduction

This case study is intended to outline specific code language that pertains to vegetation practices for development located in areas considered to be geologically hazardous and at risk to slope destabilization (landslides and coastal erosion). The city of Mukilteo, WA addresses the high level of landslide vulnerability that impacts the majority of the jurisdiction and has introduced more stringent requirements for future development. Mukilteo's regulatory approach provides a framework that sets forth clear definitions, standards, and practices that offer a strategy for Tillamook to target slides through a mitigation measure that revolves around increasing slope stability.

## Context

The city of Mukilteo is the home to 20,000 individuals and is located on the shore of the Puget Sound within Snohomish County, Washington. Originally a small blue collar village that supported fishing, trade, and lumber, the city has experienced substantial growth and development along the waterfront. The boathouses have been demolished and replaced with apartment complexes and hotels, and industry now revolves around the nearby Boeing factory in Everett and professional audio equipment manufacturing. Perhaps the most prominent feature of the city is the transportation infrastructure that serves as a hub between Seattle and Everett. The waterfront location offers ferry services,

## Case Study Significance

The city of Mukilteo has integrated strong regulation for vegetation standards within geologically sensitive areas.

- This is a model of a community that felt that existing development code was not sufficient and elected to adopt higher regulatory standards for the city.
- Vegetation and pruning requirements are informed by the Department of Ecology
- A hillside's root system greatly impacts the probability and magnitude of a landslide event.



A mudslide buries the BNSF railroad tracks running alongside Puget Sound, near Everett.

while train service is provided by Sound Transit through the Sounder commuter rail.

The city aligns with the Southern Whidbey Island fault zone, and precariously, most of the community is concentrated on a hillside that faces the Island. The steep terrain surrounding development motivated city planners to examine the development code and include specific standards for geologically hazardous areas.

Many landslides occurred on the coastal bluffs between Seattle and Everett, WA during the winters of 1996 and 1997. The landslides caused significant property damaged and interfered with rail traffic; future landslides in the area pose significant hazards to property and public safety. In the past 10 years there have been more than 200 landslides along the Seattle to Everett coastline. Each slide that covers or disturbs rail lines triggers a mandatory 48-hour halt to passenger train traffic while BNSF clears tracks and ensures the area is stable (WSDOT, 2015).

On December 28<sup>th</sup>, 2014, a landslide dumped debris five feet high and 30 feet

long, including a 50-foot tree. BNSF Railway Co. responded by imposing a moratorium on passenger trains between Seattle and Everett, which had serious implications for Amtrak Cascades and Empire Builder trains.

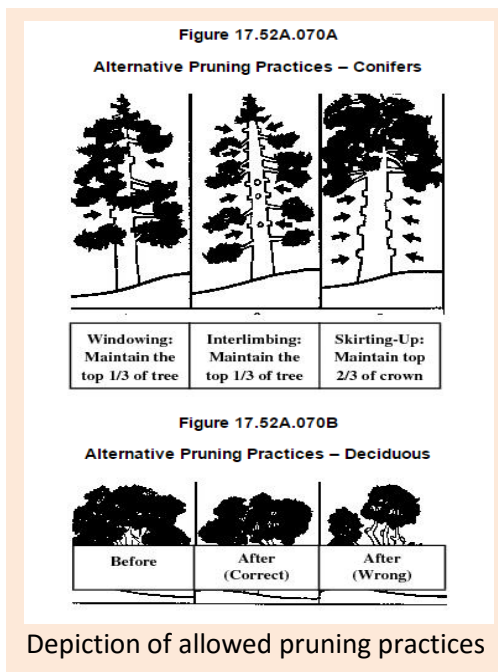
WSDOT, Amtrak, BNSF Railway, Sound Transit and other partners formed the Landslide Mitigation Work Group to research historical slide locations and causes along coastal bluffs. The group also meets with local governments and citizens about ways landowners can help prevent slides on their property (WSDOT, 2014).

## Best Practice

Chapter 17.52A defines geologically sensitive areas based on associated maps provided by the city that reflect geologic, hydrologic, and topographic characteristics.

Beyond distinguishing geologically sensitive areas, the ordinance also provides stringent regulations and requirements for vegetation management on slopes greater than forty percent. The vegetation specifications are based on recommendations outlined in the Department of Ecology's handbook [\*"Vegetation Management: A Guide for Puget Sound Bluff Property Owners"\*](#).

- Defining certain tree types that may be cut and removed in a method approved by the planning director and public works director.
- Stumps and root systems must be left undisturbed to protect the slope from erosion.
- Defining certain deep-rooted bushes or ground cover that shall be planted around the remnant stumps to establish erosion control functions.
- Defining certain tree types that cannot be cut down, except with the submittal of a geotechnical report.



- Trimming must preserve a minimum of sixty percent of original canopy/foilage
- “Windowing”, “interlimbing”, or “skirting-up” trimming practices may be utilized, but must adhere to requirements based on type of trimming practice.

## Key Takeaways for Tillamook County

Tillamook County’s existing code mentions revegetation however, this requirement is deficient and lacks the specificity needed to mandate a level of accountability as described below. Section 2.1 “Landslides” of the Comprehensive Plan stipulates that vegetation removal in areas of mass movement topography shall be engineered to minimize sliding (7-17). Section 4.130-2 instructs the documentation of “minimum removal of vegetation to accommodate use” within an associated geologic hazard report. These requirements are ambiguous and can easily be taken advantage of without clearly stated accountability measures and/or consequences.

Root systems are necessary for stabilization of soils to reduce the risk of shallow landslides. Bare soils are recognized as unstable material contributing to slope failure. After heavy rain, the shallow portion of the landslide is caused by saturated soil and decreased support of the slope. However, if the slopes have native forest cover, the probability of landslide occurrence becomes very low. Introduction of higher regulation for development, especially in areas replete with steep slopes, would substantially reduce the probability and magnitude of a landslide event.

## Key Resources

Source	Description
<a href="#">Mukilteo Geologic Sensitive Area Regulations</a>	Chapter 17.52A defines geologically sensitive areas and acknowledges specific mitigation strategies that must be taken to reduce threat.
<a href="#">Washington Department of Transportation Slide Program News, 2015</a>	The Washington State Department of Transportation initiated slide management projects that targeted six historically slide prone sites.
<a href="#">WSDOT Landslide Mitigation Action Plan</a>	WSDOT created the plan that defines the roles of the Landslide Mitigation Work Group, as a team to develop short and long term strategies to reduce landslide impacts and improve transportation and infrastructure throughout the Pacific Northwest Rail Corridor.



## Introduction

The purpose of this case study is to evaluate the efficacy of King County's implementation of stringent buffer zone requirements in landslide hazard areas. The analysis includes important context and history that directly impacts the applicability of this best practice. Additionally, the connection between terminology and definitions included within the code will be examined, and implementation strategies will be identified and discussed.

## Context

King County is the most populous county in Washington State and encompasses the tri-city metropolitan areas of Seattle, Tacoma, and Bellevue. These urban areas are linked by I-5 and I-90, bordered by the Cascadian Range to the East, and the Pacific Ocean/Puget Sound waterbodies to the West. In addition to this unique geographic setting, the county is exceedingly vulnerable because high concentrations of development have been located on steep slopes subject to landslides. Many of the major valleys and shoreline bluffs of Puget Sound are bordered by steeply sloping unconsolidated glacial deposits that are highly susceptible to landslides.

Historically, landslides have originated after severe storm events, however, one of the most destructive events occurred after the 2001 Nisqually earthquake. The earthquake is considered one of the largest in recent history, measuring 6.8 in

## Case Study Significance

Severe landslide events resulting from the Nisqually Earthquake had major implications for transportation and infrastructure.

The county recognized the need for increased landslide mapping and hazard analysis, and the results led to increased regulatory code language to best mitigate landslide risk.



Highway 101 landslide after the 2001 Nisqually earthquake

magnitude with a maximum intensity of VIII (Severe) in the Capitol Hill area of Olympia and Pioneer Square in downtown Seattle. Beyond damages associated with earthquake, the sudden seismic movement triggered a landslide that blocked a portion of the Cedar River. Overflowing water caused

damage to the surrounding structures and uplifted a significant area of trees and debris.

The threat to life and property stimulated landslide conversation that launched many planning initiatives. By June 2014,

the King County Flood Control District approved funding for a two-year investigation to update landslide hazard information for King County's river valleys and floodplains.

In addition to research and geospatial analyses, the county has also reviewed development code and integrated more rigorous requirements for building in a landslide hazard area.

## Best Practice

Title 21A of the zoning code(21A.06.680) defines landslide hazard areas through a variety of metrics that include slopes greater than 15%, impermeable soils, and areas subject to inundation by debris flows or deposition of stream-transported sediments. The comprehensive definition limits any room for ambiguity and meticulously addresses all levels of landslide susceptibility.

Beyond distinguishing landslide hazard areas, the ordinance also provides stringent regulations and requirements for proposed development. One of the most effective attributes of the code involves buffer zone requirements which are based on a critical area report prepared by a geotechnical engineer or geologist.

The critical area report assesses a variety of unique variables such as habitat type, vegetation, slope, and development on the site. An applicant is asked to provide additional information with the permit application in order to enable Permitting Department staff to better assess potential impacts the development might have on these critical areas. The report also stipulates that the resident file a Notice on Title with the King County Office of Records and Elections prior to permit approval to record the presence of critical areas and buffers on the property. The Notice on Title provides a public record of

the critical areas and associated development restrictions and is a requirement of the Zoning Code (KCC 21A.24.170).

- If a critical area report is not submitted to the department, the minimum buffer is fifty feet with an additional 15-foot building setback requirement.
- The buffer zone is predicated on the form of proposed development.

## Key Takeaways for Tillamook County

Tillamook County's development code does not include provisions related to the area surrounding structures proposed within a high-risk landslide area. The County can reduce the potential damage to structures through a buffer zone regulation. The amended code would include language modeled after King County's example and would include a requirement for a critical area report that would specify buffer zone standards based on the findings of the report. This approach does not require a high level of involvement and will not be a significant burden for community members, as the responsibility falls on the developer to fulfill the buffer requirement.

## Key Resources

Source	Description
<a href="#">King County Title 21A Zoning Code</a>	King County land use code, including title 21A for analysis of landslide hazard areas.
<a href="#">2001 Post-Quake Analysis</a>	A USGS publication that accounts landslide damages and losses resulting from the 2001 Nisqually, WA Earthquake.



## Introduction

This case study describes Colorado Springs Development Code Section 8.4.105 amendment to International Fire Code, which introduces a highly regulated Hillside Overlay Zone for areas determined as highly vulnerable to fire threat. This study describes process that motivated the city to reevaluate the standardized set of stipulations and then outlines the more rigorous language that was included into the development code. The specific recommendations taken from this practice involve the integration of an overlay district for Wildland Urban Interface areas and mitigation requirements surrounding roof materials and fuel management.

## Context

Colorado Springs, home to over 445,000 people is located 60 miles south of Denver. The city is located in a very arid desert mountain environment and is highly vulnerable to wildfire, and experienced severe damage from wildfires in 2012 and 2013. The Waldo Canyon and Black Forest fires represent the state's most damaging wildfire incidents, destroying over 850 houses and leading to 70,000 evacuations. After these events, the city reviewed the development code and determined that higher regulatory action was necessary to protect the people and property.

Colorado Spring's Land Use code, updated in September 2015, proposes a variety of modifications that increase mitigation

## Case Study Significance

Colorado Springs, CO reevaluated city code after many devastating wildfire events.

- New development requirements amend International Fire Code with the addition of more stringent regulations
- The city has integrated an overlay zone with specific standards to reduce wildfire risk.
- Mitigation strategies focus on Fuel Management and Roof Requirements



Destruction from Waldo Canyon Fire, Colorado Springs, 2012

*"Over 850 houses destroyed and 70,000 people evacuated."*

activities for wildfire hazard. [Section 7.3.504](#) specifically targets the utilization of an overlay zone with wildfire mitigation standards required for all new building construction or reconstruction, regardless of development plan approval date. The Hillside Ordinance does not apply to homes constructed prior to its adoption. As described below the most important stipulations relate to: designation of a specific 'safety zone', "Fuels Management Requirements" and "Roof Requirements".

## Current Programs

Appendix K and the Hillside Overlay Zoning Code aim to set forth compliance standards with specific criteria that are applied to areas with significant vulnerability to wildfire risk.

Fuels Management Requirements for the safety zone:

- Brush patches or clusters may be left in the safety zone, but shall be separated by clear areas of ten (10) feet or more of noncombustible materials or grass mown to not more than four (4) inches in height.
- No brush shall be allowed within ten (10) feet of the main structure.
- Large trees shall not have overlapping limbs and shall be pruned of dead limbs to a height of ten (10) feet above the ground. Tree clusters may be allowed if sufficient clear area is provided.
- Tree branches shall not extend over or under the roof eaves and shall not be within fifteen (15) feet of a wood burning appliance chimney.

## Roof Requirements

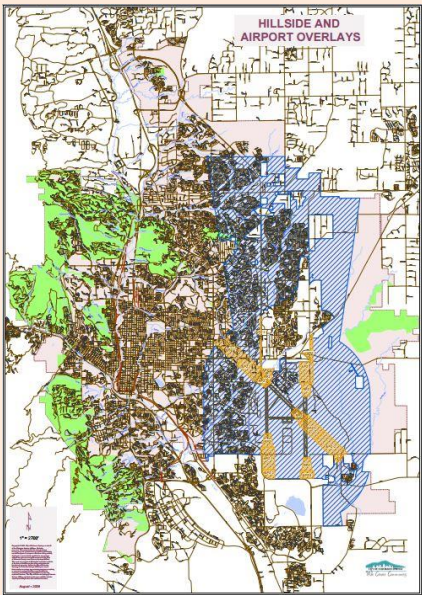
- A minimum of a Class A roof covering (excluding solid wood roofing products) shall be installed on all Residential Occupancies.
- A minimum Class B roof covering shall be installed on all remaining occupancies when an application is made for a roofing or re-roofing building permit within the limits of the City of Colorado Springs, Colorado.

## Regulation/Monitoring Practices

- The Development Services Department ensures notes required by Section E., Wildfire Risk Mitigation, of the Hillside Overlay Zone Ordinance are included on all applicable development plans and subdivision plats.
- The Zoning Administration office ensures that notes are included on all Hillside Site Plans.
- The Zoning Office informs the applicant of the required fuels management measures for each individual lot at time of review.
- The Zoning office will identify the structures requiring Class C roofing materials and fire protection system installation and mark the HSS/LGP plan accordingly.

## Key Takeaways for Tillamook County

The wildfire hazard Impacts only 0.7% of buildings in unincorporated areas of Tillamook County, however, future growth projections indicate increased development and eastward expansion into wildfire areas. It is important for Tillamook County to review and improve code language with supplementary requirements to reduce structural vulnerability to damage from wildfire.



Colorado Springs [Hillside Overlay Map](#) provides a reference for areas that must comply with wildfire mitigation development requirements.

A regulatory Wildfire Hazard Overlay modeled after Colorado Springs Hillside Overlay for the entire county would provide additional wildfire safety measures for communities and residences within the wildfire prone regions of the county. The Overlay would not impose on development outside of the overlay and would serve primarily as a protective measure for anticipated growth trends.

The adoption of a high hazard area overlay would reflect far-sighted decision-making and demonstrate Tillamook’s informed planning practices regarding development requirements. It would be most judicious to address the threat of wildfire before development rates increase and mitigate potential tensions with prospective homeowners.

A Wildfire Hazard Overlay Zone is designed to be used in conjunction with the Risk Report Wildfire Hazard Risk Zone Maps. The specific code language can be modeled after the best practices related to Colorado Springs Fuel Management and Roofing Requirements.

## Key Resources

Source	Description
<a href="#">Colorado Springs Hillside Development Guide</a>	An extensive presentation of model code language, diagrams, and requirements for development occurring within the hillside overlay. Provides information on how to minimize terrain disturbance, integrate vegetation, and mitigate impacts.
<a href="#">WUI Mitigation Ordinance</a>	An amendment to the fire prevention code to include Appendix K to outline Wildland Urban Interface Mitigation Requirements for Hillside Overlay
<a href="#">Colorado Springs City Code</a>	Section 7.3.504 designates the use of a hillside overlay zone.



## Introduction

Ashland, OR has been recognized as a model Firewise Communities/USA® since it's recognition award for Oak Knoll Meadows in 2011. This case study outlines the practices and successes of Ashland's twelve Firewise neighborhoods. This study highlights the feasibility for such a program in Tillamook County.

## Context

Ashland is a city located within Jackson County, OR. Just north of the California border, the city is home to 20,000 residents (2015, Portland State University). The city has a unique culture that is tied to Southern Oregon University, as well as many restaurants, galleries, the Oregon Shakespeare Festival, parks, and urban recreation areas. At the foothills of the Siskiyou and Cascade mountain ranges, this inland area receives less rainfall than the coastal communities.

In 2009 the city was impacted by the Siskiyou Fire that was outside the city limits, but created a big smoke column that had serious implications for public health and led to the evacuation of many neighborhoods. This event caught the attention of the public and initiated interest in wildfire mitigation. In 2011, the severity of wildfire hazard was reiterated when the Oak Knoll Fire took 11 homes in a neighborhood outside of the designated Wildfire Hazard Zone. Many of these neighborhoods have been in existence for decades, and were constructed when building codes did not reflect Firewise principles.

## Case Study Significance

In 2011, Ashland, OR, a small city (20,000 residents), took the initiative to form its first Firewise community.

- The city has less available resources, however, the political and social will to reduce risk for people and property catalyzed many important mitigation actions that have greatly reduced wildfire risk.
- The community has access to valuable information regarding vegetation, defensible space standards, and location of different hazard zones.
- Events and services include free yard debris disposal, an annual 5k run, and a Firewise Clean-Up day.



A map of Ashland's twelve neighborhood [Firewise sites](#).

## Current Programs

Since 2011, the City of Ashland has established twelve neighborhood based Firewise communities. Despite having no standards for defensible space in either Ashland or Jackson County's development codes this voluntary program has been highly effective. Firewise events are regularly held, led the local fire protection district, with assistance from students at Southern Oregon University.

The events provide community members information on their wildfire risk, the conditions that impact their community, and provide important insight and tools to reduce their risk. One of the most effective annual events is the "Ashland Firewise Clean-up Day", where representatives from the Wildfire Mitigation Commission, Recology Ashland, and Ashland Fire & Rescue work together to promote vegetative fuel removal and disposal and encourage residents to create a defensible yard before the fire season starts.

Education opportunities include courses regarding Firewise landscaping for local professionals, as well as comprehensive online tools that integrate mapping, infographics, and simple actions that homeowners can take to mitigate wildfire.

For the community of Oak Knoll Meadows, successful Firewise project initiatives include removing rows of highly flammable leland cypress and juniper in common spaces where they were within 30 feet of homes and could act as fuel bridges for fire to carry between homes, as well as replacing some wood shake roofs, and some areas underneath decks and overhangs ([City of Ashland](#)).

## Key Takeaways for Tillamook County

Historically, wildfires have burned vast areas of land and property in Tillamook County. Current protective measures, extents of existing fire protection districts, and coverage throughout the Forest Zone may be insufficient in terms of regulating wildfire mitigation. The Forest zone (F-zone) is effective, however, regulations are not in place for residential areas within the F-Zone. Encouraging the formation of Firewise communities is a non-regulatory approach that is highly effective at mitigating wildfire. As exemplified by Ashland, size and available resources do not inhibit the efficacy and success of the program.

## Key Resources

Source	Description
<a href="#">Firewise.Org Successful Stories</a>	The NFPA and Firewise Communities website identifies model communities that have taken initiative and formed highly effective programs.
<a href="#">City of Ashland</a>	The City of Ashland provides an in-depth overview of the Firewise Community history, as well as helpful informational resources, news, maps, tips, and references for service providers in the area.
<a href="#">Firewise</a>	The NFPA and Firewise offer a website that outlines the history of the program, FAQ, online courses, and a blog.



## Introduction

The purpose of this case study is to evaluate the Puget Sound Partnership’s Low-Impact Development (LID) Land Use Guidance Report. In particular, this case study evaluates the adoption of alternative regulatory standards for stormwater management. This study briefly describes the context of LID in the Puget Sound of Washington State. Lastly, specific land use code language and programmatic implementation steps pertaining to the stormwater management strategy are highlighted, and the implications for adoption of similar standards in Tillamook County are discussed.

## Context

The Puget Sound Partnership has been a national leader in the research and development of strategies to implement low-impact development since holding the first national LID conference in 2000. Since then the Partnership has commissioned studies and technical reports related to the subject. The Puget Sound offers a unique and ideal location to conduct these studies due to recent scientific reports showing the effect of urbanization and poor stormwater management techniques on the Puget Sound. As water quality became a serious issue, salmon and other aquatic animals began to reduce in population until they became threatened species.

As a response to this, from 2005-2009 the Partnership led discussions with the Washington Department of Ecology to

## Case Study Significance

By managing stormwater in small-scale, distributed facilities, the flooding effects to downstream properties from flash storm events are reduced.



Integrating LID into Local Codes

An example of Low-Impact Development in Lacey, WA.

*“Conventional practices, like stormwater ponds surrounded by chain link fences, can be eyesores and typically provide only the one function while LID techniques, such as bioretention and vegetated roofs, provide multiple benefits.”*

– Bruce Wulkan, Puget Sound Partnership

facilitate the LID Local Regulation Assistance Project, which provided detailed recommendations to 36 local governments for removing barriers to LID, and either encouraging or requiring LID.

With the creation and adoption of the recommendations of the Assistance Project, came a wealth of knowledge related to LID regulations, standards, and best practices. The information and best practices collected from the project, which involved 36 local governments, were consolidated and synthesized into the *LID Technical Guidance Manual*. The technical manual is targeted to an array of professionals including engineers, planners, landscape architects, technical staff, policy makers, and developers. The specific code language sections and standards in this case study are directly from the Guidance Manual or from the Partnership's resource guide *Integrating LID into Local Codes*.

## Current Programs

The Puget Sound Partnership's *Integrating LID into Local Codes* identifies not only model development code language but it also includes a significant amount of information related to incentive programs to encourage the use of LID. The Partnership encourages municipalities to use these incentive based programs because they are often "the most successful measure taken by local governments to spark LID for those who are not inclined to require its use." The incentives programs included in the guide are as follows:

- Reduced Permit Review Time
- Reduced Application Fees
- Dedicated Review Team
- Property Tax Reduction
- Public Recognition
- Increased Densities
- Flexibility in Building Restrictions

- Adjustments to Required Parking
- Reduced Surface Water Fees
- Lower SDC fees
- Fee Restructuring
- Reduced Stormwater Requirements
- City-Furnished LID Materials

While this is a fairly comprehensive list, the guide understands that many of these incentive programs may not work in all jurisdictions. The Partnership recommends developing an advisory committee (project team) of staff and stakeholders who are familiar with the jurisdiction and its policies to best adapt the programs to the local context.

## Topics to Address

Once the project team is assembled and a common level of understanding of LID is established among the participants, the next step is to establish a work program that includes what topics are to be addressed. The Partnership recommends the project team focus their efforts on:

- Site Planning and Assessment
- Healthy Soils
- Landscaping and Vegetation
- Hard and Impervious Surfaces
- Bulk and Dimensional Considerations
- Clearing and Grading
- Streets and Roads
- Parking
- Design Guidelines
- Site-Specific Stormwater Management
- Subdivision and Planned Unit Development
- Shoreline Management

By narrowing its focus on these areas, the project team can become deeply familiar with the challenges and opportunities LID presents. This step in the process can be used to educate outside stakeholders about how LID policies, regulations, and standards fit into the larger regulatory context.

## Perform Gap Analysis

Once a local government's project team identifies what should be addressed under an LID approach, the next step is to determine where changes need to be made to integrate LID fully into a jurisdiction's policies, regulatory code, and standards. This step focuses on the review of codes and standards against what is needed to determine where changes are needed for LID integration. This step discusses the major topics that should be reviewed during the LID integration process and shows where these topics are typically found within development regulations and standards. It is important to note that no two codes are integrated in the same-manner. Each jurisdiction should consult planning and public works staff to understand how development regulations and standards can best be modified.

A gap analysis identifies those places in a jurisdiction's codes and policies where amendments or new codes and policies may be needed in order to allow LID where feasible. These major topics include the following:

- Comprehensive Plan Goals and Policies
- Zoning Code
  - Landscaping, Native Vegetation, Tree Protection, and Open Space
  - Impervious Surface Standards
  - Bulk and Dimensional Standards
  - Site Plan Review
  - Parking
- Development Code and Standards
  - Clearing and Grading Standards
  - Engineering and Street Standards

After the project team identifies where there are gaps and barriers in existing codes and standards, the next step is to fill the gaps and remove the barriers by amending existing codes and developing new code language. This step will likely



Reduced width one-way street and short driveways minimizing impervious surfacing.

be an iterative process as the project team reviews concepts and examples of how existing code and standards may be modified to emphasize an LID approach.

Before starting the code amendment process, it is a good idea to lay out the steps of the intended project-specific LID review and approval process to provide a framework for the process. Because LID site design mimics the natural hydrology of the site, it is very important to specify the details that need to be known by the applicant and jurisdiction early in the project review and approval process so there is sufficient technical information to guide design of the site. Collaboration is a critical piece to this review process. Through the process of an initial site and feasibility assessment, the applicant typically will survey and test the development site to understand its physical characteristics. In a LID site assessment, additional on-site studies should be conducted to determine soil quality, drainage, vegetative cover, etc. Establishing these standards early is the key to ensuring this process runs as efficiently as possible. Once the process for site assessment is standardized, LID policies can be further implemented throughout the Comprehensive Plan, Subdivision Code, Engineering and Street Standards, and Zoning Code.

Both guides produced by the Puget Sound Partnership, *Integrating LID in Local Codes* and the *LID Technical Guidance Manual* offer a plethora of model codes and specific language that can be adapted or adopted by local governments. These codes range from highly regulatory standards such as determining the size of trees needed to mitigate runoff to non-regulatory on-site stormwater management incentive based programs. All code language in these guides are standards pulled directly from implementing jurisdictions and may need to be altered to best fit within the Tillamook County context.

## Key Takeaways for Tillamook County

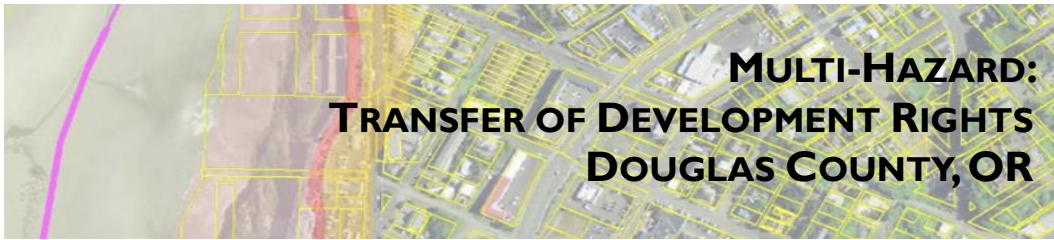
Stormwater management is a mitigation strategy that effects many natural hazards. Maintaining runoff on-site can help reduce risk for landslide and natural absorption of water causes less flooding. Additionally, low-impact development is a sustainable practice that can greatly improve water quality, provide habitat for species on land, and protect habitat for aquatic species receiving stormwater runoff. However, LID is not without its challenges. A common misconception about LID is that it produces an undue cost burden on the property owner by requiring them to institute stormwater management practices that are above and beyond what is minimally required. As LID becomes more common and better understood, the initial building cost continues to fall. Over the long-term, LID practices can actually save property owners money as maintenance costs are significantly lower than that of traditional stormwater practices.

Another important aspect to note, is that in many jurisdictions LID practices are offered as an alternative to traditional stormwater management practices.

Typically, property owners have the option to “opt-in” to the LID standards in order to achieve an incentive, ranging from reduced fees to additional density bonuses. Because Tillamook County has a large geographic area of varying ecological situations, this “opt-in” strategy may be an attractive regulatory direction. The County can develop LID standards and regulations based on the Puget Sound Partnership best practices and model ordinances but only enforce them on properties that decide to use the alternative. This would add an additional step to the site and development review process but can make a drastic difference in mitigation of natural hazards and wildlife habitat preservation in Tillamook County

## Key Resources

Source	Description
<a href="#">Puget Sound Partnership Integrating LID into Local Codes</a>	Describes the regulatory process of adopting LID standards into local codes.
<a href="#">Puget Sound Partnership LID Technical Guidance Manual</a>	Provides policy decision makers with technical assistance in adopting LID standards
<a href="#">ECONorthwest The Economics of Low-Impact Development: A Literature Review</a>	Studies the economic and financial feasibility, effectiveness, and implications of LID
<a href="#">Green Girl Development Solutions</a>	Provide LID resources and best practices.



## Introduction

The Transfer of Development Rights (TDR) program in Douglas County, OR presents a process and model code language that reflects a successful mitigation strategy to prevent development in high hazard areas. This case study will highlight the Douglas County program and then evaluate the feasibility of implementing a similar program in Tillamook. Ultimately, this example sets the framework for counties across Oregon that may be interested in utilizing TDR programs.

## Context

Located in the southwest coastal region of Oregon, Douglas County spans over 5,000 square miles and is the fifth largest county in the state. This area includes many notable natural features such as Crater Lake, Umpqua National Forest, and Willamette National Forest, and beautiful bays. There were roughly 109,000 residents in the county (Portland State University, 2015), with a significant level of employment in the timber/forestry industry (30% of labor) (2014, Census Bureau).

Recently, Douglas County has experienced severe destruction from both flooding and landslides. In December 2015, a landslide closed Highway 42 for close to a week, forcing traffic to take a detour that impacted a significant portion of the population. Then again in February (2016), a massive rockslide occurred on Tyee Access Road about 15 miles west of Sutherlin. According to the Public Works

## Case Study Significance

Douglas County, OR contains many communities that are at high risk to a variety of natural hazards such as floods, landslides, rock slides, and coastal erosion.

- After receiving a grant from DLCD, the county funded mapping and research projects to inform and develop a TDR program.
- The county's TDR program is noted as a successful model framework for which other counties can follow if they wish to implement a similar TDR program.
- The program limits risk to future development within natural hazard prone areas by transferring rights away from a highly susceptible area.



High rains led to severe flooding and landslides for Douglas County in December 2014.

Department, the rock is 40-feet in length and 40-feet tall and it could cost as much as \$50,000 to clean up (*Douglas County Public Works Department*).

The county is highly susceptible to many natural hazards, which ultimately drove the initiation of a TDR program. Senate Bill 12 establishes Oregon's policy for protecting the public from rapidly moving landslide hazard and was adopted in the wake of the catastrophic landslide events that occurred in Oregon in 1996. The Oregon Department of Land Conservation and Development (DLCD) received money from this legislature and awarded a grant to Douglas County to develop a model program to help in the mitigation of rapidly moving landslide hazards. These funds were awarded to Douglas County. Douglas County agreed to produce four main products: a model landslide hazards ordinance, model documents to support implementation of Senate Bill 12, a model Transfer of Development Rights program, and procedures to integrate DOGAMI's "further review area" maps into local tax parcel maps ([DLCD](#)).

## Current Program

The Douglas County Transfer of Development Rights Guide includes the following recommendations for other counties considering adaptation of a similar program:

- Local government should consider approaching TDRs as a unique tool that mitigates environmental, economic, social and energy (transportation) issues for rural areas.
- Local government should view TDR programs as density transfers. Density transfers should be treated much like a water/mineral right with the exception of not issuing a stock certificate.

- Completion of a credit exchange would require parties to document the process and provide jurisdictional proof of redemption. The sending property would record with the County Clerk findings stating completion of the transaction and placement of a redemption covenant.

## Key Takeaways for Tillamook County

When addressing areas that may be subject to multiple hazard threats, Tillamook County should consider initiating a TDR program. Douglas County set the framework for Oregon and established a legal precedent and foundation for which hazard mitigation can be addressed through development rights. By transferring the development right from the at-risk property, the county insures that there will be no future threat to potential residents or structures.

## Key Resources

Source	Description
<a href="#">DLCD Natural Hazards Model Ordinances</a>	DLCD has evaluated a series of hazard related ordinances throughout the state and outlined the successes and best practices that might be adopted in other areas.
<a href="#">Douglas County Model TDR Guide</a>	Written in 2000, this document examines the political feasibility of TDRs in relation to Senate Bill 100.