



Oregon

Kate Brown, Governor

Department of Land Conservation and Development

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Salem, Oregon 97301-2540

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NOTICE OF ADOPTED CHANGE TO A COMPREHENSIVE PLAN OR LAND USE REGULATION

Date: August 05, 2015

Jurisdiction: Coos County

Local file no.: AM-15-04

DLCD file no.: 003-15

The Department of Land Conservation and Development (DLCD) received the attached notice of adopted amendment to a comprehensive plan or land use regulation on 08/03/2015. A copy of the adopted amendment is available for review at the DLCD office in Salem and the local government office.

Notice of the proposed amendment was submitted to DLCD 35 days prior to the first evidentiary hearing.

Appeal Procedures

Eligibility to appeal this amendment is governed by ORS 197.612, ORS 197.620, and ORS 197.830. Under ORS 197.830(9), a notice of intent to appeal a land use decision to LUBA must be filed no later than 21 days after the date the decision sought to be reviewed became final. If you have questions about the date the decision became final, please contact the jurisdiction that adopted the amendment.

A notice of intent to appeal must be served upon the local government and others who received written notice of the final decision from the local government. The notice of intent to appeal must be served and filed in the form and manner prescribed by LUBA, (OAR chapter 661, division 10).

If the amendment is not appealed, it will be deemed acknowledged as set forth in ORS 197.625(1)(a). Please call LUBA at 503-373-1265, if you have questions about appeal procedures.

DLCD Contact

If you have questions about this notice, please contact DLCD's Plan Amendment Specialist at 503-934-0017 or plan.amendments@state.or.us



NOTICE OF ADOPTED CHANGE TO A COMPREHENSIVE PLAN OR LAND USE REGULATION

FOR DLCD USE
File No.: 003-15 {23773}
Received: 8/3/2015

Local governments are required to send notice of an adopted change to a comprehensive plan or land use regulation **no more than 20 days after the adoption.** (See [OAR 660-018-0040](#)). The rules require that the notice include a completed copy of this form. **This notice form is not for submittal of a completed periodic review task or a plan amendment reviewed in the manner of periodic review.** Use [Form 4](#) for an adopted urban growth boundary including over 50 acres by a city with a population greater than 2,500 within the UGB or an urban growth boundary amendment over 100 acres adopted by a metropolitan service district. Use [Form 5](#) for an adopted urban reserve designation, or amendment to add over 50 acres, by a city with a population greater than 2,500 within the UGB. Use [Form 6](#) with submittal of an adopted periodic review task.

Jurisdiction: Coos County

Local file no.: **AM-15-04**

Date of adoption: July 30, 2015

Date sent: 8/3/2015

Was Notice of a Proposed Change (Form 1) submitted to DLCD?

Yes: Date (use the date of last revision if a revised Form 1 was submitted): 4/30/15

No

Is the adopted change different from what was described in the Notice of Proposed Change? Yes No

If yes, describe how the adoption differs from the proposal:

The only changes made to the adopted language was the removal of the policy language. That language was put in CCCP Volume I Part I §5.11.

Local contact (name and title): Jill Rolfe, Planning Director

Phone: 541-396-7770

E-mail: planning@co.coos.or.us

Street address: 225 N. Adams

City: Coquille

Zip: 97423-

PLEASE COMPLETE ALL OF THE FOLLOWING SECTIONS THAT APPLY

For a change to comprehensive plan text:

Identify the sections of the plan that were added or amended and which statewide planning goals those sections implement, if any:

For a change to a comprehensive plan map:

Identify the former and new map designations and the area affected:

- | | | | |
|-------------|----|--------|--|
| Change from | to | acres. | A goal exception was required for this |
| change. | | | |
| Change from | to | acres. | A goal exception was required for this |
| change. | | | |
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| change. | | | |
| Change from | to | acres. | A goal exception was required for this change. |

Location of affected property (T, R, Sec., TL and address):

The subject property is entirely within an urban growth boundary

The subject property is partially within an urban growth boundary

If the comprehensive plan map change is a UGB amendment including less than 50 acres and/or by a city with a population less than 2,500 in the urban area, indicate the number of acres of the former rural plan designation, by type, included in the boundary.

Exclusive Farm Use – Acres:	Non-resource – Acres:
Forest – Acres:	Marginal Lands – Acres:
Rural Residential – Acres:	Natural Resource/Coastal/Open Space – Acres:
Rural Commercial or Industrial – Acres:	Other: – Acres:

If the comprehensive plan map change is an urban reserve amendment including less than 50 acres, or establishment or amendment of an urban reserve by a city with a population less than 2,500 in the urban area, indicate the number of acres, by plan designation, included in the boundary.

Exclusive Farm Use – Acres:	Non-resource – Acres:
Forest – Acres:	Marginal Lands – Acres:
Rural Residential – Acres:	Natural Resource/Coastal/Open Space – Acres:
Rural Commercial or Industrial – Acres:	Other: – Acres:

For a change to the text of an ordinance or code:

Identify the sections of the ordinance or code that were added or amended by title and number:

This will be included in Chapter 4 of the Coos County Zoning and Land Development Ordinance.

For a change to a zoning map:

Identify the former and new base zone designations and the area affected:

Change from	to	Acres:
Change from	to	Acres:
Change from	to	Acres:
Change from	to	Acres:

Identify additions to or removal from an overlay zone designation and the area affected:

Overlay zone designation:	Acres added:	Acres removed:
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Location of affected property (T, R, Sec., TL and address):

List affected state or federal agencies, local governments and special districts:

Identify supplemental information that is included because it may be useful to inform DLCD or members of the public of the effect of the actual change that has been submitted with this Notice of Adopted Change, if any. If the submittal, including supplementary materials, exceeds 100 pages, include a summary of the amendment briefly describing its purpose and requirements.

1 BOARD OF COMMISSIONERS

2 COOS COUNTY

3 STATE OF OREGON

4 In The Matter of Adopting replacement language for the
5 Coos County Comprehensive Plan (CCCP) Volume I Part
6 1 §5.11 Natural Hazards and Part 2 § 3.9 Natural Hazards
7 and replacing the Balance of County Portions of the
8 Natural Hazards Maps.

ORDINANCE No.: 15-05-005PL

8 SECTION 1. TITLE

9 This Ordinance shall be known as the "Coos County Ordinance No. 15-05-005PL".

10 SECTION 2. AUTHORITY

11 This ordinance is enacted pursuant to the provisions of ORS 203.035 and Chapter 215;

12 SECTION 3. PURPOSE

13 The purpose of this Ordinance is to amend the Coos County Comprehensive Plan Volume 1,
14 Part 1 § 5.11 and Part 2 § 3.9 Natural Hazards, which contains comprehensive plan provisions for all
15 unincorporated areas of Coos County outside of the Coos Bay Estuary Management Plan and the Coquille River
16 Estuary Management Plan. This ordinance amends Coos County Ordinances 85-03-005L, 84-5-016L and 82-
17 12-022L which adopted Volume I of the Coos County Comprehensive Plan;

18 SECTION 4. FINDINGS

19 The Board of Commissioners of Coos County finds that the adoption of this ordinance is a land use
20 decision which must be made in accordance with the requirements of Oregon Statewide Planning Goal 7: Areas
21 Subject to Natural Hazards ("Goal 7"). Goal 7 requires local governments to inventory information on natural
22 hazards and this was completed when the Comprehensive Plan was adopted and acknowledged in 1985.
23 However, an update to Goal 7 adopted in 2001 revised the language; this update brings the Comprehensive Plan
24 into compliance with current Goal 7 language.

25 The hazards have been reorganized to match Goal 7 as follows: Flood Hazards, Landslides,
26 Earthquakes and Related Hazards, Tsunamis, Erosion, and Wildfires.

27 The Flood Hazards section language was updated but the mapping was completed through a prior
28 amendment and the implementing ordinance has been in place since March 2014. The updates to the language
29 include information on ocean flooding. Sources for the updates include National Oceanic and Atmospheric
30 Administration (NOAA) and Federal Emergency Management Agency (FEMA).

1 The methodology for landslides was based on ORS 195.250-195.275 which is required to be followed
2 by Goal 7. The source for the update includes the Department of Geology and Mineral Industries (DOGAMI).

3 Tsunami information was gathered and from the University of Oregon, DOGAMI, NOAA and U.S.
4 Geological Survey. The tsunami map information was obtained from DOGAMI.

5 Erosion information for river and stream banks was determined by using aerial photographs from 1999
6 to 2013 to view areas of significant change over the time period. Staff also used on the ground information
7 provided by Oregon Department of Fish and Wildlife (ODFW) to confirm the areas of erosion. There was
8 mapping data used from United States Geological Survey (USGS) in this project to determine areas at risk of
9 coastal erosion.

10 Wildfire information was obtained from Oregon Department of Forestry (ODF). In 2004 ODF
11 completed a study titled "Communities at Risk" which was an assessment indicating overall risk of loss due to
12 wildfire based on four criteria: risk (likelihood of fire occurring), hazard (resistance to control once a fire starts),
13 protection capability, and value. This information was used to update this § 3.9 of Volume 1, Part II of the
14 CCCP. At the request of Citizen Advisory and the Planning Commission the gorse was expanded and map
15 information for gorse was included.

16 This ordinance complies with the requirements of the Statewide Planning Goal 7.

17 SECTION 5. AMENDMENT TO THE COOS COUNTY COMPREHENSIVE PLAN

18 Exhibit "A", attached hereto and incorporated herein by this reference, is adopted as amendment to
19 Ordinances 85-03-005L, 84-5-016L and 82-12-022L, Volume I, Part 1 and Part 2 of the Coos County
20 Comprehensive Plan. This Ordinance shall not become effective until July 30, 2016.

21 SECTION 6. SEVERANCE CLAUSE

22 If any section, subsection, provision, clause or paragraph of this ordinance shall be adjudged or
23 declared by any court of competent jurisdiction to be unconstitutional or invalid, such judgment shall not affect
24 the validity of the remaining portions of this ordinance; and it is hereby expressly declared that every other section,
25 subsection, provision, clause or paragraph of this ordinance enacted, irrespective of the enactment or validity of
26 the portion thereof declared to be unconstitutional or invalid, is valid.

27 SECTION 7. REPEAL OF INCONSISTENT ORDINANCES

28 Coos County Ordinances 85-03-005L, 84-5-016L and 82-12-022L are repealed to the extent that they
29 are in conflict with this ordinance. Coos County Ordinances 85-03-005L, 84-5-016L and 82-12-022L shall
30 remain in full force and effect in all other respects.

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Dated this 30th day of July, 2015.

BOARD OF COMMISSIONERS

ATTEST

Suzanne May
Recording Secretary

Robert "Bob" Mjien
Chair

Approved as to form:

[Signature]

Office of Legal Counsel

[Signature]
Vice Chair

[Signature]
Commissioner

First Reading: June 16, 2015

Second Reading: July 15, 2015

Effective Date: July 30, 2016

1. General Policies:

Coos County shall regulate development in known areas potentially subject to natural disasters and hazards, so as to minimize possible risks to life and property. Coos County considers natural disasters and hazards to include: ~~stream and ocean flooding, wind hazards, wind erosion and disposition, *critical streambank erosion, coastal erosion and deposition, mass movement (earthflow and slump topography), earthquakes, and weak foundation soils.~~ ***Flood Hazards, Landslides, Earthquakes, Tsunamis, Erosion, Wildfires, Winds, High Groundwater and Flash Flooding.***

This strategy shall be implemented by enacting special protective measures through zoning and other implementing devices, designed to minimize risks to life and property.

This strategy recognizes that it is Coos County's responsibility: (1) to inform its citizens of potential risks associated with development in known hazard areas; (2) to provide appropriate safeguards to minimize such potential risks; (3) ***Coordinate with emergency service provides when developing new natural hazard plans;*** (4) ***Raise public awareness of natural hazards;*** (5) ***Support research or studies on natural hazard issues and solutions;*** (5) ***continue to coordinate with emergency management in the updates of the Coos County Natural Hazards Mitigation Plan and ensure consistency with the Coos County Comprehensive Plan;*** and (6) ***Cooperate and coordinate with stakeholders to ensure natural hazards policies are being met.***

2. Flood Hazards

Coos County shall continue to participate in the National Flood Insurance Program (~~Public Law 90-448~~), recognizing that participation in this program substantially insures the health and safety of County residents and allows property owners to benefit from subsidized insurance rates. Further, this strategy also recognizes that failure to participate in this program would prohibit affected property owners from receiving construction and permanent mortgage loans by federally insured lending institutions.

~~2a-~~ The areas of special flood hazard, identified by the Federal Insurance Administration in a scientific and engineering report entitled "The Flood Insurance Study for Coos County" dated March 17, 2014, with accompanying Flood Insurance Rate Maps (***FIRM***) and Flood Boundary Floodway Maps is hereby adopted by reference and declared to be a part of the Coos County Comprehensive Plan Inventory.

~~3-~~ Coos County shall comply with the requirements of the Federal Insurance Administration Regulation ~~1910.3(b)~~. This strategy recognizes that the above-identified safeguards are appropriate to minimize adverse life and property risks.

3. Erosion

Coos County shall promote protection of valued property from risks associated with critical streambank and ocean front erosion through necessary erosion-control stabilization measures, preferring non-structural solutions where practicable. Coos County shall implement this strategy by making "Consistency Statements" required for State and Federal permits (necessary for structural streambank protection measures) that support structural protection measures when the applicant establishes that non-structural

measures either are not feasible or inadequate to provide the necessary degree of protection. This strategy recognizes the risks and loss of property from unabated critical streambank erosion, and also that state and federal agencies regulate structural solutions. *Coos County shall work with other local agencies in developing projects that help prevent or repair bank erosion. Development should be designed to minimize alteration of natural land forms in areas subject to slope instability, drainage issues or erosion. This may include additional setback requirements.*

4. Coos County shall permit the construction of new structures in known areas potentially subject to mass movement (earth flow/slump topography/rock fall/debris flow) ***Landslides*** only:

- i. if dwellings are otherwise allowed by this Comprehensive Plan; and
- ii. After the property owner or developer files with the, Planning Department a report certified by a qualified geologist or civil engineer stipulating –
 - a) his/her professional qualifications to perform foundation engineering and soils analyses
 - b) that a dwelling can or cannot be safely constructed at the proposed site, and whether any special structural or siting measures should be imposed to safeguard the proposed building from unreasonable risk of damage to life or property.

This strategy recognizes the County is responsible for identifying potential hazard areas. Coos County shall implement its share of this strategy through implementing ordinance provisions, while at the same time supporting the state building code program. This strategy recognizes that the above-identified safeguards are appropriate to minimize adverse life and property risks associated with seismic hazards and that the State Building Codes Divisions is statutorily responsible for implementing this policy through its building permit process.

~~6. Coos County shall work with State Building Codes to The State of Oregon Department of Commerce Building Codes Division (pursuant to the authority vested in it by Section 2905 of the State Structural Specialty Code) shall require an engineered foundation or other appropriate safeguard deemed necessary to protect life and property in areas of weak foundation soils. This strategy recognizes that it is the responsibility of the State of Oregon Department of Commerce Building Codes Division to determine, based on field investigations, whether safeguards are necessary to minimize potential risks. The general level of detail used in mapping areas of known weak foundation soils is not of sufficient scale to mandate specific safeguards prior to a field investigation by the Building Codes Division.~~

5. Earthquakes and Tsunamis:

To protect life, minimize damage and facilitate rapid recovery from a local source Cascadia Subduction Zone earthquake and tsunami, the County will:

- i. *Support tsunami preparedness and related resilience efforts.*
- ii. *Take reasonable measures to protect life and property to the fullest extent feasible, from the impact of a local source Cascadia tsunami.*

- iii. *Use the adopted Oregon Department of Geology and Mineral Industries (DOGAMI) Tsunami Inundation Maps applicable to County to develop tsunami hazard resiliency measures.*
- iv. *Adopt a Tsunami Hazard Overlay Zone for identified tsunami hazard areas to implement land use measures addressing tsunami risk.*
- v. *Consider potential land subsidence projections to plan for post Cascadia event earthquake and tsunami redevelopment.*
- vi. *Require a tsunami hazard acknowledgement and disclosure statement for new development in tsunami hazard areas.*
- vii. *Identify and secure the use of appropriate land above a tsunami inundation zone for temporary housing, business and community functions post event.*
- viii. *Encourage housing, tourism, and government facilities be sited above tsunami inundation areas.*

6. Wildfires

Coos County shall address wildfire danger, particularly in the wild land/urban interface. A larger defensible space in areas that have been identified as being at risk of wildfires will be created as part of development standards. Coos County will work with fire protection agencies and support the providing improved fire protection service while supporting forest management practices that recues severe wildfire hazards.

7. Other Hazards

i. Wind

Coos County shall support the policy of State Building Codes Division requiring new mobile home sitings to be secured to the ground, recognizing that "tied-downs" are appropriate safeguard against Coos County's wind hazards. (Note to Board this was moved from 5)

ii. High Groundwater and Ponding

Public health is at issue with high groundwater and ponding; therefore, Coos County shall encouraging development of public water and/or sewer systems where dense development already exists in such areas is desirable.

iii. Flash Flooding

Hazard to people and property can be minimized by restriction of development in these areas and by protection of vegetation in steep watersheds. Proper engineering of roads is also recommended. (Note to Board this was moved from 5)

3.9 NATURAL HAZARDS (PROPOSED CHANGES)

Introduction

Areas subject to natural hazards in Coos County have been identified *and mapped using the County's GIS system. Each hazard is represented by a layer in the GIS database. A paper map will be printed and recorded in the Coos County Clerk's office as an attachment to the adopted plan amendment.* ~~in a series of seven maps at a scale of 1" = 2 miles, and include areas of~~ *The hazard layers include:*

1. ~~Flood hazard~~
2. ~~Flash flooding~~
3. ~~Critical stream bank erosion~~
4. ~~Wind erosion/deposition~~
5. ~~Earthflow and slump topography~~
6. ~~Rockfall and debris flow terrain~~
1. *Flood Hazard*
 - a. *Riverine flooding*
 - b. *Coastal flooding*
2. *Landslides*
3. *Earthquakes*
 - a. *Liquefaction potential*
 - b. *Fault lines*
4. *Tsunamis*
5. *Erosion*
 - a. *Riverine streambank erosion*
 - b. *Coastal*
 - i. *Shoreline and headlands*
 - ii. *Wind*
6. *Wildfires*

~~These all considered to be geologic hazards. Other natural hazards that have not been mapped but should be considered in land use decisions include:~~

1. ~~Earthquakes~~
2. ~~Fire~~
1. ~~Winds~~
2. ~~High groundwater and ponding~~

3.—Flash flooding

4.—Shoreline erosion and deposition

Flood hazard area mapping is based on a preliminary determination by the U.S. Department of Housing & Urban Development in conjunction with the National Flood Insurance Program. The mapping of other geologic hazards is based on Environmental Geology of Western Coos and Douglas Counties by the State Department of Geology and Mineral Industries.

These maps showing hazard areas were compiled using a variety of sources. Each hazard description below includes a summary of where the data was sourced from and the methodology used to create the maps.

It is apparent that most *Most* of the naturally occurring hazards of Coos County can be attributed to excess water, landform or soil structure, or a combination of these characteristics. Man aggravates these conditions in many ways by utilizing poor construction practices and altering the vegetative cover that *Human activity may affect* restrains the occurrences of adverse impacts *both positively and negatively.*

Goal Requirements

The Statewide Planning Goals require that the comprehensive plan provide protection of life and property from natural disasters and hazards. Specifically, Goal 7 requires that:

Developments subject to damage or that could result in loss of life shall not be planned nor located in known areas of natural disasters and hazards without appropriate safeguards.

“local governments...adopt comprehensive plans (inventories, policies, and implementing measures) to reduce risk to people and property from natural hazards.”

Goal 17 (Coastal Shorelands) requires that programs be developed to “reduce the hazard to human life and property...resulting from the use and enjoyment of Oregon’s coastal shorelands.” The goal also requires that land use plans, implementing actions, and permit reviews “include consideration of...the geologic and hydrologic hazards associated with coastal shorelands.”

Goal 18 (Beaches and Dunes) requires the reduction of “the hazard to human life and property from natural or man-induced actions” associated with beach and dune areas. *This goal further requires that “Inventories shall be conducted [that] describe the...hazards... of the beach and dune areas[.]”*

Flooding

In 1968, the federal government established the National Flood Insurance Program. Administered by the Federal Emergency Management Agency, an agency of the Department of Homeland Security, Department of Housing and Urban Development (HUD); the program is designed to reduce annual flood losses through more careful planning and to provide property owners with affordable insurance protection. In 1973, the Congress passed the Flood Disaster Protection Act which makes flood insurance mandatory as a condition of receiving any mortgage loan, grant, or other funding that is in any way federally connected to buy, build, or improve property located in a HUD-identified flood-prone area-FEMA-identified Special Flood Hazard Area. This included direct financing from a federal agency (FHA, VA, FmHa, EDA, EPA, etc.); or conventional mortgages from banks and savings and loan institutions that are regulated or insured by the Federal government.

Completion of a more detailed survey of special flood hazard areas and floodway was originally completed in 1983 and revised in 2014. This survey is titled "Flood Insurance Study – Coos County, Oregon" and is accompanied with Flood Insurance Rate Maps and Flood Boundary-Floodway maps.

This Flood Insurance Study investigates the existence and severity of flood hazards in Coos County, Oregon, and aids in the administration of the National Flood Insurance Act of 1973. This study will be has been used to convert Coos County to the regular program of flood insurance offered by the Federal Emergency Management Agency (FEMA). All areas subject to flood hazards have been identified, mapped, and adopted as part of the Coos County Zoning and Land Development Ordinance as a result of this study, including both riverine and coastal flooding.

Before an individual can purchase flood insurance, the jurisdiction in which he or she lives must become eligible for the program. Currently the county and six of eight all seven of the incorporated areas in the county have achieved eligibility. On-going eligibility requirements include notifying the Federal Insurance Administration when boundaries are changed through annexation, maintaining records of flood-proofing and information on elevation of lower floors of new and substantially improved structures in the flood hazard areas, and submitting an annual report. Eligibility is suspended if a community fails to adequately enforce or repeal its floodplain management regulations, which must meet certain standards.

The general requirements for floodplain management regulations are that they must be legally enforceable and applied uniformly. The community must also provide that the regulations meeting the minimum criteria listed below take precedence over any less restrictive conflicting local laws, ordinances, or codes. The community must also ensure that its comprehensive plan is consistent with the objectives listed below.

At a minimum the floodplain management regulations must:

- 1. Require building permits for all proposed construction or other development in the community;*
- 2. Require review of all permits to assure that sites are reasonably free from flooding.*

For development in flood-prone areas, the regulations must also require:

- 1. Proper anchoring of structures;*
- 2. The use of construction materials and methods that will minimize flood damage;*
- 3. Adequate drainage for new subdivisions;*
- 4. The location and design of new or replacement utility systems to prevent flood loss or pollution;*
- 5. Including base flood elevation data in all subdivision proposals and other proposals for new development greater than 50 lots or 5 acres;*

Stream~~Stream~~ *Riverine Flooding*

Stream ~~Stream~~ *Riverine* flooding is the temporary inundation of low-lying areas by water overflowing the banks of a stream or river during periods of high flow volume. Locally, this condition results from heavy rainfall

on hilly terrain that does not absorb water quickly. It is often aggravated by concurrent ocean flooding. Urbanization can further compound stream flooding because it ~~decreases~~ **increases** runoff and **requires storm drainage systems to handle flows beyond their design**. ~~poorly designed storm drainage systems are incapable of offsetting this loss of natural infiltration.~~

Flooding can damage structures through the effects of current action, stranding **standing** water erosion, and siltation. It inflicts losses on agricultural lands by scouring topsoil, eroding stream banks, silting croplands, and killing livestock. It can threaten citizens by isolating dwellings, damaging property, disrupting transportation, and polluting or diverting water supplies.

The areas subject to inundation by large floods are ~~termed~~ **called** floodplains. Floodways are the channels that convey fast-moving water during flood periods. That area which is outside the floodway but is subject to periodic flooding is called the floodway fringe. On the lower reaches of rivers such as the Coos and Coquille, where the gradient is low and there are natural levees, the floodway fringe and the floodplain are almost the same.¹

In Coos County, almost all lowlands adjacent to rivers, streams, sloughs, **lakes** and bays are subject to **flooding**. ~~hazard and~~ **Land uses in these areas includes agricultural, residential, commercial and industrial uses**. Many areas are inundated several times yearly. One year in three, for instance, the water discharge of one of the three forks of the Coquille River alone exceeds the bankfull capacity at Bear and Lampa Creeks. This capacity is exceeded **nearly** every year by the combined flow of any two of the three forks. As a result, the river banks in the lower reaches of the Coquille are overtopped about three times a year on the average, according to the U.S. Army Corps of Engineers. Downstream from the City of Coquille, siltation in the channel has raised most of the river bottom above the level of the surrounding lowlands, which creates drainage problems after floods.

~~Land use in the floodplains of Coos County is generally agricultural with some rural residential and commercial/industrial uses use. For example, log Log storage occurs along Isthmus Slough. There and there are millponds and log decks here and in some areas of the Coquille floodplain. The seasonally flooded areas of the Coquille Valley are also important feeding and resting areas for migrating wildfowl. While most of the incorporated areas are on river or marine terraces and uplands, portions are susceptible to flooding. FEMA encourages developers to relocate from Special Flood Hazard Areas to areas less likely to be subjected to loss of life and property. When development in Special Flood Hazard Areas is unavoidable, action should be taken to mitigate the possibility and magnitude of loss to the greatest extent possible.~~

In 1968, the federal government established the National Flood Insurance Program. Administered by the Department of Housing and Urban Development (HUD), the program is designed to reduce annual flood losses through more careful planning and to provide property owners with affordable insurance protection. In 1973, the Congress passed the Flood Disaster Protection Act which makes flood insurance mandatory as a condition of receiving any mortgage loan, grant, or other funding that is in any way federally connected to buy, build, or improve property located in a HUD-identified flood-prone area. This included direct financing from a federal agency (FHA, VA, FmHa, EDA, EPA, etc.), conventional mortgages from banks and savings and loan institutions that are regulated or insured by the Federal government.

¹ John Beaulieu and Paul Hughes, Environmental Geology of Western Coos and Douglas Counties (DOGAMI, 1975), p. 59.

Beaulieu, John, and Paul Hughes. Environmental Geology of Western Coos and Douglas Counties. DOGAMI, 1975.

Before an individual can purchase flood insurance, the jurisdiction in which he or she lives must become eligible for the program. Currently the county and six of eight of the incorporated areas in the county have achieved eligibility. On-going eligibility requirements include notifying the Federal Insurance Administration when boundaries are changed through annexation, maintaining records of flood-proofing and information on elevation of lower floors of new and substantially improved structures in the flood hazard areas, and submitting an annual report. Eligibility is suspended if a community fails to adequately enforce or repeal its floodplain management regulations, which must meet certain standards.

The general requirements for floodplain management regulations are that they must be legally enforceable and applied uniformly. The community must also provide that the regulations meeting the minimum criteria listed below take precedence over any less restrictive conflicting local laws, ordinances, or codes. The community must also ensure that its comprehensive plan is consistent with the objectives listed below.

At a minimum the floodplain management regulations must:

1. Require building permits for all proposed construction or other development in the community;
2. Require review of all permits to assure that sites are reasonably free from flooding;

For development in flood-prone areas, the regulations must also require:

1. Proper anchoring of structures;
2. The use of construction materials and methods that will minimize flood damage;
3. Adequate drainage for new subdivisions;
4. The location and design of new or replacement utility systems to prevent flood loss or pollution;
5. Including base flood elevation data in all subdivision proposals and other proposals for new development greater than 50 lots or 5 acres;

Completion of a more detailed survey of special flood hazard areas and floodway was completed in 1983. This survey is titled "Flood Insurance Study - Coos County, Oregon" and is accompanied with Flood Insurance Rate maps and Flood Boundary Floodway maps.

This Flood Insurance Study investigates the existence and severity of flood hazards in Coos County, Oregon, and aids in the administration of the National Flood Insurance Act of 1973. This study will be used to convert Coos County to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA).

Ocean Flooding

Ocean flooding is the saltwater inundation of low-lying areas by tidal action, storm surge, *rising ocean levels*, or tsunamis. *Tsunamis are discussed in greater detail under their own hazard category, but tidal action, storm surge, and rising ocean levels are discussed below.*

According to the National Oceanic and Atmospheric Administration (NOAA), the highest predicted recorded tide to date in Coos County was on January 26, 1983 in Charleston and is was approximately

6 7 feet above mean sea level according to the station datum in Charleston.² and is a Higher than expected tides can be a factor in coastal stream waterway flooding to as far as the head of tidal influence. In the Coos Bay Estuary, this can affect as far as the furthest tip of Isthmus Slough to the south and beyond the confluence of the East and West Forks of the Millicoma River beyond the unincorporated community of Allegany and the South Fork of Coos River to the east³. In the Coquille River Estuary, tidal influence extends over 35 miles up the Coquille River and beyond Myrtle Point⁴, placing a large portion of the population in the Coquille Valley at risk.

Storm surge describes the is a flood or tsunami-like rise of in sea level by of as much as 4-7 feet above prevailing tidal elevations. These conditions are caused by because of low barometric pressure, and wind, and the rotation of the earth and are exacerbated by wave action and rainfall.⁵ Communities and development along low coastal shorelands, such as Bandon, are especially at risk of damage from storm surge.

A continual increase in global temperatures would add additional hazards to communities in low-lying areas. Overall warming of the ocean leads to the melting of icebergs and ice caps which, in turn, causes the overall sea level to rise. The Intergovernmental Panel on Climate Change (IPCC) stated in a 2014 report that the overall rate of sea level rise across the globe was 1.5-1.9 millimeters per year between 1901 and 2010 and 2.8-3.6 mm/yr between 1993 and 2010.⁶ NOAA reports Charleston is expected to see an increase in sea level of 0.59 and 1.29 mm/yr,^{7,8} which, while less than the global average, is not inconsequential. Low lying areas are particularly at risk of rising sea levels and can expect to see increased property damage, disrupted transportation networks on both land and sea, loss of low-lying agricultural lands, and loss of wildlife habitat.⁹

The impact of high tide and storm surge ocean flooding hazards in combination can be particularly destructive to development in coastal lowlands as well as contributing to inland stream flooding. Identification of these areas can be a basis for making land use decisions. As a result, FEMA encourages developers to relocate from Special Flood Hazard Areas to areas less likely to be subject to loss of life and property. When development in Special Flood Hazard Areas is unavoidable, action should be taken to mitigate the possibility and magnitude of loss to the greatest extent possible.

Tsunamis are waves generated at sea by seismic or submarine volcanic activity. The highest probable local tsunami would reach approximately 14 feet above mean sea level, though this height could conceivable by doubled through concurrence with particularly high tides and storm surge. Efficient local warning procedures can reduce the threat of injury and loss of life to recreational users of coastal beaches and coves.

² "Datums for 9432780, Charleston OR." Datums - NOAA Tides & Currents. Accessed April 1, 2015. <http://tidesandcurrents.noaa.gov/datums.html?id=9432780>

³ Coos County Comprehensive Plan. Vol. II. Coos County Planning Department, 1985.

⁴ Coos County Comprehensive Plan. Vol. III. Coos County Planning Department, 1985.

⁵ Harris, D. Lee. Characteristics of the Hurricane Storm Surge. U.S. Department of Commerce, 1963. 3-9.

⁶ "Observed Changes and Their Causes." In Climate Change 2014 Synthesis Report, edited by Rajendra K. Pachauri and Leo Meyer, 42. Geneva: IPCC, 2014.

⁷ "Mean Sea Level Trend - 9432780 Charleston, Oregon." Sea Level Trends. Accessed April 1, 2015. http://co-ops.nos.noaa.gov/sltrends/sltrends_station.shtml?stnid=9432780.

⁸ "Extreme Water Levels - Charleston, OR - NOAA Tides & Currents." Extreme Water Levels - Charleston, OR - NOAA Tides & Currents. Accessed April 1, 2015. http://co-ops.nos.noaa.gov/est/est_station.shtml?stnid=9432780.

⁹ "Sea Level Rise and Coastal Hazards." Sea Level Rise and Coastal Hazards | 2012 Washington State Integrated Climate Change Response Strategy | Climate Change | Washington State Department of Ecology | Preparing for a Changing Climate. Accessed April 1, 2015. <http://www.ecy.wa.gov/climatechange/2012ccrs/coasts.htm>.

Flash Flooding

Flash flooding can occur in the smaller upland stream channels in areas characterized by steep slopes exceeding 50% and having a vertical relief of 1000 feet or more.

Hazard to people and property can be minimized by restriction of development in these areas and by protection of vegetation in steep watersheds. Proper engineering of roads is also recommended.

Landslides Mass Movement

Mass movement is Landslides are the downslope movement of rock and soil. There are several types of landslides mass movement (often called "landslides"), depending upon the rate of movement and on the kind of material involved, ranging from rock falls (free falling or bouncing rocks, as happens in canyons) to flows (sliding materials behaves as or contains a liquid, such as mudflows or avalanches). These are described on the accompanying table.

Mapping for this hazard exists only on the western portion of the County and a strip along the Powers highway; the eastern and southernmost portions of the County have not been mapped. Earthflow and slump topography are generally recognized by reduced slope relative to the rest of the slope, irregular draining, irregular topography (hummocky in the case of slump topography), bowed and tilted trees, or, usually, a combination of the above features. Rockfall and debris flow terrain is usually characterized by bedrock exposures in cliffs, by accumulations of rocky debris that are not covered by plants, and by gullied, elongated slurry-like deposits of rock and soil in steep channels or on steep slopes.

Mass movement Landslides can may be precipitated by the improper cutting or filling of terrain for road and other construction, removal of vegetation and root systems, increased moisture content in soils, the vibration of blasting or earthquakes, and streambank erosion. It is most commonly seen in the uplands and along sea cliffs. Occurrences of landslides exist across the entire county, with the majority being located in the southern half of the County. The rolling, grassy hills along the South Fork of the Coquille River are identified in the mapping as earthflow and slump topography, and this This is most evident in the frequent slides along the highway to Powers. Development in identified mass movement landslide hazard areas should be avoided or carefully controlled, because of the potential impacts on roads, structures, and pipelines.

The Oregon Department of Geology and Mineral Industries (DOGAMI) has developed the Statewide Landslide Information Database of Oregon 3.0 (SLIDO) to catalog and describe landslides across the state of Oregon and, as a result, across Coos County. The SLIDO is a compilation of 347 studies from 1952 to 2012 showing areas that had previously suffered a landslide in an attempt to understand where future landslides may occur. The SLIDO database was trimmed from a state-wide layer to the boundaries of Coos County in order to create the map adopted by the County showing landslide hazards within its boundaries.

Earthquakes

Earthquakes have not been addressed in the mapping as most of those experienced in the county originate on the Mendocino Fault off the northern Californian coast. Earthquakes originating there in 1922, 1923, and 1954 caused no damage here, though buildings swayed and sleepers were awakened in 1922 and shaking was observed in 1954.

New maps available from DOGAMI indicate where earthquake-related hazards, such as liquefaction¹⁰ and faulting, occur within Coos County. Due to its proximity to the geologically-active Cascadia subduction zone, the 2010 Coos County Natural Hazard Mitigation Plan rates Coos County as highly vulnerable to earthquake damage, meaning more than 10% of the County's assets are likely to be damaged or affected by an earthquake.¹¹

The potential for damage from earthquakes is greater in the Coos Bay/Coos River area, Bandon Dunes Resort, and Coquille River/Winter Lakes areas southern part of the county, and In these areas, damage is more likely to be a result of liquefaction and landslides than of faulting. However, faults do exist in and around South Slough and south to the Coquille River and development along these fault lines should be avoided.

As part of DOGAMI Open-File Report O-13-06, "Ground Motion, Ground Deformation, Tsunami Inundation, Coseismic Subsidence, and Damage Potential Maps for the 2012 Oregon Resilience Plan for Cascadia Subduction Zone Earthquakes," Ian Madin and William Burns created a liquefaction susceptibility map for all of Oregon based on the type of soil deposit in a general area. Soil types were based on the Oregon Geologic Data Compilation and SLIDO 2.0 and susceptibility was rated on a scale of 0-5 using the following definitions:

0	None
1	Very Low
2	Low
3	Moderate
4	High
5	Very High

The map adopted by the County inventories only those areas rated at "High" or "Very High" risk of liquefaction in Coos County. These areas represent the places most likely to suffer loss of life or property during an earthquake.

Structural design incorporating seismic considerations is a good response to earthquake potential in all parts of the county and is handled as part of the building permitting process overseen by the Oregon Department of Consumer and Business Services Building Codes Division. This is especially critical in the Coos Bay/North Bend area because of the greater instability of the older stabilized dunes, former marshes, and fill material that much of the cities' development occurs on. High occupancy and critical use facilities such as schools and hospitals should be located in areas of solid ground conditions.

Tsunamis

Tsunamis are larger than usual waves generated at sea by seismic or submarine volcanic activity. Tsunami heights can range from normal wave height to upwards of 60 feet, depending on the cause and coastal conditions at landfall, and can travel at speeds of hundreds of miles an hour. In the last 70 years, Coos County has seen tsunamis range from 0-10 feet¹², though it is expected that the tsunami

¹⁰ Liquefaction: "conversion of soil into a fluidlike mass during an earthquake or other seismic event" - "Liquefaction." Merriam-Webster. Accessed April 16, 2015. <http://www.merriam-webster.com/dictionary/liquefaction>.

¹¹ "Earthquake." In Coos County Multi-Jurisdictional Natural Hazards Mitigation Plan. University of Oregon's Community Service Center, 2010.

¹² "Tsunami." In Coos County Multi-Jurisdictional Natural Hazards Mitigation Plan. University of Oregon's Community Service Center, 2010.

generated by a local Cascadia Subduction Zone event will exceed this range. If a tsunami makes landfall during a time of high tide and storm surge, the compounding effects of these conditions could result in a tsunami reaching unexpected heights. The height could reach 30 feet or more. The highest probable local tsunami would reach approximately 14 feet above mean sea level, though this height could conceivably be doubled through concurrence with if it occurs at the same time as particularly high tides and storm surge.

The geologic record shows that the largest of these large Cascadia Subduction Zone earthquakes and accompanying tsunamis occur about every 500 years but range in frequency from 200 to 1,000 years, plus or minus 200 years¹³. The last such earthquake and tsunami occurred over 300 years ago, on the evening of January 26th, 1700¹⁴. This means that we are in the time window where a destructive Cascadia earthquake and tsunami could occur and the probability of that occurrence will continue to increase over time. This time, the stakes are much higher as the great earthquake and catastrophic tsunami could occur when tens of thousands of Oregonians and visitors are enjoying coastal beaches and towns. To address this substantially increasing risk within our community, the county is proactively addressing tsunami preparedness and mitigation within its land use program. Land use planning that addresses tsunami risk is an essential tool to help increase resilience to a potentially catastrophic tsunami event within Coos County.

The Department of Geology and Mineral Industries (DOGAMI) has mapped areas likely to be inundated during a tsunami caused by an earthquake in the Cascadia Subduction Zone ranging in size from "small (S)" to "extra extra large (XXL)". These Tsunami Inundation Maps (TIMs) provide essential information for defining tsunami risk along the Oregon Coast. According to the TIMs, the areas at highest risk are the low lying or sandy beaches along the coast, such as Old Town Bandon, Bullards Beach, and the North Spit, but also include areas up the Coos and Coquille Rivers as far as Allegany and Coquille. The areas around Lakeside and both North and South Ten Mile Lakes are also at risk. Coos County has adopted the portion of the XXL TIM applicable to Coos County as an element of the Plan and the implementing ordinance; however, this inundation map is not intended to be used or construed as the extent of tidal influence when determining the extent of the Coastal Shoreland Boundary.

Efficient local warning procedures can reduce the threat of injury and loss of life to recreational users of coastal beaches and coves. However, tsunami warning sirens and other warning procedures are not expected to be as effective for a tsunami generated by a local Cascadia Subduction Zone event and the only warning residents and visitors of Coos County may receive is severe ground shaking. It is therefore essential that community members and visitors be educated in the need to move to high ground as soon as prolonged ground shaking subsides. To prepare for and mitigate against loss and damage caused by tsunamis, Coos County is a current participant in NOAA's TsunamiReady program and has designated tsunami evacuation routes and sites to guide residents and visitors to safer areas in the event of an earthquake or tsunami.

Erosion

Critical-Riverine Bank Streambank Erosion

¹³ DOGAMI. "Tsunami Hazards in Oregon." Oregon Geology Fact Sheet. April 3, 2009. Accessed April 17, 2015. http://www.oregongeology.org/pubs/fs/tsunami-factsheet_onscreen.pdf.

¹⁴ Atwater, Brian F., Musumi-Rokkaku Satoko, Satake Kenji, Tsuji Yoshinobu, Ueda Kazue, and David K. Yamaguchi. *The Orphan Tsunami of 1700—Japanese Clues to a Parent Earthquake in North America*. U.S. Geological Survey, 2005.

Streambank erosion (other than by flash flooding) occurs constantly on all rivers and streams in the Coos and Coquille drainage basins. Critical erosion causes a loss of land to streambank cave-ins and can initiate landslides on the adjacent uplands. Critical streambank erosion occurs most commonly along floodplains and at the base of river terraces or landslide deposits in the uplands. Valuable farmland is being lost from the floodplains in the Broadbent area, for example, and along Highway 42 several landslides *along Highway 42* are kept active by streambank erosion at their bases.

~~The problem~~ *Streambank erosion* is naturally occurring and can be most effectively and most economically controlled by protection of bank vegetation and by careful planning, which can prevent the location of structures in areas threatened by this hazard. Careful engineering of roads is also necessary to prevent frequent need for expensive repairs. Riprap and other Structural solutions, *such as riprap*, are less preferred *than vegetative solutions* but may be useful or desirable *necessary* for *the* protection of existing roads or structures and land.

The Coos County Planning Department has identified areas that appear prone to streambank erosion by comparing aerial photographs from 1999 with aerial photographs from 2013 and, in consultation with Oregon Department of Fish and Wildlife Staff, finding areas along river and streambanks that showed obvious erosion occurring, including increased exposure of substrate, reduction of vegetation coverage, and an increase in the width of the waterway.

Coastal Erosion Shoreline Erosion and Deposition

Beach and headland erosion occurs along the entire Coos County coastline. These hazards are addressed in greater detail in Section 3.8, "Dunes and Ocean and Lake Shorelands." Areas of beach erosion and deposition and coastal headland erosion rates are shown on the map accompanying that section.

Wave erosion poses a major hazard to coastal development. Wave energy is highest during winter months, and erosion is consequently greater then. Broad summer beaches become narrow and steep as vast amounts of sand are moved offshore. Development that appears to be a safe distance from the sea becomes threatened when a particularly powerful series of storms pound the coast, such as in the winter of 1976-1977.

The pattern of erosion of upland areas by waves depends on the geology. Sheared or crumbly rock leads to earthflow and slumping falling rocks and landslides with rapid rates of erosion. Development in such areas can be dangerous. Wave erosion of hard bedrock forms cliffs and erosion rates are slow (except along faults or joints); when significant erosion does occur, it occurs as is be the breaking off of large chunks of rock. Removal of driftwood and rock debris from the bases of cliffs and areas where mass movement is occurring probably increases erosion rates significantly.

Sand is constantly being moved by wave and current action. Interruption of this movement can cause formation of new beaches, as at Bastendorff following jetty construction. This generally occurs at the expense of other areas – existing beaches may get smaller or disappear altogether and headland erosion may increase. Placement of large rocks (riprap) and construction of protective structures like seawalls (which are parallel to the coast) and groins (rigid structures which project outward from the shore), then, should be discouraged since they have a negative impact on the properties of others by tying up sand that would have been deposited elsewhere and in some instances by removing a source of beach sand. They may also increase future costs to the public; on the East Coast and in California increased threat to coastal developments have lead to a huge cry for publicly-funded coastal protection projects, many of which seem to be fraught with unforeseen impacts. One means of dealing with beach erosion holds much promise: beach nourishment (supplying sand, generally from dredging projects or

projects or from well offshore) is being tried by the Army Corps of Engineers in the Miami, Florida, area and elsewhere, although the high energy wave environment of the Oregon Coast and lack of sand supply presents obstacles to implementing the same measures locally. The mining and removal of sand from beaches also increases erosion and should be carefully controlled. Mining and removal of material from beach and dune areas is subject to Statewide Planning Goal 18 and may not be permitted.

The maps adopted by the County showing areas at risk of coastal erosion were completed by the US Geological Survey as part of a national study to determine a "coastal vulnerability index" detailing areas at risk due to sea level rise. The risk of coastal erosion was a component used to determine this overall index. The information portrayed in this map is precise only to a scale of approximately 5-10 kilometers (3-6 miles) and should not be used to determine hazard for specific locations. As more detailed information becomes available at a local level, the County will look at updating this section to account for future recommendations.

Wind Erosion and Deposits

Wind erosion and deposits are essentially coastal processes locally and, together with wave action, contribute to our a changing coastline. Areas subject to the effects of wind erosion and deposition are indicated in the mapping and include the sand dune areas inland from the Coos-Umpqua beach in the Oregon Dunes National Recreation Area, the Bandon spit on the Coquille River, and the New River area.

Blowing sand can be a nuisance to recreational users and a long-term hazard to structures located in the path of migrating dunes, which can move as much as 6 feet per year. This is a hazardous factor in local planning because of an abundant sand supply, persistent winds, and an absence of stabilizing vegetation. Identification and mapping of areas subject to wind erosion and deposition can aid in planning the optional location on development. Concern should also be shown for the impact of development on currently stabilized areas.¹⁵

Such development could open new deposits of loose sand causing problems on adjacent properties. Protecting existing vegetation and requiring revegetation as soon as possible when the plant cover must be disturbed are ways of reducing this hazard. Additional hazards of development in dune areas are covered in the section on dunes (Section 3.8).

Fire-*Wildfire*

Wildfires are defined as "unwanted, unplanned damaging fires in forests."¹⁶ Wildfires are generally fed by an overabundance of fuel and dry, windy conditions and can be particularly damaging to communities that reside within the interface between forestlands and developed areas. Historically, wildfires in Coos County have ranged in size from approximately 180 acres to almost 300,000 acres in 1868 when most of the Elliott State Forest burned.¹⁷ In southern Coos County, large populations of gorse and scotch broom increases risk to wildfires due to a naturally high content of oil.

¹⁵ See "Dunes and Ocean and Lake Shorelands" (Section 3.8, this document) for a discussion of the hazards of development in dune areas. "Stabilized areas" refers both to recently stabilized dunes and older established dunes (DS, DC, and OSC; and ODS respectively on the sand dunes maps in the Background Document, pp. 15-11 through 15-13). Older stabilized dunes generally have well-developed soil profiles. Both types are vegetated, whereas active dune forms are not.

¹⁶ "Smokey Bear - The Science of Wildfires." Smokey Bear. Accessed April 1, 2015.

<http://www.smokeybear.com/wildfire-science.asp>.

¹⁷ "Wildfire." In Coos County Multi-Jurisdictional Natural Hazards Mitigation Plan. University of Oregon's Community Service Center, 2010.

In 2004, the Oregon Department of Forestry (ODF) completed a “Communities at Risk” assessment for the state of Oregon. In this assessment, four ratings were calculated: risk (the likelihood of a fire occurring), hazard (resistance to control once a fire starts, based on topography, fuel, and weather), protection capability (capacity and resources available to undertake fire prevention measures), and value (human and economic values).¹⁸ The scores of these values were combined and used to determine an area’s overall risk factor on a scale of 4-27 (“Total Score”), which is one part of the data being used to determine what areas are at a high risk of wildfire hazard in Coos County.

The second piece of data being used to determine wildfire risk in Coos County is an aerial survey of gorse in southern Coos County completed by ODF in 2014. ODF Invasive Species Specialists flew over Coos and Curry Counties in early 2014 and recorded the location and extent of blooming gorse and confirmed accuracy by reviewing a portion of the indicated areas on the ground.

Coos County already has measures in place to help protect against wildfires in forestlands and those areas immediately adjacent to forestlands by requiring new development create firebreak setbacks around proposed structures. The areas determined to be at high risk of wildfires in the Communities at Risk report generally fall within the forestlands and their interfaces with other zones; as a result, they are already partially protected. These measures can be further expanded to include those areas designated as at high risk of fire hazard by the Communities at Risk report or gorse aerial survey which are not already within the forestlands or forestland-interfaces.

Fire poses a major hazard to development in forested areas of the county and especially to the residential development in brushy coastal areas such as the Bandon area where there are extensive stands of highly inflammable gorse and broom. The problem is often compounded by inadequate roads serving residential developments in forested areas.

Other hazards

The following hazards are not included in Statewide Planning Goal 7 and are not currently a priority for making land use decisions in Coos County. However, at some point in the future, they may become a priority and are being included here in case that time ever does come.

Mass Movement

Mass movement is the downslope movement of rock and soil. There are several types of mass movement (often called “landslides”), depending upon the rate of movement and on the kind of material involved. These are described on the accompanying table.

Mapping for this hazard exists only on the western portion of the County and a strip along the Powers highway; the eastern and southernmost portions of the County have not been mapped. Earthflow and slump topography are generally recognized by reduced slope relative to the rest of the slope, irregular draining, irregular topography (hummocky in the case of slump topography), bowed and tilted trees, or, usually, a combination of the above features. Rockfall and debris flow terrain is usually characterized by bedrock exposures in cliffs, by accumulations of rocky debris that are not covered by plants, and by gullied, elongated slurry-like deposits of rock and soil in steep channels or on steep slopes.

Mass movement can be precipitated by the improper cutting or filling of terrain for road and other construction, removal of vegetation and root systems, increased moisture content in soils, the vibration of

¹⁸ Identifying and Assessment of Communities at Risk in Oregon. Oregon Department of Forestry, 2004.

blasting or earthquakes, and streambank erosion. It is most commonly seen in the uplands and along sea cliffs. The rolling, grassy hills along the South Fork of the Coquille River are identified in the mapping as earthflow and slump topography, and this is most evident in the frequent slides along the highway to Powers. Development in identified mass movement hazard areas should be avoided or carefully controlled, because of the potential impacts on roads, structures, and pipelines.

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Earthquakes have not been addressed in the mapping as most of those experienced in the county originate on the Mendocino Fault off the northern Californian coast. Earthquakes originating there in 1922, 1923, and 1954 caused no damage here, though buildings swayed and sleepers were awakened in 1922 and shaking was observed in 1954. The potential for damage from earthquakes is greater in the Coos Bay area and southern part of the county, and damage is more likely to be a result of liquification and landslides than of faulting. Structural design incorporating seismic considerations is a good response to earthquake potential in all parts of the county. This is especially critical in the Coos Bay/North Bend area because of the greater instability of the older stabilized dunes, former marshes, and fill material that much of the development occurs on. High occupancy and critical use facilities such as schools and hospitals should be located in areas of solid ground conditions.

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Winds

Persistent winds are a feature of much of Coos County and are of particular importance as a potential hazard to the siting of mobile homes. Accordingly, the State Department of Commerce enforces siting and tie-down regulations that govern the placement of mobile homes.

High Groundwater and Ponding

High groundwater and ponding are most common in the coastal lowlands, marine terraces, inland floodplains, and some areas of Coos County's sand dunes. Uneven settling, flooding of basements, floatation of septic tanks, and septic system failure are common consequences of development in these areas. Potential for pollution of domestic water sources is also high. Since public health is at issue, encouraging development of public water and/or sewer systems where dense development already exists in such areas is desirable.

Shoreline Erosion and Deposition

Beach and headland erosion occur along the entire Coos County coastline. These hazards are addressed in greater detail in Section 3.8, "Dunes and Ocean and Lake Shorelands." Areas of beach erosion and deposition and coastal headland erosion rates are shown on the map accompanying that section.

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becomes threatened when a particularly powerful series of storms pound the coast, as in the winter of 1976-1977.

The pattern of erosion of upland areas by waves depends on the geology. Sheared or crumbly rock leads to earthflow and slumping with rapid rates of erosion. Development in such areas can be dangerous. Wave erosion of hard bedrock forms cliffs and erosion rates are slow (except along faults or joints); when significant erosion does occur, it is by the breaking off of large chunks of rock. Hazard, however, is slight and moderate setbacks are generally considered adequate protection. Removal of driftwood and rock debris from the bases of cliffs and areas where mass movement is occurring probably increases erosion rates significantly.

Sand is constantly being moved by wave and current action. Interruption of this movement can cause formation of new beaches, as at Bastendorff following jetty construction. This generally occurs at the expense of other areas—existing beaches may get smaller or disappear altogether and headland erosion may increase. Placement of large rocks (riprap) and construction of protective structures like seawalls (which are parallel to the coast) and groins (rigid structures which project outward from the shore), then, should be discouraged since they have a negative impact on the properties of others by typing up sand that would have been deposited elsewhere and in some instances by removing a source of beach sand. They may also increase future costs to the public; on the East Coast and in California increased threat to coastal developments have led to a hue and cry for publicly funded coastal protection projects, many of which seem to be fraught with unforeseen impacts. One means of dealing with beach erosion holds much promise: beach nourishment (supplying sand, generally from dredging projects or from well offshore) is being tried by the Army Corps of Engineers in the Miami, Florida, area and elsewhere. The mining and removal of sand from beaches also increases erosion and should be carefully controlled.

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