

LINCOLN COUNTY, WASHINGTON HAZARD MITIGATION PLAN

2019
UPDATE



Prepared By
Northwest Management, Inc.

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Foreword

“Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. Mitigation activities may be implemented prior to, during, or after an incident. However, it has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs.”¹

The original Lincoln County, Washington Multi-Hazard Mitigation Plan was developed in 2010 – 2011 by the Lincoln County MHMP planning committee in cooperation with Northwest Management, Inc. of Moscow, Idaho (NMI). The 2019 update process was also conducted by NMI in collaboration with Lincoln County Emergency Management and the Planning Team. The updated document is now referred to as the Lincoln County, Washington Hazard Mitigation Plan.

This Plan satisfies the requirements for a local hazard mitigation plan and a flood mitigation plan under 44 CFR Part 201.6 and 79.6.

¹ Federal Emergency Management Agency. “Local Multi-Hazard Mitigation Planning Guidance.” July 1, 2008.

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U.S. Department of Homeland Security
FEMA Region 10
130 – 228th Street, SW
Bothell, Washington 98021



FEMA

January 14, 2020

The Honorable Rob Coffman
Chair, Lincoln County Board of Commissioners
P.O. Box 28
Davenport, Washington 99122

Dear Chair Coffman:

On September 16, 2019, the United States Department of Homeland Security’s Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan as a multi-jurisdictional local plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act’s, Hazard Mitigation Assistance grants projects through September 15, 2024, through your state:

Lincoln County	Town of Almira	Town of Creston
Town of Odessa	Town of Reardon	Town of Wilbur
City of Davenport	City of Harrington	City of Sprague
Lincoln County Conservation District	Lincoln County Health District #1	Lincoln County Health District #3

The updated list of approved jurisdictions includes Lincoln County Health District #1, that recently adopted their respective addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan’s approval or FEMA’s mitigation grant programs, please contact Kevin Zerbe, State Mitigation Strategist with Washington Emergency Management Division at (253) 512-7467, who coordinates and administers these efforts for local entities.

Sincerely,


Mark Carey, Director
Mitigation Division

cc: Tim Cook, Washington Emergency Management Division

Enclosure

JS:vl

www.fema.gov

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Table of Contents

Foreword	iii
Overview of this Plan and its Development	2
<i>Phase I Hazard Assessment</i>	3
<i>Goals and Guiding Principles</i>	4
Documenting the Planning Process	18
<i>The Planning Team</i>	18
<i>Description of the Planning Process</i>	18
<i>Planning Committee Meetings</i>	21
<i>Public Involvement</i>	23
<i>Documented Review Process</i>	27
<i>Plan Monitoring and Maintenance</i>	27
Lincoln County Characteristics	32
<i>Description of the Region</i>	32
<i>Geography and Natural Resources</i>	32
<i>Demographics</i>	35
<i>Socioeconomics</i>	36
<i>Development Trends</i>	37
<i>Hazard Management Capabilities</i>	39
Regional and Local Hazard Profiles	42
<i>Flood</i>	42
<i>Earthquake</i>	47
<i>Landslide</i>	55
<i>Severe Weather</i>	59
<i>Wildland Fire</i>	63
<i>Avalanche</i>	73
<i>Seiche</i>	77
<i>Volcano</i>	79
<i>Drought</i>	85
Jurisdictional Risk and Vulnerability Assessments	90
<i>Lincoln County Annex</i>	90
<i>City of Davenport Annex</i>	127
<i>City of Sprague Annex</i>	135
<i>Town of Almira Annex</i>	145
<i>Town of Creston Annex</i>	155
<i>Town of Harrington Annex</i>	163
<i>Town of Odessa Annex</i>	173
<i>Town of Reardan Annex</i>	183
<i>Town of Wilbur Annex</i>	191

<i>Lincoln Hospital District Annex</i>	201
<i>Odessa Memorial Healthcare Center Annex</i>	205
<i>Lincoln County Conservation District Annex</i>	208
Mitigation Strategy	248
<i>Mechanisms to Incorporate Mitigation Strategies</i>	248
<i>Prioritization of Action Items</i>	249
Jurisdictional Mitigation Strategies	251
<i>Lincoln County Annex</i>	251
<i>City of Davenport</i>	257
<i>City of Sprague</i>	261
<i>Town of Almira</i>	265
<i>Town of Creston</i>	269
<i>Town of Harrington</i>	273
<i>Town of Odessa</i>	275
<i>Town of Reardan</i>	279
<i>Town of Wilbur</i>	283
<i>Lincoln Hospital District</i>	287
<i>Odessa Memorial Healthcare Center</i>	289
<i>Lincoln County Conservation District</i>	291
<i>Wildland Fire Action Items</i>	293
Supporting Information	312
<i>List of Tables</i>	312
<i>List of Figures</i>	314
<i>Record of Local Adoption</i>	317
<i>Fire District/Agency Signatures</i>	329
<i>Planning Committee Minutes</i>	332
<i>Capability Assessments</i>	339
<i>Record of Meeting Attendance</i>	349
<i>Record of Published Articles</i>	352
<i>Potential Funding Sources</i>	355

Chapter 1

Plan Overview

IN THIS SECTION:

- Planning Participants
- Phase I Hazard Assessment
- Goals and Guiding Principles
- Integration with Other Planning Mechanisms

Chapter 1
Plan Overview

Overview of this Plan and its Development

This regional Hazard Mitigation Plan (HMP) is an update to the 2011 Multi-Hazard Mitigation Plan. The original document and the 2019 update are the result of analyses, professional cooperation and collaboration, assessments of hazard risks, and other factors considered with the intent to reduce the potential for hazards to threaten people, structures, infrastructure, and unique ecosystems in Lincoln County, Washington. The planning team responsible for implementing this project was led by Lincoln County Emergency Management. Agencies and organizations that participated in the planning process included:

- Lincoln County Commissioners and County Departments
- Lincoln County Fire District #5
- City of Davenport
- Town of Reardan
- Town of Odessa
- Lincoln County Fire District #4
- Lincoln County Conservation District
- Amateur Radio Group
- Lincoln Hospital District
- Davenport Ambulance
- Avista Utilities
- Lincoln County Public Health District
- Town of Creston
- Odessa Fire Department
- Town of Wilbur
- Lincoln County Fire District #7
- Town of Harrington
- City of Sprague
- National Park Service

In October of 2017, Lincoln County Emergency Management solicited competitive bids from companies to provide the service of updating the Lincoln County, Washington Multi - Hazard Mitigation Plan. Northwest Management, Inc. was selected to provide this service to the County. NMI is a natural resource consulting firm located in Moscow, Idaho.

Phase I Hazard Assessment

The Hazard Mitigation Plan is developed in accordance with the Federal Emergency Management Agency (FEMA) and Washington Military Department, Emergency Management Division requirements for a county level pre-disaster mitigation plan. The State of Washington Hazard Mitigation Plan identifies nine natural hazards affecting the State. For consistency, the planning committee developed annexes for the same natural hazards. The hazards addressed in this Plan are:

- | | |
|------------------|-------------|
| ✱ Flood | ✱ Avalanche |
| ✱ Earthquake | ✱ Seiche |
| ✱ Landslide | ✱ Volcano |
| ✱ Severe Weather | ✱ Drought |
| ✱ Wildland Fire | |

A Phase I Assessment was facilitated with the county planning committee to determine the relative frequency of a hazard’s occurrence and the potential impact a hazard event will have on people, property, infrastructure, and the economy based on local knowledge of past occurrences. A matrix system with hazard magnitude on the x axis and frequency on the y axis was used to score each hazard.

The following table summarizes the results of the Phase I Hazard Assessments for Lincoln County.

		Magnitude		
		Low	Medium	High
Frequency	Low	Avalanche	Landslide Seiche	Earthquake Volcano
	Medium	Flood	Drought	
	High		Wildland Fire Severe Weather	

Frequency was rated at one of three levels: “High” for hazards occurring multiple times per year over a five-year period, “Medium” for hazards occurring every 5 to 25 years, or “Low” for hazards occurring more than 25 years apart.²

The scoring system (shown below) was used to categorize the relative magnitude each hazard may have on the community.

² Custer County, Idaho. Scoring system partially adapted from the Custer County Multi-Jurisdiction All Hazard Mitigation Plan. 2008. Pp 165-168.

Magnitude of Hazards						
Value	Reconstruction Assistance From	Geography (Area) Affected	Expected Bodily Harm	Loss Estimate Range	Population Sheltering Required	Warning Lead Times
1	Family	Parcel	Little to No Injury / No Death	\$1000s	No Sheltering	Months
2	City	Block or Group of Parcels	Multiple Injuries with Little to No Medical Care / No Death	\$10,000s	Little Sheltering	Weeks
2	County	Section or Numerous Parcels	Major Medical Care Required / Minimal Death	\$100,000s	Sheltering Required Neighboring Counties Help	Days
4	State	Multiple Sections	Major Injuries / Requires Help from Outside County / A Few Deaths	\$1,000,000s	Long Term Sheltering Effort	Hours
8	Federal	Countywide	Massive Casualties / Catastrophic	\$10,000,000s	Relocation Required	Minutes

Goals and Guiding Principles

Federal Emergency Management Agency Philosophy

Effective November 1, 2004, a Multi-Hazard Mitigation Plan approved by the Federal Emergency Management Agency (FEMA) is required for Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation Program (PDM) eligibility. The HMGP and PDM program provide funding, through state emergency management agencies, to support local mitigation planning and projects to reduce potential disaster damages.

The new local Multi-Hazard Mitigation Plan requirements for HMGP and PDM eligibility is based on the Disaster Mitigation Act of 2000, which amended the Stafford Disaster Relief Act to promote an integrated, cost effective approach to mitigation. Local Multi-Hazard Mitigation Plans must meet the minimum requirements of the Stafford Act-Section 322, as outlined in the criteria contained in 44 CFR Part 201. The plan criteria cover the planning process, risk assessment, mitigation strategy, plan maintenance, and adoption requirements.

To be eligible for project funds under the Flood Mitigation Assistance (FMA) program, communities are required under 44 CFR Part 79.6(d)(1) to have a mitigation plan that addresses flood hazards. On October 31st, 2007, FEMA published amendments to the 44 CFR Part 201 at 72 Federal Reg. 61720 to incorporated mitigation planning requirements for the FMA program (44 CFR Part 201.6). The revised Local Mitigation Plan Review Crosswalk (July 2008) used by FEMA to evaluate local hazard mitigation plans is consistent with the

Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by Section 322 of the Disaster Mitigation Act of 2000, the National Flood Insurance Act of 1968, as amended by the National Flood Insurance Reform Act of 2004 and 44 Code of Federal Regulations (CFR) Part 201 – Mitigation Planning, inclusive of all amendments through October 31, 2007 was used as the official guide for development of a FEMA-compatible Lincoln County, Washington Multi-Hazard Mitigation Plan.³

FEMA will only review a local Multi-Hazard Mitigation Plan submitted through the appropriate State Hazard Mitigation Officer (SHMO). Draft versions of local Hazard Mitigation Plans will not be reviewed by FEMA. FEMA will review the final version of a plan prior to local adoption to determine if the plan meets the criteria, but FEMA will be unable to approve it prior to adoption.

In Washington state, the SHMO is:

Timothy Cook
Washington Military Department
Emergency Management Division
Building 20, M/S: TA-20
Camp Murray, WA 98430-5122

A FEMA designed plan will be evaluated on its adherence to a variety of criteria.

- Adoption by the Local Governing Body
- Multi-jurisdictional Plan Adoption
- Multi-jurisdictional Planning Participation
- Documentation of Planning Process
- Identifying Hazards
- Profiling Hazard Events
- Assessing Vulnerability: Identifying Assets
- Assessing Vulnerability: Estimating Potential Losses
- Assessing Vulnerability: Analyzing Development Trends
- Multi-jurisdictional Risk Assessment
- Local Hazard Mitigation Goals
- Identification and Analysis of Mitigation Measures
- Implementation of Mitigation Measures
- Multi-jurisdictional Mitigation Strategy
- Monitoring, Evaluating, and Updating the Plan
- Implementation Through Existing Programs
- Continued Public Involvement

³ Federal Emergency Management Agency. "Local Multi-Hazard Mitigation Planning Guidance." July 1, 2008.

Planning Philosophy and Goals

Lincoln County Planning Philosophy

This effort will utilize the best and most appropriate science from all partners and will integrate local and regional knowledge about natural hazards while meeting the needs of local citizens and the regional economy.

Mission Statement

To make residents, communities, state agencies, local governments, and businesses less vulnerable to the effects of hazards through the effective administration of hazard mitigation grant programs, hazard risk assessments, wise and efficient infrastructure hardening, and a coordinated approach to mitigation policy through federal, state, regional, and local planning efforts. Our combined priorities will be the protection of people, structures, infrastructure, and unique ecosystems that contribute to our way of life and the sustainability of the local and regional economy.

Jurisdictional Planning and Mitigation Goals

When the original MHMP was created, each participating jurisdiction in Lincoln County was asked to develop their own set of planning and mitigation goals. During the first planning committee meeting, the group discussed several overall short-term and long-term goals as well as goals for the planning process itself. Members of the committee were given a list of example goals statements and a blank goals worksheet to fill out and return. The following section outlines the goals submitted by each jurisdiction.

Lincoln County & Lincoln County Conservation District

1. *Planning* – Educate communities about the unique challenges of natural hazard preparedness in the County.
2. *Mitigation* – Reduce the impact of hazard events and potential losses incurred by both public and private residents and entities.
3. *Mitigation* – Establish mitigation priorities and develop feasible solutions to hazard-related issues.
4. *Planning* – Strategically locate and plan infrastructure projects that take into consideration the impacts of natural hazards.
5. *Planning* – Seek opportunities to protect, enhance, and integrate emergency and essential services with land use planning and natural resource management.
6. *Mitigation* – Develop mitigation strategies that will alleviate or lessen the impacts of severe weather events throughout the County.
7. *Planning* – Continue to work with local partners to reduce the risks of ignitions and potential losses from wildland fire events.
8. *Planning* – Develop protocol prioritization for the protection of people, structures, infrastructure, and unique ecosystems that contribute to the sustainability of the regional economy and our way of life.

City of Davenport

1. *Planning* – Through pre-planning and mitigation strategies, reduce the mortality and morbidity in citizens resulting from disasters.
2. *Planning* – Protect life and property by planning for disasters and developing mitigation strategies.
3. *Planning* – Develop land use policies to alleviate hazard risks and impacts for future development.
4. *Planning* – Strengthen emergency operations plans and procedures by increasing collaboration among public agencies, non-profit organizations, business, and industry.
5. *Mitigation* – Reduce the impact of hazards events and potential losses incurred by both public and private residents and entities.
6. *Mitigation* – Establish county and city participation in the National Flood Insurance Program and strive to reduce premiums by lowering their Community Rating System score.
7. *Planning* – Educate communities about the unique challenges of natural hazard preparedness in the county.
8. *Planning* – Work with local organizations to improve sheltering capacity during severe weather events.

City of Sprague

1. *Planning* – Establish mitigation priorities and develop mitigation strategies.
2. *Planning* – Reduce the impact of hazard events and potential losses incurred by both public and private residents and entities.
3. *Planning* – Strengthen emergency operations plans and procedures by increasing collaboration among public agencies, non-profit organizations, business, and industry.
4. *Planning* – Work with local organizations to improve sheltering capacity during severe weather events.

Town of Almira

1. *Mitigation* – Prepare and implement emergency plans to reduce the impacts from weather.
2. *Planning* – Bring new businesses to Almira to help improve the sustainability of the community.
3. *Planning* – Replace the town's 80-year-old water system, including the water tower and the main line, and improve existing municipal wells.
4. *Planning* – Establish feasible mitigation strategies and priorities.

Town of Creston

1. *Planning* – Minimize the impacts of emergencies and disasters on the people, property, environment, and economy of the Town of Creston.
2. *Planning* – Educate the community about natural and man-made hazard emergency situations.
3. *Mitigation* – Reduce the impact of hazard events and potential losses when possible through emergency warning notifications.
4. *Planning* – Establish mitigation priorities and develop strategies.
5. *Mitigation* – Work with Lincoln County in identifying hazardous material flow through the County.

6. *Mitigation* – Work with local organizations to improve sheltering capacity during severe weather events.

Town of Harrington

1. *Planning* – Work with the local school district to improve sheltering capacity during severe weather events including the use of the Harrington Memorial Hall.
2. *Mitigation* – Enforce regulations and restrictions for building in areas of special flood hazard (Ordinance 451) that meet requirements for National Flood Insurance as set out in Harrington’s Comprehensive Plan.
3. *Planning* – Work with local partners to coordinate mitigation planning and disaster response.
4. *Planning* – Continue to work with the International Code Council to meet the detailed requirements of the 1991 Uniform Building Code.

Town of Odessa

1. *Planning* – Through the continued progression of mitigation with county operations and services, the advancement of emergency services will provide continued protection for the citizens of the Town of Odessa, reducing the morbidity and mortality in the event of a devastating event.
2. *Mitigation* – Safeguard the well-being of all individuals in our community and their properties; while protecting and preserving the natural properties of our environment.

Town of Reardan

1. *Planning* – Protect residents during hazards by immediate notification and possible evacuation and prompt cleanup efforts.
2. *Planning* – Prioritize the protection of people, structures, infrastructure, and unique ecosystems that contribute to our way of life and the sustainability of the local and regional economy.

Town of Wilbur

1. *Planning* – Educate communities about the unique challenges of natural hazard preparedness in the County.
2. *Mitigation* – Establish mitigation priorities and develop feasible solutions.
3. *Planning* – Strategically locate and plan infrastructure projects that take into consideration the impacts of natural hazards.

Lincoln Hospital District

1. *Planning* – Effectively and efficiently respond to a variety of emergent or critical situations affecting routine operations and Lincoln Hospital.
2. *Planning* – Through pre-planning and mitigation strategies, reduce the mortality and morbidity in Lincoln County citizens resulting from disasters.
3. *Planning* – Protect life and property in Lincoln County by planning for disasters and developing mitigation strategies.

Odessa Memorial Healthcare Center

1. *Planning* – Establish mitigation priorities and develop mitigation strategies.
2. *Planning* – Strategically locate and plan infrastructure projects that take into consideration the impacts of natural hazards.

3. *Planning* – Strengthen emergency operations plans and procedures by increasing collaboration among public agencies, non-profit organizations, business, and industry.
4. *Planning* – *Seek* opportunities to protect, enhance, and integrate emergency and essential services.
5. *Mitigation* – Odessa Memorial Healthcare Center will work with the town of Odessa and local organizations to improve sheltering capacity during severe weather events.
6. *Planning* – Continue to work on action items and proposed projects identified in the Lincoln County Community Wildfire Protection Plan.

County Community Wildfire Protection Plan Goals

1. Identify and map Wildland Urban Interface (WUI) boundaries
2. Identify and evaluate hazardous fuel conditions, prioritize areas for hazardous fuel reduction treatments, and recommend the types and methods of treatment necessary to protect communities
3. Prioritize the protection of people, structures, infrastructure, natural resources, and unique ecosystems that contribute to our way of life and the sustainability of the local and regional economy
4. Develop regulatory measures such as building codes and road standards specifically targeted to reduce the wildland fire potential and reduce the potential for loss of life and property
5. Educate communities about the unique challenges of wildfire in the wildland-urban interface
6. Provide a plan that balances private property rights of landowners in Lincoln County with personal safety and responsibility
7. Improve fire service organizations' awareness of wildland fire threats, vulnerabilities, and mitigation opportunities or options
8. Address structural ignitability and recommend measures that homeowners and communities can take to reduce the ignitability of structures
9. Recommend additional strategies for private, state, and federal lands to reduce hazardous fuel conditions and lessen the life safety and property damage risks from wildfires
10. Improve county and local fire agency eligibility for funding assistance (National Fire Plan, Healthy Forest Restoration Act, FEMA, and other sources) to reduce wildfire hazards, prepare residents for wildfire situations, and enhance fire agency response capabilities
11. Provide opportunities for meaningful discussions among community members and local, state, and federal government representatives regarding their priorities for local fire protection and forest management
12. Meet or exceed the requirements of the National Fire Plan and FEMA for a county level Community Wildfire Protection Plan
13. Identify areas of inadequate fire protection, such as gaps in district coverage, and develop solutions

Integration with Other Local Planning Mechanisms

During the original development of this Hazard Mitigation Plan, several planning and management documents were reviewed to avoid conflicting goals and objectives. Additionally, existing programs and policies were reviewed to identify those that may weaken or enhance the hazard mitigation objectives outlined in this document. The following narratives help identify and briefly describe some of the existing

planning documents and ordinances considered during the development of this plan. This list does not necessarily reflect every plan, ordinance, or other guidance document within each jurisdiction. This is a summary of the guidance documents known to and recommended for review by members of the planning committee.

Lincoln County Comprehensive Emergency Management Plan (2013)

The purpose of the Comprehensive Emergency Management Plan (CEMP) is to guide the Lincoln County Department of Emergency Management in its responsibility to preserve lives, protect property and the environment, and to ensure public health in times of natural or technological disasters. The organization also provides for the coordination of recovery efforts following disasters and will provide actions to mitigate the effects of such disasters, to the extent possible.

The CEMP is an all hazard plan that is promulgated by Lincoln County Board of Commissioners and Mayors of the participating cities and towns within the county and applies to all local public and private entities and organizations participating and included in the plan.

The CEMP is an all hazard approach to emergency and disaster situations likely to occur in the county, as described in the Lincoln County Hazard Identification/Vulnerability Analysis (HIVA), and provides the foundation for:

1. The establishment of an organization and guidelines for efficient and effective use of government, private sector and volunteer resources.
2. An outline of local government responsibilities in emergency management activities as described under RCW 38.52 and other applicable laws.
3. An outline of other participants' responsibilities in emergency management activities as agreed upon by the participating agencies and organizations.

Emergency Support Function (ESF) #2 (Communications), ESF #4 (Firefighting) and ESF #5 (Emergency Management) were reviewed for inclusion of mitigation activities into this Hazard Mitigation Plan update.

Lincoln County Comprehensive Plan (2018 DRAFT)

The Lincoln County Comprehensive Plan is an update of the County's existing comprehensive plan, which was adopted in 1983. Upon adoption, this new plan replaces and supersedes the 1983 document. The comprehensive plan consists of goals, objectives and policies, which will help guide the land use decision making of County officials during the next 20 years. The plan should be reviewed at least every five years and modified or updated as deemed appropriate by the board of county commissioners. The comprehensive plan is not a law or ordinance, but a guide for land use decision making. It establishes the long-term goals which the County seeks to achieve and it establishes the policy guidelines for when, where and how to provide public facilities, change zoning designations and otherwise facilitate, coordinate and regulate development. Some of the plan's policies are implemented upon adoption of the plan. Other policies are not implemented directly by the plan, but rather will be implemented through future changes to the County's development regulations after adoption of the plan. Included in the plan is an implementation strategy, which outlines the tasks that need to be completed in order to implement the policy recommendations. Also, this plan should be reviewed at the beginning of each year by the planning commission in order to determine whether the vision of this plan is being implemented.

The Comprehensive Plan guides policy decisions related to the physical, social, and economic growth of the County. Adopted by the County Commissioners, this Plan is an official document to guide growth and development over the next 20 years. The Plan provides direction through a framework of goals and policies that aim to better citizens' quality of life and promote Lincoln County.

The Lincoln County Comprehensive Plan draft was reviewed for information regarding growth and economic development trends throughout the County. General description of the County was also updated using information from the Lincoln County Comprehensive Plan draft. Updates of building and zoning ordinances were reviewed for inclusion in the 2019 Lincoln County Hazard mitigation Plan update.

Lincoln County Code: Title 16 – Land Divisions (2016)

The process by which land is divided is a matter of concern and should be administered in a uniform manner by cities, towns and counties throughout the state. The purpose of this title is to regulate the division of land and to promote the public health, safety, and general welfare in accordance with established standards to prevent the overcrowding of land; to lessen congestion on the streets and highways; to promote effective use of land; to promote safe and convenient travel by the public on streets and highways; to provide adequate provisions for light and air; to facilitate adequate provisions for water, sewerage, parks and recreation areas, sites for schools and school grounds and other public requirements; to provide for proper ingress and egress; to provide for the expeditious review and approval of proposed subdivisions, which conforms to zoning and development standards and commercial needs of the citizens of the County and where to require uniform monumenting of land subdivisions and conveyancing by accurate legal description. In accordance with Chapter 58.17 RCW, Lincoln County has prescribed a method for controlling the division of land in unincorporated areas. Whereas the board of county commissioners deems the controls, standards, procedures and penalties set forth in this title to be essential to the protection of the public health, safety and general welfare of the citizens of Lincoln County and the adoption to be in the public interest.

Lincoln County Code: Title 16 was reviewed to ensure compatibility with any conflicting mitigation action items. Title 16 did not have much bearing on any mitigation action items listed.

Lincoln County Code – Flood Damage Prevention

Chapter 15.16 of the Lincoln County Code⁴ says that the flood-hazard areas of Lincoln County are subject to periodic inundation, which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare. These flood losses are caused by the cumulative effect of obstructions in areas of special flood hazards, which increase flood heights and velocities and, when inadequately anchored, damage uses in other areas. Uses that are inadequately flood-proofed, elevated or otherwise protected from flood damage, also contribute to the flood loss. To accomplish its purposes, this chapter includes methods and provisions for:

⁴ Lincoln County, Washington. January 2005. Lincoln County Code – Title 15 Building and Construction, Chapter 15.16 Flood Damage Prevention. Lincoln County Planning Services. Lincoln County Board of Commissioners. Davenport, Washington.

- 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
- Requiring that uses vulnerable to floods, including facilities, which serve such uses, be protected against flood damage at the time of initial construction
- Controlling the alteration of natural flood plains, stream channels and natural protective barriers, which help accommodate or channel flood waters
- Controlling filling, grading, dredging and other development, which may increase flood damage
- Preventing or regulating the construction of flood barriers, which will unnaturally divert flood waters or may increase flood hazards in other areas

Lincoln County Code: Flood Damage Prevention was reviewed to ensure compatibility with any conflicting mitigation action items. Mitigation action items listed in the 2019 Lincoln County Hazard Mitigation Plan update described as dredging or clearing waterways were reviewed for compatibility with the Flood Damage Prevention code.

Creston Flood Damage Prevention Ordinance

The purpose of Creston’s Flood Damage Prevention Ordinance is to promote public health, safety, and general welfare, reduce the annual cost of flood insurance, and minimize public and private losses due to flood conditions in specific areas. The flood-hazard areas of Creston are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base. To accomplish its purposes, the 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; and
5. Preventing or regulating the construction of flood barriers that unnaturally divert floodwaters or may increase flood hazards in other areas.

Creston Flood Damage Prevention Ordinance was reviewed to ensure compatibility with any conflicting mitigation action items. The Flood Damage Prevention Ordinance did not have much bearing on any mitigation action items listed.

Creston Critical Area Ordinance

This ordinance establishes that wetlands, aquifer protection areas, critical wildlife habitat, frequently flooded areas, and geologically hazardous areas are classified as critical areas. Cities and counties are required to use best available science in developing policies and regulations to protect the functions and values of critical areas. Any development proposed within a designated critical area shall be subject to project review.

Creston Critical Area Ordinance was reviewed to ensure compatibility with any conflicting mitigation action items. The Critical Area Ordinance did not have much bearing on any mitigation action items listed.

Lake Roosevelt National Recreation Area Fire Management Plan (2015)

The preparation of a Wildland Fire Management Plan is required by the National Park Service (NPS) Wildland Fire Management Guidelines (DO-18), which states: "All parks with vegetation that can sustain fire must have a fire management plan. The resource management objectives of the park may determine whether a prescribed fire component is needed". Vegetation at Lake Roosevelt National Recreation (LRNRA) Area includes at least three fire prone ecosystems, these being steppe (semi-arid grassland), shrub/steppe, and ponderosa pine forests.

The NPS at LRNRA needs this plan to guide management decisions in response to wildland fire incidents occurring within LRNRA and adjacent to the area's boundary. Presently and in the future all wildland fires will be suppressed. The size and configuration of LRNRA's land base eliminates the option of using wildland fire to obtain other resource objectives that may be possible in a park with a large aggregate acreage. In contrast, the preferred alternative proposes to add a prescribed fire component that would enhance the NPS's ability to manage and improve the park's ecosystem components and processes while providing for firefighter and public safety.

The Lake Roosevelt National Recreation Area Fire Management Plan was reviewed to identify fuel reduction project areas that could be expanded upon by the County in the 2019 Lincoln County Hazard Mitigation Plan update.

Lake Roosevelt National Recreation Area Shoreline Management Plan Environmental Assessment (2009)

The Shoreline Management Plan is intended to evaluate the need to modify visitor access opportunities along the shoreline, whether it is accessed from the lake or from land. Alternatives in the Management Plan make recommendations regarding future management of the shoreline to accommodate visitors and fluctuating lake levels, to better protect natural, cultural and scenic resources, and to more effectively distribute visitor use.

The Shoreline Management Plan Environmental Assessment was used to identify future development along the shoreline of the National Recreation Area.

Swanson Lakes Wildlife Area Management Plan (2015)

Management goals for the Washington State Department of Fish and Wildlife (WADFWS) Swanson Lakes Wildlife Area are to preserve habitat and species diversity for wildlife resources, maintain healthy populations of game and non-game species, protect and restore native plant communities, and provide diverse opportunities for the public to encounter, utilize, and appreciate wildlife and wild areas.

One of the agency's goals, as outlined in the Wildlife Area Management Plan, is to provide fire management on agency lands, which they do by maintaining fire protection contracts with the local fire districts. One of the agency's concerns regarding wildland fire is that it threatens sensitive habitats within the Wildlife Area. Swanson Lakes Wildlife Area contains fire-sensitive habitat that is critical to the survival of the Columbian sharp-tailed grouse. Deciduous trees and shrubs provide critical winter habitat, and the cover associated with tall bunchgrasses provides needed hiding and escape cover for sharp-tailed grouse.

The Swanson Lakes Area Management Plan was reviewed to identify fuel reduction project areas that could be expanded upon by the County in the 2019 Lincoln County Hazard Mitigation Plan update.

Lincoln County Livestock Evacuation Program (Ongoing)

Lincoln County is currently working on an effort to provide for the evacuation of all livestock during emergency situations, particularly wildland fire. This effort is organized by a team of volunteers that helps contact livestock owners in the affected areas and work together to either cut fences to allow animals to escape on their own or evacuate the animals to designed round up grounds. The volunteers involved in this program have organized the necessary equipment including trucks, trailers, and communication devices as well as on-call veterinarians to quickly and safely provide for the safety of the animals. The group involved in this program is working closely with the Sheriff's office to develop a formal plan outlining the program and its implementation.

The Lincoln County Livestock Evacuation Program was reviewed to determine if there was a need for identifying mitigation actions that could be listed in the 2019 Lincoln County Hazard Mitigation Plan update.

Washington State Enhanced Hazard Mitigation Plan (2018)

The Washington State Enhanced Hazard Mitigation (SEHMP) Plan profiles hazards, identifies risks and vulnerabilities, and proposes strategies and actions to reduce risks to people, property, the economy, the environment, infrastructure and first responders. The Washington SEHMP is a multi-agency, statewide document. It incorporates best practices, programs and knowledge from multiple state agencies, tracks progress in achieving mitigation goals through state and local programs and strategies and communicates that progress among agency partners and elected leadership.

The Washington State Enhanced Hazard Mitigation Plan was used in the 2019 Lincoln County Hazard Mitigation Plan update to develop some of the hazard profiles and risk assessments.

Process for Incorporating Other Planning Mechanisms

This section provides additional details explaining how the hazard mitigation plan will be incorporated into other planning mechanisms, ensuring consistency and efficiency when planning and preparing for natural hazard events. This is also an opportunity to accomplish mitigation action items (MAI's) through other plans as well. MAIs are projects/initiatives that either reduce risk and/or exposure associated with a given hazard or increase preparedness in post-disaster scenarios. Examples of MAI's include modification of building codes to restrict construction in known flood zones and the strategic placement of generators to ensure the continuation of essential services in the event of a power outage.

Lincoln County Comprehensive Emergency Management Plan (2013)

- Currently, there are no plans to update the Lincoln County CEMP. However, the HMP will be reviewed at the time of the next update and the two plans will be integrated accordingly. Any projects or equipment needs identified during the update of the CEMP will be considered for inclusion in the list of mitigation action items in the HMP.

Lincoln County Comprehensive Plan (2018 DRAFT)

- As of September 2018, the Lincoln County Comprehensive Plan was in draft-form and being worked on by the Lincoln County Planning Commission. During the first annual review of the HMP (late summer of 2020), the Goals and Policies listed in each section of the Comprehensive Plan will be considered for inclusion in the list of mitigation action items.

Lincoln County Code: Title 16 – Land Divisions (2016)

- Like other relevant codes, the Title 16 – Land Division code will always be referenced during the review, revision, and development of mitigation during any update of the HMP. Although it was updated recently in 2016, the HMP may also be used to trigger a review of the code should the hazard analyses indicate that it may necessary.

Lincoln County Code – Flood Damage Prevention

- Like other relevant codes, the Flood Damage Prevention code will always be referenced during the review, revision, and development of flood-related mitigation action items during any update of the HMP. The HMP may also be used to trigger a review of the code should the hazard analyses indicate that it may necessary.

Creston Flood Damage Prevention Ordinance

- The Creston Flood Damage Prevention Ordinance will be referenced during future updates of the HMP. As potential projects are identified through the application and enforcement of the ordinance, they will be added to the plan during annual updates and formally included at the time of the next full revision. The flood analyses performed for the HMP during future updates may also trigger a review and revisions of the ordinance.

Creston Critical Area Ordinance

- Reviewed during the development of mitigation action items for this update of the HMP, the Creston Critical Area Ordinance will be used to guide the review, revision, and development of current and future projects that could be affected by hydrologic features of the immediate landscape.

Lake Roosevelt National Recreation Area Fire Management Plan (2015)

- Last updated in 2015, the current version and subsequent updates of the Lake Roosevelt National Recreation Area Fire Management Plan will be used to guide the review, revision, and development of wildland fire hazard mitigation projects in the HMP.

Lake Roosevelt National Recreation Area Shoreline Management Plan Environmental Assessment (2009)

- Although there are currently no plans to update the Shoreline Management Plan, any new projects that are identified during future updates will be considered for inclusion in the HMP. Conversely, as the HMP is updated the Shoreline Management Plan will be used to guide the development of any projects concerning the Lake Roosevelt National Recreation Area Shoreline.

Swanson Lakes Wildlife Area Management Plan (2015)

- As subsequent updates of the Swanson Lakes Wildlife Area Management Plan are completed, any new wildland fire mitigation projects that are identified will be considered for inclusion in the HMP. The plan will also be considered for review during the next annual update or full revision of the HMP.

Lincoln County Livestock Evacuation Program (Ongoing)

- Since the Livestock Evacuation Program update process is ongoing, it will be reviewed and referenced for the development of any new mitigation projects that could be included during the next update of the HMP.

Washington State Enhanced Hazard Mitigation Plan (2018)

- The Washington State Enhanced Hazard Mitigation Plan will be checked for revisions prior to each update of the county HMP. Should any new information relevant to the county be included in the update of the state plan, it will be considered for inclusion in the county plan.

Chapter 2

Planning Process

IN THIS SECTION:

- Description of the Planning Process
- The Planning Team
- Planning Committee Meetings
- Public Involvement

Chapter 2
Planning
Process

Documenting the Planning Process

Documentation of the planning process, including public involvement, is required to meet FEMA's DMA 2000 (44CFR§201.6(b) and §201.6(c)(1)). This section includes a description of the planning process used to develop this plan, including how it was prepared, who was involved in the process, and how all the involved agencies participated.

The Planning Team

The Lincoln County Emergency Manager, Sheriff Wade Magers, led the planning committee efforts. The Project Manager for Northwest Management, Inc. was Brad Tucker. Mr. Tucker led a team of resource professionals that included county and city elected officials and staff, as well as representatives from fire protection districts, law enforcement, hospital and school districts, public health districts, and local interest groups.

During the update process the planning committee invited any resident of Lincoln County to attend planning meetings where the entire HMP was reviewed and discussed. Additionally, the press releases encouraged interested citizens to contact their county emergency manager or attend planning committee meetings in person to ensure that all issues, potential solutions, and ongoing efforts were thoroughly discussed and considered by the committee.

The planning philosophy employed in this project included the open and free sharing of information with interested parties. Information from federal and state agencies was integrated into the database of knowledge used in this project. Meetings with the committee were held throughout the planning process to facilitate a sharing of information between cooperators.

Description of the Planning Process

The Lincoln County Hazard Mitigation Plan was updated through a collaborative process involving all the organizations and agencies detailed in Chapter 1 of this document. The planning effort began by organizing and convening a countywide planning committee.

Lincoln County Emergency Manager, Sheriff Wade Magers, began organizing the planning committee in December of 2017 by sending out a project invitation letter to a wide variety of local officials, experts, specialists, and citizen groups. Table 2.1 shows the original mailing list for the invitation to participate in the Hazard Mitigation Plan updating process.

Table 2.1. List of Initial Planning Committee Invitees.

Adam Kelsey, National Park Service	Leslie Felker, Town of Almira
Andrew Stenbeck, Washington Department of Natural Resources	Linda Fisher, Lincoln County Treasurer
Andy Lefevre, Town of Reardan	Lynn Geissler, Lincoln County Amateur Radio Emergency Services
Arletta Hoffman, City of Sprague	Lynn McWhorter, Town of Wilbur
Bill Bell, Town of Odessa	Mark Stedman, Sprague School District
Brian Finkbeine, Town of Odessa	Matt Castle, Washington Department of Natural Resources
Brian Telford, Lincoln County Sheriff's Office	Matt Schneider, City of Davenport
Bruce Holloway, Spokane County Fire District #3	Mike Finch, Lincoln County Fire District #7
Carol Paul, Lincoln County Fire District #4 and Community of Edwall	Mike Piper, Lincoln County Fire District #5
Carol Schott, Odessa Memorial Healthcare Center	Monte Swenson, Harrington School District
Craig Haden, Lincoln County Fire District #7 and Town of Wilbur	Neil Fink, Town of Odessa
Dale Lathrop, Lincoln County Amateur Radio Emergency Services	Paul Gillilaud, City of Harrington
Dan Johnson, Washington State Police	Peggy Semprimoznik, Lincoln County Clerk
Dave Ayers, Avista Corporation	Phil Nollmeyer, Lincoln County Public Works
Dennis Bly, Lincoln County Board of Commissioners	Rick Becker, Lincoln County Public Works
Dennis Pinar, Lincoln County Fire District #8	Roger Ferris, Washington Fire Commissioners Association
Doug Asbjornsen, Reardan-Edwall School District	Ron Mielke, Lincoln County Fire District #6
Doug Plinsky, Town of Odessa	Ron Shepherd, Lincoln County Prosecuting Attorney and Coroner
Ed Dzedzy, Lincoln County Public Health District	Ryan Rettowski, Town of Reardan
Eric Cassidy, Lincoln County Hospital	Sandy Buchanon, Lincoln County Hospital
Gene Johnson, Lincoln County Fire District #5	Scott Hutsell, Lincoln County Board of Commissioners
Jaime Smith, National Park Service	Shauna Schmerer, Almira School District
Jill Freeze, Davenport School District	Shelly Johnston, Lincoln County Auditor
Jim Kowalkowski, Davenport School District	Sherman Johnson, Town of Reardan
Jo Borden, Lincoln County 911 Coordinator	Steve Goemmel, City of Davenport
John Strohmaier, Lincoln County Superior Court	Steve Peters, Lincoln County Emergency Communications
Jon Fink, Town of Odessa	Steven Finkbeiner, Odessa Memorial Healthcare Center
Josh Grant, Lincoln County District Court	Suellen White, Odessa School District
Judy Boutain, City of Sprague	Ted Hopkins, Lincoln County Board of Commissioners
Juli Anderson, Washington Department of Fish and Wildlife	Tom Martin, Lincoln Hospital District
Kathy Wilcox, Lincoln County Sheriff's Office	Wade Magers, Lincoln County Sheriff
Kelly Watkins, Lincoln County Undersheriff	William Wadlington, Town of Creston (Schools)

Many of these individuals attended the first planning committee meeting personally or sent a representative from their office or organization.

The planning process for the original 2011 MHMP included seven distinct phases which were in some cases sequential (step 1 then step 2) and in some cases intermixed (step 5 completed throughout the process). All steps were revisited during the 2019 update in case any part of the process needed to be fully updated or partially updated.

1. **Organization of Resources** – Lincoln County and NMI worked together to develop a comprehensive list of potential participants as well as a project timeline and work plan.
2. **Collection of Data** – NMI coordinated with the planning team to gather any available data and information about the extent and periodicity of hazards in Lincoln County to ensure a robust dataset for making inferences about hazards.
3. **Field Observations and Estimations** – NMI and the planning team developed risk models and identified problem areas to better understand risks, juxtaposition of structures and infrastructure to risk areas, access, and potential mitigation projects.
4. **Mapping** – NMI developed a comprehensive database and map files relevant to pre-disaster mitigation control and mitigation, structures, resource values, infrastructure, risk assessments, and other related data.
5. **Public Involvement** – NMI and Lincoln County developed a plan to involve the public from the formation of the planning committee to news releases, public meetings, public review of draft documents, and acknowledgement of the final plan by the signatory representatives.
6. **Strategies and Prioritization** – NMI and the planning team representatives worked together to review the risk analyses and develop realistic mitigation strategies.
7. **Drafting of the Report** – **NMI drafted a final report** integrating the results of the planning process and worked with members of the planning team to review each section, incorporated public comments, proceed with the state and federal review processes, and finally adopt the final document.

Multi-Jurisdictional Participation

CFR requirement §201.6(a)(4) calls for multi-jurisdictional planning in the development of Hazard Mitigation Plans that impact multiple jurisdictions. To be included as an adopting jurisdiction in the Lincoln County Hazard Mitigation Plan jurisdictions were required to participate in at least one planning committee meeting or meet with planning team leadership individually, provide a goals statement, submit at least one mitigation strategy, and adopt the final plan by resolution.

The following is a list of jurisdictions that have met the requirements for an adopting jurisdiction and are thereby included in the 2019 updated Hazard Mitigation Plan:

Lincoln County

- City of Davenport
- City of Sprague
- Lincoln Hospital District
- Odessa Memorial Healthcare Center
- Town of Almira
- Town of Creston
- Town of Harrington
- Town of Odessa
- Town of Reardan
- Town of Wilbur

These jurisdictions were represented on the planning committee and at public meetings and participated in the development of hazard profiles, risk assessments, and mitigation measures.

The monthly planning committee meetings were the primary venue for authenticating the planning record. However, additional input was gathered from each jurisdiction in a combination of the following ways:

- Planning committee leadership visited local government meetings to provide planning updates and exchange information. Scott Hutsell, Board of Commissioners, represented Lincoln County on the planning committee and reported progress and findings to the Board during their regular meetings. Sheriff Magers also reported to the Board regarding the progress of the Plan. Additionally, representatives on the planning committee periodically attended city council meetings to provide municipality leadership with updates on the project and to request reviews of draft material. All adopting jurisdictions maintained active participation in the monthly planning committee meetings.
- Planning committee leadership and representatives of the municipalities and special districts facilitated one-on-one correspondence and discussion as needed. This helped to ensure understanding of the process, collect data and other information, and develop specific mitigation strategies. NMI representatives emailed and/or called each jurisdiction individually at least once during the planning process to answer questions and request additional information. Additionally, NMI participated in conference calls with the city of Sprague, the town of Harrington, and the Odessa Memorial Healthcare Center to explain the process and gather data for risk assessments and mitigation strategies.
- Planning meetings were advertised through local media outlets to encourage the public in attending. Because the public was invited to participate throughout the planning process, standalone public meetings were not warranted.
- Written correspondence occurred at least monthly between the planning committee leadership and each participating jurisdiction, updating the cooperators on the document's progress, making requests for information, and facilitating feedback. NMI representatives used an email distribution list of all the stakeholders to announce meetings, distribute meeting minutes, provide draft sections for review, and request information. All participating jurisdictions provided comments to the draft document during the data gathering phase as well as during the various committee and public review processes.
- At the request of planning committee leadership, the Lincoln County Courthouse as well as each city office hosted copies of the draft of the Hazard Mitigation Plan and provided staff on hand to answer any questions during the public comment phase of the planning process. Nearly all the participating jurisdictions retained a draft copy of the MHMP in a public area after the close of the official public comment period.
- Once the draft Plan was completed, planning committee leadership met with each participating jurisdiction to discuss the review process, note any additional revisions in the document, and ensure their understanding of the adoption process.

Planning Committee Meetings

The following list of people participated in the planning process by attending at least one of the planning committee meetings, by responding to elements of the Hazard Mitigation Plan's preparation, or by some other means of involvement. A few participants served on the committee as dual representatives of more than one jurisdiction. A record of sign-in sheets is included in the Chapter 7 Appendices.

Lincoln County Participants

Name	Title	Agency/Group	Adopting Jurisdiction Representing
Rob Coffman	District #3 Commissioner	Board of Commissioners	Lincoln County
Scott Hutsell	District #2 Commissioner	Board of Commissioners	Lincoln County
Mark Stedman	District #1 Commissioner	Board of Commissioners	Lincoln County
Wade Magers	Sheriff/ Emergency Manager	Lincoln County Sheriff's Office	Lincoln County
Rob Reinbold	Fire Chief	Lincoln County Fire District #5	Lincoln County
Ed Dzedzy	Public Health Administrator, Registered Sanitarian	Lincoln County Health Department	Lincoln County
Phil Nollmeyer	County Operations and Permit Coordinator	Public Works	Lincoln County
Jason Schumacher	Engineering Services	Public Works	Lincoln County
Carol Paul	Fire District #4 Commissioner	Lincoln County Fire District	Lincoln County
Casey Nonnemacher	Fire District #4 Commissioner	Lincoln County Fire District #4	Lincoln County
Ryan Rettkowski	Fire Chief	Lincoln County Fire District #4	Lincoln County
Elsa Bowen	Lincoln County Conservation District Manager	Lincoln County Conservation District	Lincoln County
Sandy Buchanon	Unknown	Lincoln Hospital District	Lincoln Hospital District
Lance Strite	EMS Supervisor; City Council Member	Emergency Medical Services; City Government	Lincoln Hospital District; City of Davenport
Steve Goemmel	City Administrator	City Government	City of Davenport
Shawn Coombs	City Councilmember	City Government	City of Sprague
Lexi Behrens	Clerk/Treasurer	City Government	City of Sprague
Darrell Francis	City Councilmember	City Government	Town of Almira
Jeannette Coppersmith	Clerk/Treasurer	City Government	Town of Almira
Karen Paulsen	Clerk/Treasurer	City Government	Town of Creston
Ross Felice	Mayor	City Government	Town of Creston
Carol Schott	Unknown	Odessa Memorial Healthcare Center	Odessa Memorial Healthcare Center
Kelly Watkins	City Councilmember	City Government	Town of Odessa
Denise Snead	Clerk/Treasurer	City Government	Town of Odessa
Jeff Evers	City Administrator	City Government	Town of Reardan
Gloria Kuchenbuch	Mayor	City Government	Town of Wilbur
Peter B. Davenport	City Councilmember	City Government	Town of Harrington
Scott McGowan	Fire Chief	Lincoln County Fire District #6	Town of Harrington/ Lincoln County
Timothy Tipton	President	Harrington Chamber of Commerce	Town of Harrington
Jim Mitchell	Resident	County citizens	None specified

Keith R. Green	Resident	Porcupine Bay citizens	None specified
Barbara Green	Resident	Porcupine Bay citizens	None specified

Committee Meeting Minutes

Planning committee meetings were held from January 2018 through August 2018. The minutes and attendance records for each planning committee meeting are included in the Chapter 7 Appendices.

Public Involvement

Public involvement in this plan was made a priority from the inception of the project. There were many ways that public involvement was sought and facilitated. In some cases, this led to members of the public providing information and seeking an active role in protecting their own homes and businesses, while in other cases it led to the public becoming more aware of the process without becoming directly involved in the planning.

News Releases

Under the auspices of the Lincoln County planning committee, formal news releases were submitted to the *Davenport Times*, *Wilbur Register*, *Odessa Record, Star*, *Huckleberry Press*, and the *Lincoln Advertiser* prior to each planning meeting. The first press release informed the public that the Multi-Hazard Mitigation Plan process was taking place, who was involved, why it was important to Lincoln County, and who to contact for more information. The next four press releases were in the form of a flyer announcing the upcoming meeting dates and venues, which was submitted to the newspapers. The last press release provided information regarding the public comment period including where hardcopies of the draft could be viewed, the availability of the draft on the Lincoln County website, and instructions on how to submit comments. A record of published articles regarding the Multi-Hazard Mitigation Plan is included in the Chapter 7 Appendices.

Figure 2.1. Press Release #1 – Planning Process Announcement.

Multi-Hazard Mitigation Planning Underway!

Davenport, WA – The planning process has been launched to complete a multi-jurisdictional Multi - Hazard Mitigation Plan for Lincoln County, Washington as part of the FEMA Pre-Disaster Mitigation program. This project is being funded through a FEMA Pre-Disaster Mitigation grant. The Lincoln County Multi - Hazard Mitigation Plan will include risk analyses, vulnerability assessments, and a summary of mitigation recommendations for disasters such as floods, landslides, wildfire, earthquakes, severe storms, and drought.

Northwest Management, Inc. has been retained by Lincoln County to provide risk assessments, mapping, field inspections, interviews, and to collaborate with the planning committee to author the Plan. The coordinating team includes all area fire districts, land managers, elected officials, county departments, law enforcement, local agencies, city officials, and others. Northwest Management specialists will conduct analyses and work with the committees to formulate recommendations for treatments and other action items that will help lessen potential impacts and losses from various natural hazards.

One of the goals of the planning process will be to increase the participating jurisdictions' eligibility for additional grants that will help reduce the risk and potential impacts of disaster events. The planning team will be conducting public meetings to discuss preliminary findings and to seek public input on the Plan's recommendations later this summer. For more information on the Lincoln County Multi - Hazard Mitigation Plan project, contact Sheriff Wade Magers at 509-725-9264 or Tera King, Northwest Management, at 208-883-4488 ext 133.

Public Meetings

Residents of Lincoln County were invited to each planning team meeting. This was done through multiple press releases announcing the next meeting date and location. Residents were given multiple opportunities to participate in the planning process and express their concerns regarding risk. There were several residents that took advantage of the opportunity throughout the process. These participants participated by reviewing sections of the plan as they were made available. One individual also expressed concern about wildfires starting in the timbered canyons and rapidly spreading onto the surrounding agriculture fields. This individual suggested that the local fire services utilize local landowners and their equipment to quickly establish a fire line to contain wildfires. Local fire service representatives and law enforcement present explained that it is a liability to have landowners operating in and around any fire without being accounted for.

Figure 2.2. Press Release – Public Meeting Flyer.



Media Release

Public Meeting Announced on Natural Hazard Planning *Lincoln County Set to Update Hazard Risk Plans*

DAVENPORT, WASH (February 14, 2018) – Lincoln County launched a project to update the Hazard Mitigation Plan. The next planning meeting is open to the public and will take place on March 27, 2018, at 10:00 a.m. at the Lincoln County Commissioners Chambers.

This update will include the integration of the existing Lincoln County Community Wildfire Protection Plan. Local agencies and organizations in Lincoln County have created a committee to complete the required five-year update of the document as part of the FEMA Pre-Disaster Mitigation program. The project is being funded through a grant from FEMA.

Northwest Management, Inc. has been retained by Lincoln County to provide risk assessments, hazard mapping, field inspections, interviews, and to collaborate with the planning committee to update the Plan. The committee includes representatives from local communities/municipalities, rural and wildland fire districts, Lincoln County Sheriff's Department, Washington Department of Natural Resources, conservation districts, Bureau of Land Management, highway districts, private landowners, area businesses, various Lincoln County departments, and others.

The public is encouraged to attend the upcoming meeting and learn about the hazard assessment process for flood, landslide, earthquake, severe weather, wildland fire, and others. Maps will be present to highlight potential risks at specific locations throughout the county. Based on these maps, potential mitigation activities will be created with the intent to reduce hazard-exposure and disaster-vulnerability of Lincoln County residents and communities.

For more information, or for those interested in attending, please contact:

Sheriff Wade Magers
509-725-9264
wmagers@col.lincoln.wa.us

Meeting date: 10:00 a.m. Tuesday, March 27, 2018
Meeting location: Lincoln County Commissioners Chambers, 27234 WA-25, Davenport, WA.

Public Comment Period

A public comment period was conducted from October 18th thru November 1st, 2018 to allow members of the public of Lincoln County an opportunity to view the full draft plan and submit comments and any other input to the committee for consideration. A press release was submitted to the local media outlets announcing the comment period, the location of Plan for review, and instructions on how to submit comments. Hardcopy drafts were printed and made available at the Lincoln County Courthouse and city halls

in Davenport, Reardan, Odessa, Harrington, Almira, Creston, Wilbur, and Sprague. Each hardcopy was accompanied by a letter of instruction for submitting comments to the planning committee. Most of these communities retained the hardcopy draft well beyond the actual comment period with the anticipation that anyone coming into their offices would have the opportunity to ask questions regarding the Plan or provide input. A record of published articles regarding the public comment period is included in the Chapter 7 Appendices.

Figure 2.3. Press Release #3 – Public Comment Period.

Lincoln County Hazard Plan Available for Public Review

Davenport, WA. The Lincoln County Multi-Hazard Mitigation Plan has been completed in draft form and is available to the public for review and comment at the Clerk’s office in the Lincoln County Courthouse and the city halls in Davenport, Reardan, Odessa, Harrington, Almira, Creston, Wilbur, and Sprague. Electronic copies may be viewed in pdf format at <http://www.co.lincoln.wa.us/>. The public review phase of the planning process will be open from October 18th, 2018 thru November 1st, 2018.

The purpose of the Lincoln County Multi-Hazard Mitigation Plan (MHMP) is to reduce the impact of hazards such as floods, landslides, severe weather, wildfire, earthquakes, and drought on Lincoln County residents, landowners, businesses, communities, local governments, and state and federal agencies while maintaining appropriate emergency response capabilities and sustainable natural resource management policies. The MHMP identifies high risk areas as well as structures and infrastructure that may have an increased potential for loss due to a hazard event. The document also recommends specific projects that may help prevent disasters from occurring altogether or, at the least, lessen their impact on residents and property. The MHMP is being developed by a committee of city and county elected officials and departments, local and state emergency response representatives, land managers, hospital and school district representatives, and others.

The Lincoln County MHMP includes risk analysis at the community level with predictive models for where disasters are likely to occur. This Plan will enable Lincoln County and its communities to be eligible for grant dollars to implement the projects and mitigation actions identified by the committee. Although not regulatory, the MHMP will provide valuable information as we plan for the future.

Comments on the MHMP must be submitted to the attention of Sheriff Magers, Lincoln County Emergency Management, at WMagers@co.lincoln.wa.us or mailed to Lincoln County Emergency Management, PO Box 367, Davenport, Washington 99122 by close of business on November 1st, 2018. For more information on the Lincoln County Multi - Hazard Mitigation Plan process, contact Sheriff Magers at 509-725-9264 or Brad Tucker, Northwest Management, at 208-245-1920.

Web Posting

The draft plan was also posted for public review on the Lincoln County website homepage during and after the official public comment period. Instructions for submitting public input as well as local project contact numbers were also provided on the webpage.

Continued Public Involvement

Lincoln County is dedicated to involving the public directly in review and updates of this Multi - Hazard Mitigation Plan. The County Emergency Manager, through the planning committee, is responsible for the annual review and update of the Plan as recommended in the Chapter 6, “Plan Monitoring and Maintenance” section of this document.

The public will have the opportunity to provide feedback about the Plan annually on the anniversary of the adoption at a meeting of the County Board of Commissioners. Copies of the Plan will be kept at the County Courthouse. The Plan also includes contact information for the Emergency Manager, who is responsible for keeping track of public comments.

A public meeting will also be held as part of each annual evaluation or when deemed necessary by the planning committee. The meetings will provide the public a forum for which they can express concerns, opinions, or ideas about the Plan. The County Commissioner’s Office will be responsible for using County resources to publicize the annual meetings and maintain public involvement through the County’s webpage and local newspapers.

Documented Review Process

Review and comment on this Plan has been provided through several avenues for the committee members as well as for members of the general public. A record of the document’s review process has been established through email correspondence, press releases, published articles, meeting minutes, and meeting sign-in sheets. The proof of these activities is recorded in the Chapter 7 Appendices.

During regularly scheduled committee meetings in 2018, the committee members met to discuss findings, review mapping and analysis, and provide written comments on draft sections of the document. During the public meetings attendees observed map analyses, photographic collections, discussed general findings from the community assessments, and made recommendations on potential project areas.

Sections of the draft Plan were delivered to the planning committee members during the regularly scheduled committee meetings and emailed to the committee the following day. The completed final draft of the document was presented to the committee in September 2018 for full committee review. The committee spent two weeks proofreading and editing sections of the draft. Many jurisdictions met individually to review and revise their specific risk assessment and mitigation strategy including the prioritization of action items. Once the committee’s review was completed, the draft document was released for public review and comment. The public review period remained open from October 18th thru November 1st, 2018.

Plan Monitoring and Maintenance

As part of Lincoln County policy regarding this planning document, the entire Hazard Mitigation Plan should be reviewed annually (from date of adoption). Reviews should be conducted at a special meeting of a joint planning committee, open to the public and involving all jurisdictions, where action items, priorities, budgets, and modifications can be made or confirmed. Lincoln County Emergency Management (or an official designee of the joint committee) is responsible for the scheduling, publicizing, and leadership of the annual review

meeting. During this meeting, participating jurisdictions will report on their respective projects and identify needed changes and updates to the existing Plan. Maintenance to the Plan should be detailed at this meeting, documented, and attached to the formal plan as an amendment to the Hazard Mitigation Plan. Re-evaluation of this plan should be made on the 5th anniversary of its acceptance, and every 5-year period following.

Annual Review Agenda

The focus of the joint planning committee at the annual review meeting should include, at a minimum, the following topics:

- Update historical events record based on any events in the past year.
- Review county profile and individual community assessments for each hazard and note any major changes or mitigation projects that have altered the vulnerability of each entity.
- Update the Emergency Resources information as necessary for each emergency response organization.
- Add a section to note accomplishments or current mitigation projects.
- All action items in Chapter 6 will need updated as projects are completed, and as new needs or issues are identified.
- Address Emergency Operations Plans – how can we dovetail the two plans to make them work for each other? Specifically, how do we incorporate the County’s EOP into the action items for the regional MHMP?
- Address Updated County Comprehensive Land Use Plans – how can we dovetail the two plans to make them work for each other?
- Incorporate additional hazard chapters as funding allows.

All meeting minutes, press releases, and other documentation of revisions should be kept on record by Lincoln County Emergency Management.

Five-Year Re-evaluation Agenda

The focus of the planning committee at the five-year re-evaluation should include all topics suggested for the annual review plus some additional items.

- Update County demographic and socioeconomic data.
- Address any new planning documents, ordinances, codes, etc. that have been developed by the County or cities.
- Review listed communication sites.
- Review municipal water sources, particularly those in the floodplain or landslide impact areas.
- Redo all risk analysis models incorporating new information such as an updated County parcel master database, new construction projects, development trends, population vulnerabilities, changing risk potential, etc.
- Update county risk profiles and individual community assessments based on new information reflected in the updated models.

All meeting minutes, press releases, and other documentation of revisions should be kept on record by Lincoln County Emergency Management.

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Chapter 3

Community Profile

IN THIS SECTION:

- Description of the Region
- Geography and Vegetation
- Demographics
- Socioeconomics
- Development Trends
- Hazard Management Capabilities
- Regional Hazard Profile

Chapter 3
Community Profile

Lincoln County Characteristics

The information in this chapter is derived from multiple sources, including past wildfire protection plans and the official website for Lincoln County, Washington.

Description of the Region

Lincoln County is in east-central Washington state, just west of the Spokane, Washington metropolitan area. The county contains 2,310 square miles of land and 29 square miles of water. The northern boundary of the county is made up of the Spokane River and, after the confluence, the Columbia River (Lake Roosevelt). The Colville and Spokane Indian reservations also border Lincoln County to the north.

Prior to the 1800s, the region was inhabited by several groups of Native Americans, such as the Spokane people. The rolling plains were considered a wasteland by early U.S. military authorities. The first permanent settlers arrived in the mid-1800s and settled in the bottomlands close to water sources. More people settled in Lincoln County in the 1870s and 1880s, especially with the construction of the Northern Pacific rail lines. The new arrivals discovered that the best agricultural land was on the deep soils of the rolling hills and agriculture became the major industry in the region. Lincoln County was officially established in 1883.

Today Lincoln County is the seventh-largest county in Washington by land area, but one of five counties with less than 11,000 residents. Lincoln County does not have one large population center but instead has small communities spread throughout the state. The vast areas between communities are mostly made up of uninhabited farm or rangeland. Davenport is the county seat and the largest city by population. Davenport sits on Highway 2 about 35 miles west of Spokane, Washington, in the northeast part of the county. Highway 2 runs east to west along the northern half of the county and connects the towns of Reardan, Creston, Wilbur, and Almira. Most other communities are in the southern half of the county including Harrington and Odessa. Sprague, a city on Interstate 90, lies in the far southeast corner of the county.

Geography and Natural Resources

The broad region that encompasses Lincoln County is referred to as the Columbia Plateau, a large expanse of somewhat level land made up of lava-formed basalt bedrock, between the Cascade and Rocky Mountains. Lincoln County lies within a more specific region referred to geologically as the “channeled scablands”. According to the Lincoln County soil survey, the channeled scablands contain rough relief and were formed by flooding during the last ice age. Floodwaters and meltwaters scoured the bedrock, creating features such as channels, plateaus and buttes. Prominent soils found in the scablands include the Anders soils and are primarily used as rangeland.

Another major physiographic feature found in Lincoln County includes the fairly-level uplands. Upland soils, such as Broadax soils, are found in areas where the wind-deposited sediments (loess) were not scoured by glacial waters. These areas are important to the production of grains such as winter wheat and barley.⁵

Looking at historical climate data for different towns and cities across Lincoln County, average daily temperatures in the winter vary from 27° to 30° F. For the same sample period and the same locations, average daily temperatures in summer vary from 64° to 68° F. Precipitation and snowfall data from these locations shows more variability. Annual mean precipitation varies between 10 inches and 15 inches, while annual mean snowfall can range from 16 inches to 38 inches. The general trend is that the western side of Lincoln County (particularly the southwest part) tends to be drier on average and has a higher tendency toward long dry periods.⁶

Lincoln County is a diverse ecosystem with a complex array of vegetation, wildlife, and fisheries that have developed with, and adapted to fire as a natural disturbance process. Nearly a century of wildland fire suppression coupled with past land-use practices (primarily timber harvesting and agriculture) has altered plant community succession and has resulted in dramatic shifts in the fire regimes and species composition. As a result, some forests and rangelands in Lincoln County have become more susceptible to large-scale, higher-intensity fires posing a threat to life, property, and natural resources including wildlife and plant populations. High-intensity, stand-replacing fires have the potential to seriously damage soils and native vegetation. In addition, an increase in the number of large, high-intensity fires throughout the nation's forest and rangelands has resulted in significant safety risks to firefighters and higher costs for fire suppression.

Vegetation

Much of the terrain in Lincoln County is dominated by shrub-steppe communities, with some grassland interspersed with rock outcrops. The dominant grass and shrub-steppe communities are primarily composed of bluebunch wheatgrass, Idaho fescue, Wyoming big sage, and rigid sage. Common shrub species are snowberry, rose, serviceberry, and wax currant. Although riparian areas are few, they offer important vertical structure in the vast extent of open grassland. These stands of trees and/or shrubs provide hiding, escape and thermal cover, shade, foraging and nesting sites, perches, and water sources. Overstory trees in riparian zones include quaking aspen, black cottonwood, and water birch, while the understory vegetation is composed of hydrophytic shrub species such as mock orange, alder, Rocky Mountain maple, black hawthorn, and willow.⁷

Located in a semi-arid transition zone, plant communities along the Lake Roosevelt National Recreation Area gradually change from steppe and shrub-steppe communities to ponderosa pine forest. As this is a transition

⁵ Stockman, Dale D. "Soil Survey of Lincoln County, Washington." *United States Department of Agriculture, Soil Conservation Service*, 1981, www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/washington/WA043/0/wa043_text.pdf

⁶ "Cooperative Climatological Data Summaries," *Western Regional Climate Center*, 2018. wrcc.dri.edu/Climate/west_coop_summaries.php

⁷ Washington Department of Fish and Wildlife. 2006. Swanson Lakes Wildlife Area Management Plan. Wildlife Management Program, Washington Department of Fish and Wildlife, Olympia. 40 pp.

zone between grassland and forest environment, large block definitions can be difficult due to effects of varying aspect and soil types. The three predominant plant communities include bunchgrass grasslands (steppe); shrub-steppe; and transition ponderosa pine forest. Other communities of note include wetland/riparian, lithosolic (rocky soil), rocky outcrops, and mixed-conifer forests.⁸

Table 3.1. Vegetative Cover Types in Lincoln County.

Cover	Acres	Percent
Herbaceous/Nonvascular-dominated	916,299	61%
No Dominant Lifeform	41,479	3%
Non-vegetated	17,945	1%
Shrub-dominated	455,676	30%
Tree-dominated	65,084	4%
Total	1,496,482	100%

Hydrology

The Washington Department of Ecology & Water Resources Program is charged with the development of the Washington State Water Plan. Included in the State Water Plan are the statewide water policy plan and component basin and water body plans, which cover specific geographic areas of the state. The Washington Department of Ecology has prepared general lithologies of the major ground water flow systems in Washington.

The state may assign or designate beneficial uses for particular Washington water bodies to support. These beneficial uses are identified in section WAC 173-201A-200 of the Washington Surface Water Quality Standards (WQS). These uses include:

- Aquatic Life Uses: char; salmonid and trout spawning, rearing, and migration; non-anadromous interior redband trout, and indigenous warm water species
- Recreational Uses: primary (swimming) and secondary (boating) contact recreation
- Water Supply Uses: domestic, agricultural, and industrial; and stock watering

While there may be competing beneficial uses in streams, federal law requires protection of the most sensitive of these beneficial uses.

A correlation to mass wasting due to the removal of vegetation caused by high intensity wildland fire has been documented. Burned vegetation can result in changes in soil moisture and loss of rooting strength that can result in slope instability, especially on slopes greater than 30%. The greatest watershed impacts from increased sediment will be in the lower gradient, depositional stream reaches.

Of critical importance to Lincoln County will be the maintenance of the domestic watershed supplies in the Lower Spokane Watershed (WRIA 54), Lower Lake Roosevelt Watershed (WRIA 53), and Upper Crab-Wilson Watershed (WRIA 43).

⁸ Hebner, Scott. 2000. Fire Management Plan Environmental Assessment. Lake Roosevelt National Recreation Area. October 2000. 63 pp.

Air Quality

The primary means by which the protection and enhancement of air quality is accomplished is through implementation of National Ambient Air Quality Standards (NAAQS). These standards address six pollutants known to harm human health including ozone, carbon monoxide, particulate matter, sulfur dioxide, lead, and nitrogen oxides.⁹

The Clean Air Act, passed in 1963 and amended in 1977, is the primary legal authority governing air resource management. The Clean Air Act provides the principal framework for national, state, and local efforts to protect air quality. Under the Clean Air Act, OAQPS (Office for Air Quality Planning and Standards) is responsible for setting standards, also known as national ambient air quality standards (NAAQS), for pollutants which are considered harmful to people and the environment. OAQPS is also responsible for ensuring these air quality standards are met, or attained (in cooperation with state, Tribal, and local governments) through national standards and strategies to control pollutant emissions from automobiles, factories, and other sources.¹⁰

Smoke emissions from fires potentially affect an area and the airsheds that surround it. Climatic conditions affecting air quality in northeast Washington are governed by a combination of factors. Large-scale influences include latitude, altitude, prevailing hemispheric wind patterns, and mountain barriers. At a smaller scale, topography and vegetation cover also affect air movement patterns. Air quality in the area is generally moderate to good. However, locally adverse conditions can result from occasional wildland fires in the summer and fall, and prescribed fire and agricultural burning in the spring and fall. All major river drainages are subject to temperature inversions which trap smoke and affect dispersion, causing local air quality problems. This occurs most often during the summer and fall months and would potentially affect all communities in Lincoln County. Winter time inversions are less frequent, but are more apt to trap smoke from heating, winter silvicultural burning, and pollution from other sources.

Demographics

Lincoln County grew in population to a peak of over 17,000 around 1910. During this time, there were more than 2,000 farms in the county and almost twice as many people lived in the rural areas as in the towns. Presently, farms are much larger in average acreage, but fewer in number.¹¹

The U.S. Census Bureau estimates that Lincoln County has experienced a 2.1% decrease in population between the 2010 census and 2016. There was a population increase between 2000 and 2010 (10,184 to 10,570 people) but 2016 estimates have the Lincoln County population at 10,350. The Census Bureau also

⁹ USDA-Forest Service (United States Department of Agriculture, Forest Service). 2000. Incorporating Air Quality Effects of Wildland Fire Management into Forest Plan Revisions – A Desk Guide – Draft. April 2000.

¹⁰ Louks, B. 2001. Air Quality PM 10 Air Quality Monitoring Point Source Emissions; Point site locations of DEQ/EPA air monitoring locations with monitoring type and pollutant. Oregon Department of Environmental Quality. Feb. 2001. As GIS Data set. Boise, Id.

¹¹ Lincoln County. 1983. Lincoln County Comprehensive Plan. Lincoln County Planning Commission. Davenport, Washington. 34 pp.

reported there were 5,860 housing units in 2016 and 4,337 households. The population density of Lincoln County was of 4.6 persons per square mile as reported in the 2010 Census.¹²

<i>Table 3.2. Population trend in Lincoln County</i>		
	Lincoln County	Washington state
Population 2000	10,184	5,894,121
Population 2010	10,570	6,724,540
Population 2016	10,350	7,288,000
Percent change, 2010 to 2016	-2.1%	8.4%

Socioeconomics

The median income for a household in Lincoln County in 2016 was \$47,676. This is well below the 2016 median household income for Washington state (\$62,848) and for the United States (\$55,322).

Unemployment rates in Lincoln County fluctuate throughout the year as they reflect seasonal employment and are generally lower in the summer and higher in the winter. County unemployment was at 6.2% through the first half of 2016 and the average civilian labor force during this period was at 4,871. Reports on the first half of 2017 show unemployment down to 5.3% and an average civilian labor force at 4,936.¹³

Income estimates for 2016 show that 38.3% of the households in Lincoln County earn between \$35,000 and \$75,000 per year. Households earning less than \$15,000 make up 12.1% and households earning more than \$100,000 represent 16.6 %.

¹² "QuickFacts" *United States Census Bureau*, 2018.

<https://www.census.gov/quickfacts/fact/table/lincolncountywashington/POP010210#viewtop>

¹³ Tweedy, Doug. "Lincoln County Profile", *Washington State Employment Security Department*, September 2017.

<https://esd.wa.gov/labormarketinfo/county-profiles/lincoln#wages>

Table 3.4. Selected Economic Characteristics for 2016

	Estimated Number of Employed Workers	Percent (%)
OCCUPATION		
Management, professional, and related occupations	1,469	35.1
Service occupations	783	18.7
Sales and office occupations	817	19.5
Natural resources, construction, and maintenance occupations	729	17.4
Production, transportation, and material moving occupations	390	9.3
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	693	16.5
Construction	379	9.0
Manufacturing	194	4.6
Wholesale trade	142	3.4
Retail trade	299	7.1
Transportation and warehousing, and utilities	250	6.0
Information	85	2.0
Finance, insurance, real estate, and rental and leasing	126	3.0
Professional, scientific, management, administrative, and waste management services	219	5.2
Educational, health and social services	933	22.3
Arts, entertainment, recreation, accommodation and food services	340	8.1
Other services (except public administration)	229	5.5
Public administration	299	7.1

Employment within this region leans heavily towards private wage and salary workers. Estimates for 2016 show that this category comprised more than 65% of the workforce, while those same estimates reported that government workers made up about 25%.¹⁴

The regional economy continues to rely heavily on agriculture, namely wheat, as Lincoln County is second only to Whitman County in total annual wheat production for the state of Washington. Roughly 80% of Lincoln County land area is farmland and about one-third of that is planted in wheat. Along with wheat production, livestock production is another important aspect of agri-business in Lincoln County.

Development Trends

The clear majority of Lincoln County is privately owned. Most of the land is used for ranching and farming purposes; although, more and more residents are moving into the rural areas along the Lake Roosevelt shoreline. Numerous subdivisions and housing clusters are developing along the northern border of the county. Many permanent residents have established homesites along Lake Roosevelt; however, much of the

¹⁴ "Selected Economic Characteristics – American Community Survey 5-Year Estimates", U.S. Census Bureau, 2018. <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF>

recent and planned development has been in response to the growing recreational or second home market in this area.

Table 3.5. Ownership Categories in Lincoln County.

Land Owner	Acres	Percent
Bureau of Land Management	80,875	5%
Bureau of Reclamation	6,093	0%
Lincoln County	758	0%
Washington Department of Natural Resources	44,176	3%
Private	1,346,138	90%
School District	95	0%
The Nature Conservancy	346	0%
Washington Department of Fish and Wildlife	17,638	1%
Washington Department of Transportation	364	0%
Total	1,496,482	100%

Lincoln County Land Services is responsible for land divisions, zoning, addressing, forestry, building permits, building plan reviews, and inspections. This department also enforces the current Lincoln County Comprehensive Plan. Most of Lincoln County is zoned “Agriculture”, but there are also identified commercial and industrial sites as well as “Public Facilities” areas. The largest swath of the “Public Facilities” zone lies along the Lake Roosevelt shoreline.

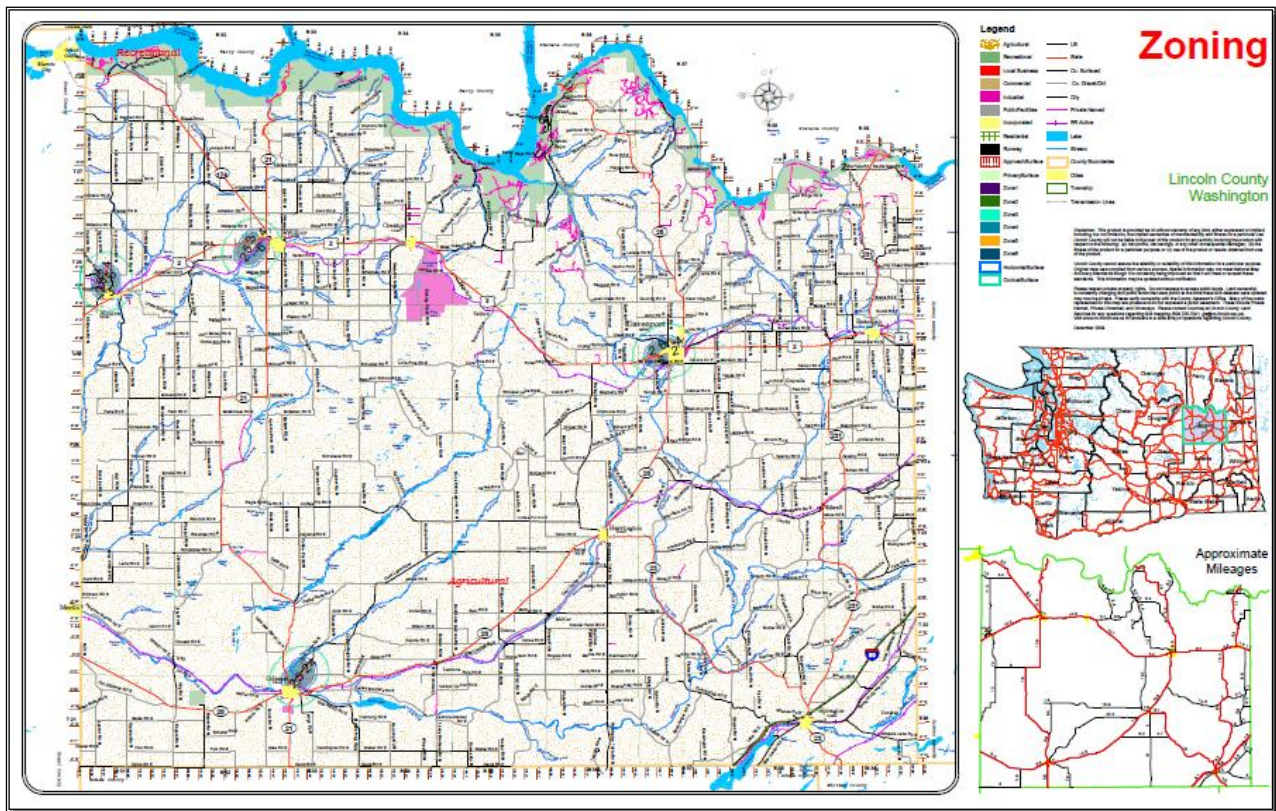
In 2013 a USDA livestock processing facility opened in Odessa. The processing plant was established in cooperation with the Cattle Producers of Washington (CPoW) and the Livestock Processor’s Cooperative Association (LPCA) with the purpose of aiding livestock producers in marketing their own product.¹⁵

There is currently very little commercial or residential construction occurring in any of Lincoln County’s incorporated communities. However, residential and recreational construction has been occurring along the Lake Roosevelt shoreline. There are several unincorporated communities or clusters of housing developments in this area including Lincoln, Seven Bays, Porcupine Bay, Spring Canyon, Deer Meadows, etc.

As development of rural communities continues, questions are being raised about how to serve these communities in emergency situations, and how to mitigate hazard risk. Due to the remote nature of some areas of Lincoln County, residents have a certain level of expectation of self-sufficiency. Homeowner groups and neighbors in some areas have already gathered for discussions and drills related to fire evacuation and other disaster events.

¹⁵ “Our Facility”, CPoW-LPCA Processing Plant, 2018. <https://www.lpcaodessa.com/>

Figure 3.1. Lincoln County Zoning Map.



Hazard Management Capabilities

The Lincoln County Department of Emergency Management is responsible for the administration and overall coordination of the emergency management program for Lincoln County and the cities within the county. The Incident Command System (ICS) is the basis for all direction, control and coordination of emergency response and recovery efforts. Emergency response and supporting agencies and organizations have agreed to carry out their objectives in support of the incident command structure to the fullest extent possible.

The Lincoln County Central Dispatch / 911 Center, with support of the Emergency Operations Center, is designated as the primary communications center for Lincoln County. It maintains 24-hour emergency alerting and communications capability for receiving, coordinating and disseminating emergency information. The Lincoln County Central Dispatch / 911 Center provides communications coverage over the entire Lincoln County area. It is the central receiving point for emergency notification and warning information and disseminates pertinent emergency information to support agencies.

Amateur Radio Services volunteers may provide additional local or statewide communications networks. This capability can also provide backup communication systems at the Lincoln County Emergency Operations Center if required.

All fire districts and agencies providing fire protection services in Lincoln County have reciprocal memorandums of understanding with each other.

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Chapter 4

Hazard Profiles

IN THIS SECTION:

- Flood Annex
- Earthquake Annex
- Landslide Annex
- Severe Weather Annex
- Wildland Fire Annex
- Avalanche Annex
- Seiche Annex
- Volcano Annex
- Drought Annex

Regional and Local Hazard Profiles

Flood

Floods have long been a serious and costly natural hazard affecting the state of Washington. Floods damage roads, farmlands, and structures, often disrupting lives and businesses. Simply put, flooding occurs when water leaves the river channels, lakes, ponds, and other confinements where we expect it to stay. Flood-related disasters occur when human property and lives are impacted by flood waters. An understanding of the role of weather, runoff, landscape, and human development in the floodplain is therefore the key to understanding and controlling flood-related disasters. Major disasters declarations related to flooding were made for Washington in 1956, 1957, 1963, 1964, 1971, 1972, 1974, 1975, 1977, 1979, 1983, 1986 (x3), 1989, 1990 (x2), 1996, 1997 (x3), 1998, 2003, 2006 (x2), 2007, 2009, 2016 and 2017. Every county has received a Presidential Disaster Declaration since 1970.¹⁶

Floods can be divided into two major categories in eastern Washington: riverine and flash flood. Riverine flooding is associated with a watershed, which is the natural drainage basin that conveys water runoff from rain. Riverine flooding occurs when the flow of runoff is greater than the carrying capacities of the natural drainage systems. Rain water that is not absorbed by soil or vegetation seeks surface drainage lines following natural topography lines. These lines merge to form a hierarchical system of rills, creeks, streams and rivers. Generally, floods can be slow or fast rising depending on the size of the river or stream.

Flash floods are much more dangerous and flow much faster than riverine floods. Flash floods may have a higher velocity in a smaller area and will likely recede relatively quickly. Such floods are caused by the introduction of a large amount of water into a limited area (e.g., extreme precipitation events in watersheds less than 50 square miles), crest quickly (e.g., eight hours or less), and generally occur in hilly or otherwise confined terrain. Flash floods occur in both urban and rural settings, principally along smaller rivers and drainage ways that do not typically carry large amounts of water. This type of flood poses more significant safety risks because of the rapid onset, the high-water velocity, the potential for channel scour, and the debris load.¹⁷

Three types of flash flooding

1. Extreme precipitation and runoff events
2. Inadequate urban drainage systems overwhelmed by small intense rainstorms
3. Dam failures

Events that may lead to flash flooding include significant rainfall and/or snowmelt on frozen ground in the winter and early spring months, high intensity thunderstorms (usually during the summer months), and

¹⁶ “Disaster Declarations”. Federal Emergency Management Agency, 2018. <https://www.fema.gov/disasters>.

¹⁷ Statewide Regional Evacuation Study Program. Central Florida Region Technical Data Report. Volume 1-7, Chapter II – Regional Hazards Analysis. Available online at <http://www.cfrpc.org/EVACUATION%20MASTER%20DVD%20-%20PDF%20VERSION/VOLUME%201/Chapter%202/CFRPC%20Chapter%20II%20-%20Hazards%20Analysis.pdf>.

rainfall onto burned areas where high heat has caused the soil to become hydrophobic or water repellent which dramatically increases runoff and flash flood potential.

Flash floods from thunderstorms do not occur as frequently as those from general rain and snowmelt conditions but are far more severe. The onset of these flash floods varies from slow to very quick and is dependent on the intensity and duration of the precipitation and the soil types, vegetation, topography, and slope of the basin. When intensive rainfall occurs immediately above developed areas, the flooding may occur in a matter of minutes. Sandy soils and sparse vegetation, especially recently burned areas, are conducive to flash flooding. Mountainous areas are especially susceptible to damaging flash floods, as steep topography may stall thunderstorms in a limited area and may also funnel runoff into narrow canyons, intensifying flow. A flash flood can, however, occur on any terrain when extreme amounts of precipitation accumulate more rapidly than the terrain can allow runoff. Flash floods are most common in Washington during the spring and summer months due to thunderstorm activity.

Occasionally, floating ice or debris can accumulate at a natural or man-made obstruction and restrict the flow of water. Ice and debris jams can result in two types of flooding:

- Water held back by the ice jam or debris dam can cause flooding upstream, inundating a large area and often depositing ice or other debris which remains after the waters have receded. This inundation may occur well outside of the normal floodplain.
- High velocity flooding can occur downstream when the jam breaks. These flood waters can have additional destructive potential due to the ice and debris load that they may carry.¹⁸

Flooding from ice or debris jams is a relatively common phenomenon in eastern Washington, but not in Lincoln County specifically. Small jams can occur in many of the streams throughout Lincoln County, particularly at bridge abutments and culverts; however, these jams rarely cause significant damage or flooding.

The major source of flood waters in Lincoln County is normal spring snow melt. As spring melt is a “natural” condition; the stream channel is defined by the features established during the average spring high flow (bank-full width). Small flow peaks exceeding this level and the stream’s occupation of the floodplain are common events. The magnitude of most floods in Lincoln County depend on the combinations of intensity and duration of rainfall, pre-existing soil conditions, area of a basin, elevation of the rain or snow level, and amount of snow pack. Man-made changes to a basin also can affect the size of floods. Although floods can happen at any time during the year, there are typical seasonal patterns for flooding in eastern Washington, based on the variety of natural processes that cause floods:

- Heavy rainfall on wet or frozen ground, before a snow pack has accumulated, typically cause fall and early winter floods
- Rainfall combined with melting of the low elevation snow pack typically cause winter and early spring floods
- Late spring floods in Lincoln County result primarily from melting of the snow pack

¹⁸ Barnhill, Dave, et al. “Flash Floods – How do they occur?”. [Waterlines](#). Division of Water, Indiana Department of Natural Resources. Spring-Summer 1999. Indianapolis, Indiana.

- Summer flash floods are caused by thunderstorms¹⁹

The most commonly reported flood magnitude measure is the “base flood.” This is the magnitude of a flood having a one-percent chance of being equaled or exceeded in any given year. Although unlikely, “base floods” can occur in any year, even successive ones. This magnitude is also referred to as the “100-year Flood” or “Regulatory Flood”. Floods are usually described in terms of their statistical frequency. A “100-year flood” or “100-year floodplain” describes an event or an area subject to a 1% probability of a certain size flood occurring in any given year. This concept does not mean such a flood will occur only once in one hundred years. Whether or not it occurs in a given year has no bearing on the fact that there is still a 1% chance of a similar occurrence in the following year. Since floodplains can be mapped, the boundary of the 100-year flood is commonly used in floodplain mitigation programs to identify areas where the risk of flooding is significant. Any other statistical frequency of a flood event may be chosen depending on the degree of risk that is selected for evaluation, e.g., 5-year, 20-year, 50-year, 500-year floodplain.

The areas adjacent to the channel that normally carry water are referred to as the floodplain. In practical terms, the floodplain is the area that is inundated by flood waters. In regulatory terms, the floodplain is the area that is under the control of floodplain regulations and programs (such as the National Flood Insurance Program which publishes the FIRM maps). The floodplain is often defined as:

“That land that has been or may be covered by floodwaters, or is surrounded by floodwater and inaccessible, during the occurrence of the regulatory flood.”²⁰

Winter weather conditions are the main driving force in determining where and when base floods will occur. The type of precipitation that a winter storm produces is dependent on the vertical temperature profile of the atmosphere over a given area.²¹ Unusually heavy snow packs or unusual spring temperature regimes (e.g., prolonged warmth) may result in the generation of runoff volumes significantly greater than can be conveyed by the confines of the stream and river channels. Such floods are often the ones that lead to widespread damage and disasters. Floods caused by spring snow melt tend to last for a period of several days to several weeks, longer than the floods caused by other meteorological sources.

Floods that result from rainfall on frozen ground in the winter, or rainfall associated with a warm, regional frontal system that rapidly melts snow at low and intermediate altitudes (rain-on-snow) can be the most severe. Both situations quickly introduce large quantities of water into the stream channel system, easily overloading its capacity.

On small drainages, the most severe floods are usually a result of rainfall on frozen ground; however, moderate quantities of warm rainfall on a snow pack, especially for one or more days, can also result in rapid runoff and flooding in streams and small rivers. Although meteorological conditions favorable for short-duration warm rainfall are common, conditions for long-duration warm rainfall are relatively rare.

¹⁹ Kresch, David and Karen Dinicola. “What Causes Floods in Washington State”. Fact Sheet 228-96. U.S. Geological Survey. Tacoma, Washington.

²⁰ FEMA. Federal Emergency Management Agency. National Flood Insurance Program. Washington D.C. Available online at www.fema.gov.

²¹ “Snowstorms”. Rampo College. Resource Section for Meteorology. Available online at http://mset.rst2.edu/portfolios/k/khanna_n/meteorology/snowstorms.htm. October 2006.

Occasionally, however, the polar front becomes situated along a line from Hawaii through Oregon, and warm, moist, unstable air moves into the region.

The nature and extent of a flood event is the result of the hydrologic response of the landscape. Factors that affect this hydrologic response include soil texture and permeability, land cover and vegetation, land use and land management practices. Precipitation and snow melt, known collectively as runoff, follow one of three paths, or a combination of these paths, from the point of origin to a stream or depression: overland flow, shallow subsurface flow, or deep subsurface (“ground water”) flow. Each of these paths delivers water in differing quantities and rates. The character of the landscape will influence the relative allocation of the runoff and will, accordingly, affect the hydrologic response.

Unlike precipitation and ice formation, steps can be taken to mitigate flooding through manipulation or maintenance of the floodplain. Insufficient natural water storage capacity and changes to the landscape can be offset through water storage and conveyance systems that run the gamut from highly engineered structures to constructed wetlands. Careful planning of land use can build on the natural strengths of the hydrologic response. Re-vegetation of burned slopes diverts overland flow (fast and flood producing) to subsurface flow (slower and flood moderating).

The failure to recognize or acknowledge the extent of the natural hydrologic forces in an area has led to development and occupation of areas that can clearly be expected to flood on a regular basis. Despite this, communities are often surprised when the stream leaves its channel to occupy its floodplain. A past reliance on structural means to control floodwaters and “reclaim” portions of the floodplain has also contributed to inappropriate development and continued flood-related damages.

Development in or near floodplains increases the likelihood of flood damage. New developments near a floodplain add structures and people in flood areas thereby increasing, not the extent of the flood itself, but the impacts or damages that may be caused. New construction can also alter surface water flows by diverting water to new courses or increasing the amount of water that runs off impervious pavement and roof surfaces. This second effect diverts waters to places previously unaffected by flood issues. Unlike the weather and the landscape, this flood-contributing factor can be controlled. Development and occupation of the floodplain places individuals and property at risk. Such use can also increase the probability and severity of flood events (and consequent damage) downstream by reducing the water storage capacity of the floodplain, or by pushing the water further from the channel or in larger quantities downstream.²²

Second Order Hazard Events

Except for dam failure, flood events are typically caused by severe weather events such as thunder storms or rapid spring runoff. Lincoln County has a relatively low risk of major flood damages; however, flood events can trigger other types of hazard events that may be more damaging than the flood itself. The following chart outlines the interconnection between flood and other types of hazard events.

²² Planning and Flood Risk. Planning Policy Statement 15. The Planning Service, Department of Environment. June 2006. Available online at http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/pps15-flood-risk.pdf.

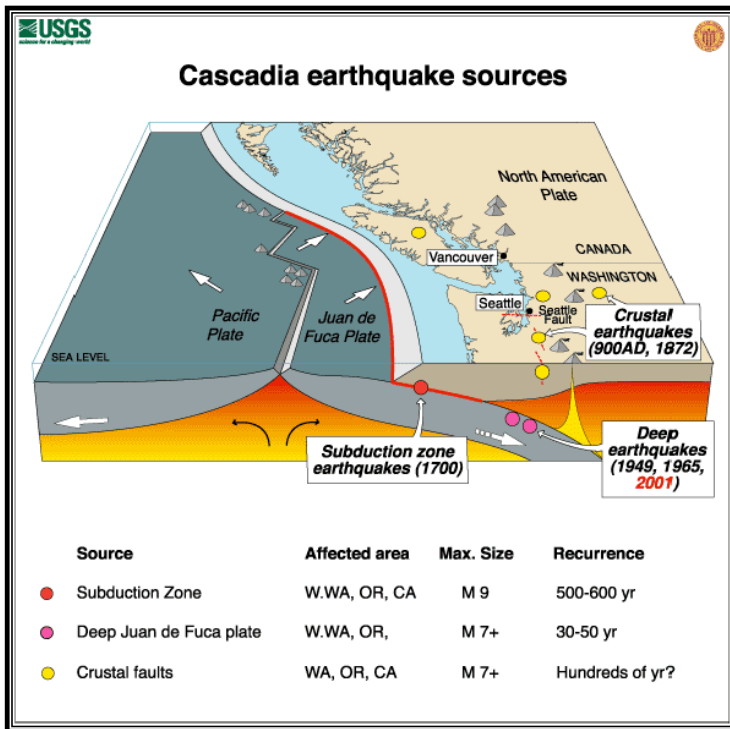
Table 4.1. Second-Order Hazards Related to Flood Events.

Related Causal Events	Related Effects
Severe Weather	Landslide
Dam Failure	Dam Failure
	Transportation Systems
	Infectious Disease/Epidemic/Pandemic
	Crop Loss
	Hazardous Materials

Earthquake

An earthquake is trembling of the ground resulting from the sudden shifting of rock beneath the earth's crust. Earthquakes may cause landslides and rupture dams. Severe earthquakes destroy power and telephone lines, gas, sewer, or water mains, which, in turn, may set off fires and/or hinder firefighting or rescue efforts. Earthquakes also may cause buildings and bridges to collapse.

Figure 4.1. Cascadia Earthquake Sources.



By far, earthquakes pose the largest single natural hazard exposure faced by Washington. They may affect large areas, cause great damage to structures, cause injury, loss of life and alter the socioeconomic functioning of the communities involved. The hazard of earthquakes varies from place to place, dependent upon the regional and local geology.

Earthquakes occur along faults, which are fractures or fracture zones in the earth across which there may be relative motion. If the rocks across a fault are forced to slide past one another, they do so in a *stick-slip* fashion; that is, they accumulate strain energy for centuries or millennia, then release it almost instantaneously. The energy released radiates outward from the source, or focus,

as a series of waves - an earthquake. The primary hazards of earthquakes are ground breaking, as the rocks slide past one another, and ground shaking, by seismic waves. Secondary earthquake hazards result from distortion of the surface materials such as water, soil, or structures.

Ground shaking may affect areas 65 miles or more from the epicenter (the point on the ground surface above the focus). As such, it is the greatest primary earthquake hazard. Ground shaking may cause seiche, the rhythmic sloshing of water in lakes or bays. It may also trigger the failure of snow (avalanche) or earth materials (landslide). Ground shaking can change the mechanical properties of some fine grained, saturated soils, whereupon they liquefy and act as a fluid (liquefaction). The dramatic reduction in bearing strength of such soils can cause buried utilities to rupture and otherwise undamaged buildings to collapse.

The earth's crust breaks along uneven lines called faults. Geologists locate these faults and determine which are active and inactive. This helps identify where the greatest earthquake potential exists. Many faults mapped by geologists, are inactive and have little earthquake potential; others are active and have a higher earthquake potential.

Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves

(tsunamis). Buildings with foundations resting on unconsolidated landfill and other unstable soil, or trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths and injuries and extensive property damage.

Aftershocks are smaller earthquakes that follow the main shock and can cause further damage to weakened buildings. Aftershocks can occur in the first hours, days, weeks, or even months after the quake. Some earthquakes are foreshocks, and a larger earthquake might occur.

Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related injuries result from collapsing walls, flying glass, and falling objects because of the ground shaking, or people trying to move more than a few feet during the shaking.²³

Damaging Pacific Northwest earthquakes can arise from three distinct source zones.

1. Deep earthquakes beneath the Puget Sound have damaged Seattle and Olympia
2. Shallow faults can cause intense local shaking – urban areas are especially vulnerable
3. An offshore subduction zone fault can cause strong shaking across the entire region²⁴

More than 1,000 earthquakes are recorded in Washington each year; a dozen or more of these produce significant shaking or damage. Large earthquakes in 1949 and 1965 killed 15 people and caused more than \$200 million (1984 dollars) property damage.

Earth scientists believe that most earthquakes are caused by slow movements inside the Earth that push against the Earth's brittle, relatively thin outer layer, causing the rocks to break suddenly. This outer layer is fragmented into several pieces, called plates. Most earthquakes occur at the boundaries of these plates. In Washington, the small Juan de Fuca plate off the coast of Washington, Oregon, and northern California is slowly moving eastward beneath a much larger plate that includes both the North American continent and the land beneath part of the Atlantic Ocean. Plate motions in the Pacific Northwest result in shallow earthquakes widely distributed over Washington and deep earthquakes in the western parts of Washington and Oregon. The movement of the Juan de Fuca plate beneath the North America plate is in many respects similar to the movements of plates in South America, Mexico, Japan, and Alaska, where the world's largest earthquakes occur.²⁵

We cannot predict precisely where, when, and how large the next destructive earthquake will be in Washington, but seismological and geological evidence supports several possibilities. Large earthquakes reported historically in Washington have most frequently occurred deep beneath the Puget Sound region.

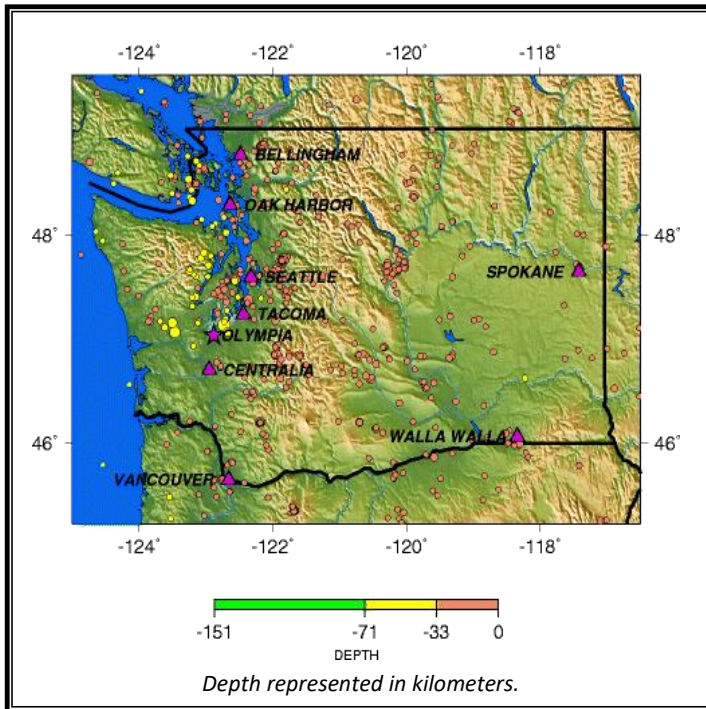
²³ FEMA. Federal Emergency Management Agency. Available online at www.fema.gov. September 2007.

²⁴ USGS. "Earthquake Hazards in Washington and Oregon Three Source Zones." U.S. Geological Survey. The Pacific Northwest Seismic Network. Available online at <http://www.geophys.washington.edu/SEIS/PNSN/>. August 2008.

²⁵ Noson, Linda Lawrance, Anthony Qamar, and Gerald Thorsen. "Washington State Earthquake Hazards". Washington Division of Geology and Earth Resources Information Circular 85. Olympia, Washington, 1988. http://file.dnr.wa.gov/publications/ger_ic85_earthquake_hazards_wa.pdf.

The most recent and best documented of these were the 1949 Olympia earthquake and the 1965 Seattle-Tacoma earthquake. The pattern of earthquake occurrence observed in Washington so far indicates that large earthquakes like the 1965 Seattle-Tacoma earthquake are likely to occur about every 35 years and large earthquakes similar to the 1949 Olympia earthquake about every 110 years.

Figure 4.2. Seismicity of Washington 1990-2006.



The largest earthquake now considered a possibility in the Pacific Northwest is a shallow subduction-style earthquake like recent destructive earthquakes in Alaska and Mexico, which had magnitudes greater than 8. An earthquake this large would be expected to occur along the coast of Washington or Oregon. Although we have no record of such large earthquakes in the Pacific Northwest within the last 150 years, some scientists believe that rocks and sediments exposed along the coasts of Washington and Oregon show evidence that as many as eight such earthquakes have occurred in the last several thousand years. This evidence indicates an average interval of time between subduction earthquakes of several hundred years.

The largest earthquake reported in Washington did not occur in the Puget Sound region, but rather at a shallow depth under the North Cascade Mountains. Recent studies in the southern Cascades near Mount St. Helens indicate that other areas in the Cascades may produce large, shallow earthquakes, comparable in size to the 1949 and 1965 Puget Sound earthquakes. The average interval of time between occurrences of such earthquakes in the Cascade Mountains is uncertain because they have occurred infrequently.²⁶

²⁶ Noson, Linda Lawrance, Anthony Qamar, and Gerald Thorsen. "Washington State Earthquake Hazards". Washington Division of Geology and Earth Resources Information Circular 85. Olympia, Washington, 1988. http://file.dnr.wa.gov/publications/ger_ic85_earthquake_hazards_wa.pdf.

Earthquakes are measured in two ways. One determines the power, the other describes the physical effects. Magnitude is calculated by seismologists from the relative size of seismograph tracings. This measurement has been named the Richter scale, a numerical gauge of earthquake energy ranging from 1.0 (very weak) to 9.0 (very strong). The Richter scale is most useful to scientists who compare the power in earthquakes. Magnitude is less useful to disaster planners and citizens, because power does not describe and classify the damage an earthquake can cause. The damage we see from earthquake shaking is due to several factors like distance from the epicenter and local rock types. Intensity defines a more useful measure of earthquake shaking for any one location. It is represented by the modified Mercalli scale. On the Mercalli scale, a value of I is the least intense motion and XII is the greatest ground shaking. Unlike magnitude, intensity can vary from place to place. In addition, intensity is not measured by machines. It is evaluated and categorized from people's reactions to events and the visible damage to man-made structures. Intensity is more useful to planners and communities because it can reasonably predict the effects of violent shaking for a local area.

Table 4.2. Largest Known Earthquakes Felt in Washington.²⁷

Year	Max. Modified Mercalli Intensity	Felt Area (sq km)	Location
1872	IX(3)	1,010,000	North Cascades
1877	VII(9)	48,000	Portland
1880	VII(10)		Puget Sound
1891	VII(10)		Puget Sound
1893	VII(8)	21,000	Southeastern Washington
1896	VII(12)		Puget Sound
1904	VII(5)	50,000	Olympic Peninsula
1909	VII(5)	150,000	Puget Sound
1915	VI(5)	77,000	North Cascades
1918	VIII(5)	650,000	Vancouver Island
1920	VII(14)	70,000	Puget Sound
1932	VII(15)	41,000	Central Cascades
1936	VII(14)	270,000	Southeastern Washington
1939	VII(14)	200,000	Puget Sound
1945	VII(14)	128,000	Central Cascades
1946	VII(14)	270,000	Puget Sound
1946	VIII(4)	1,096,000	Vancouver Island
1949	VIII(22)	594,000	Puget Sound
1949	VIII	2,220,000	Queen Charlotte Island
1959	VI(12)	64,000	North Cascades
1959	X(26)	1,586,000	Hebgen Lake (Montana)
1962	VII(14)	51,000	Portland
1965	VIII(14)	500,000	Puget Sound
1980	IV		Mount St Helens
1981	VII(39)	104,000	South Cascades
1983	VII(42)	800,000	Borah Peak (Idaho)
1993	VII		Klamath Falls, Or
2001			Nisqually, Wa

The largest earthquake now considered a possibility in the Pacific Northwest is a shallow subduction-style earthquake like the recent destructive earthquakes in Alaska and Mexico, which had magnitudes greater than 8. An earthquake this large would be expected to occur along the coast of Washington or Oregon. Although we have no record of such large earthquakes in the Pacific Northwest within the last 150 years, some scientists believe that rocks and sediments exposed along the coasts of Washington and Oregon show evidence that as many as eight such earthquakes have occurred in the last several thousand years. This evidence indicates an average interval of time between subduction earthquakes of several hundred years. A

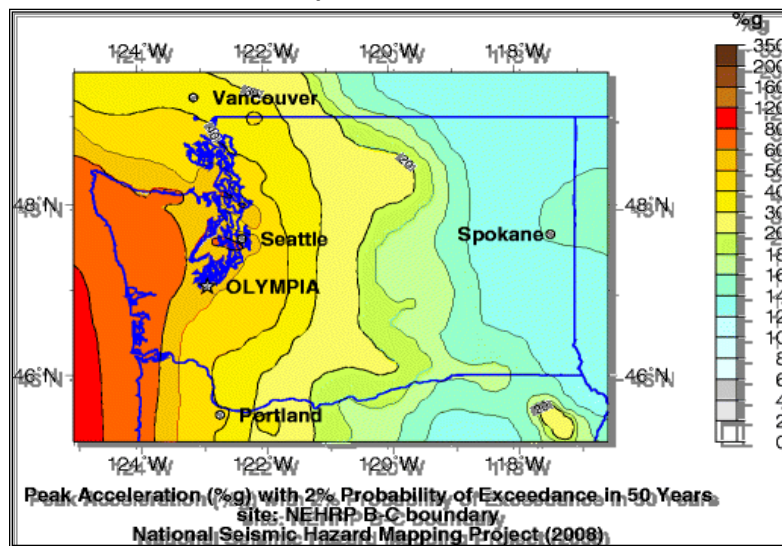
²⁷ Noson, Linda Lawrance, Anthony Qamar, and Gerald Thorsen. "Washington State Earthquake Hazards". Washington Division of Geology and Earth Resources Information Circular 85. Olympia, Washington, 1988. http://file.dnr.wa.gov/publications/ger_ic85_earthquake_hazards_wa.pdf.

magnitude 8 subduction earthquake would not only cause widespread dangerous ground shaking but would also likely produce water waves capable of inundating coastal areas in a matter of minutes.

Earthquake damage is primarily caused by ground shaking. However, wood frame houses, well attached to their foundations and built on firm ground, generally sustain little structural damage during earthquakes. In contrast, unreinforced brick buildings commonly suffer severe damage. Ground shaking may also displace and distort the non-structural parts of a building including windows, ceiling tiles, partitions and furniture-producing property damage and endangering life. Other hazards such as ground liquefaction is commonly triggered by strong ground shaking.

The U.S. Geological Survey has gathered data and produced maps of the nation, depicting earthquake shaking hazards. This information is essential for creating and updating seismic design provisions of building codes in the United States. The USGS Shaking Hazard maps for the United States are based on current information about the rate at which earthquakes occur in different areas and on how far strong shaking extends from quake sources. The values shown on the map are "peak ground acceleration (PGA) in percent of g with 2% probability of exceedance in 50 years". Therefore, the map represents longer-term likelihood of ground accelerations. The "2% probability of exceedance in 50 years" refers to the fact that earthquakes are somewhat random in occurrence. One cannot predict exactly whether an earthquake of a given size will or will not occur in the next 50 years. The map takes the random nature of earthquakes into account. It was constructed so that there is a 2% chance (2 chances in 100) that the ground acceleration values shown on the map will be exceeded in a 50-year time. This map is based on seismic activity and fault-slip rates and considers the frequency of occurrence of earthquakes of various magnitudes.²⁸ Locally, this hazard may be greater than that shown, because site geology may amplify ground motions.

Figure 4.3. Washington Peak Acceleration Map.



²⁸ Qamar, Anthony. "Earthquake Hazards in the Pacific Northwest." Cascadia Region Earthquake Workgroup. University of Washington Geophysics. January 2008.

The International Building Code (IBC), a nationwide industry standard, sets construction standards for different seismic zones in the nation. IBC seismic zone rankings for Washington are among the highest in the nation. When structures are built to these standards they have a better chance to withstand earthquakes.

Structures that follow the 1970 Uniform Building Codes (UBC), which are now replaced by the International Building Code, are generally less vulnerable to seismic damages because that was when the UBC started including seismic construction standards to be applied based on regional location. This stipulated that all structures be constructed to at least seismic risk Zone 2 Standards. The State of Washington adopted the UBC as its state building code in 1972, so it is assumed that buildings built after that date were built in conformance with UBC seismic standards and have less vulnerability. Obviously, issues such as code enforcement and code compliance are factors that could impact this assumption. However, for planning purposes, establishing this line of demarcation can be an effective tool for estimating vulnerability. In 1994, seismic risk Zone 3 Standards of the UBC went into effect in Washington, requiring all new construction to be capable of withstanding the effects of 0.3 times the force of gravity. More recent housing stock follows Zone 3 standards. In 2009, the state again upgraded the building code to follow International Building Code Standards.

The Washington State Legislature has also adopted the 2009 version of the International Residential Code as the official state building code starting on July 1, 2010. The 2009 IRC governs the new construction of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with separate means of egress. Provisions in the 2009 IRC for earthquake structural and foundation design are determined by the seismic design category of a proposed structure.²⁹

Future injuries and property losses from earthquake hazards can be reduced by considering these hazards when making decisions about land use, by designing structures that can undergo ground shaking without collapse, by securely attaching the non-structural elements of a building, and by educating the public about what to do before, during, and after an earthquake to protect life and property.³⁰

Second-Order Hazard Events

Earthquake events can result in other types of hazard incidents. In a disaster event, the first hazard event may not be the primary cause of damages or losses within the community. Historical earthquake events have often resulted in structural fires due to broken gas lines, candles, electrical malfunctions, etc. The following chart outlines the interconnection between earthquake hazards and other types of hazard events.

²⁹ Washington State Building Code. 2006. International Residential Code. State Building Code Council. Available online at <http://sbcc.wa.gov/page.aspx?nid=3>.

³⁰ Noson, Linda Lawrance, Anthony Qamar, and Gerald Thorsen. "Washington State Earthquake Hazards". Washington Division of Geology and Earth Resources Information Circular 85. Olympia, Washington, 1988. http://file.dnr.wa.gov/publications/ger_ic85_earthquake_hazards_wa.pdf.

Table 4.3. Second-Order Hazards Related to Earthquake Events.

Related Causal Events	Related Effects
None	Dam Failure
	Structural/Urban Fire
	Wildland Fire
	Transportation System
	Hazardous Materials
	Landslide
	Seiche
	Volcano

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Landslide

Landslide is a general term for a wide variety of down slope movements of earth materials that result in the perceptible downward and outward movement of soil, rock, and vegetation under the influence of gravity. The materials may move by falling, toppling, sliding, spreading, or flowing. Some landslides are rapid, occurring in seconds, whereas others may take hours, weeks, or even longer to develop. Although landslides usually occur on steep slopes, they also can occur in areas of low relief.³¹

Landslides can occur naturally or be triggered by human-related activities. Naturally-occurring landslides can occur on any terrain, given the right condition of soil, moisture, and the slope's angle. They are caused from an inherent weakness or instability in the rock or soil combined with one or more triggering events, such as heavy rain, rapid snow melt, flooding, earthquakes, vibrations and other natural causes. Other natural triggers include the removal of lateral support through the erosive power of streams, glaciers, waves, and longshore and tidal currents; through weathering, and wetting, drying and freeze-thaw cycles in surficial materials; or through land subsidence or faulting that creates new slopes. Long-term climate change can influence landslide occurrences through increased precipitation, ground saturation, and a rise in groundwater level, which reduces the strength and increases the weight of the soil.

Landslides can also be induced, accelerated or retarded by human actions. Human-related causes of landslides can include grading, terrain/slope cutting and filling, quarrying, removal of retaining walls, lowering of reservoirs, vibrations from explosions, machinery, road and air traffic, and excessive development. Normally stable slopes can fail if disturbed by development activities. Often, a slope can also become unstable by earthmoving, landscaping, or vegetation clearing activities. Changing drainage patterns, groundwater level, slope and surface water through agricultural or landscape irrigation, roof downspouts, septic-tank effluent or broken water or sewer lines can also generate landslides. Due to the geophysical or human factors that can induce a landslide event; they can occur in developed areas, undeveloped areas, or any areas where the terrain was altered for roads, houses, utilities, buildings, and even for lawns in one's backyard.³²

Washington State has six landslide provinces, each with its own characteristics. Lincoln County is part of the Columbia Basin province which is underlain by Tertiary volcanic rocks that in general are not prone to landslides. This province has extensive layers of sediments intermingling with basalt flows. Some large landslides have formed along the steep cliffs of the Columbia River Basalt Group that line the Columbia River and its tributaries. Landslides in this province include slope failures in bedrock and landslides in overlying sediments. Bedrock slope failures are most common in the form of very large ancient slumps or earth flows. A final triggering mechanism appears to have been over-steepening of a slope or removal of toe support by streams or glacial floods. Slide planes are generally in interbedded tuff or fine-grained filling valleys in the basalt. Sliding along Lake Roosevelt in northern Lincoln County is prevalent where Pleistocene deposits fill valleys cut into Paleozoic and Mesozoic igneous and metamorphic rocks.³³

Landslides range from shallow debris flows to deep-seated slumps. They destroy homes, businesses, and public buildings, undermine bridges, derail railroad cars, interrupt transportation infrastructure, damage

³¹ "Landslides". SAARC Disaster Management Center. New Delhi. Available online at <http://saarc-sdmc.nic.in/pdf/landslide.pdf>. Accessed March 2011.

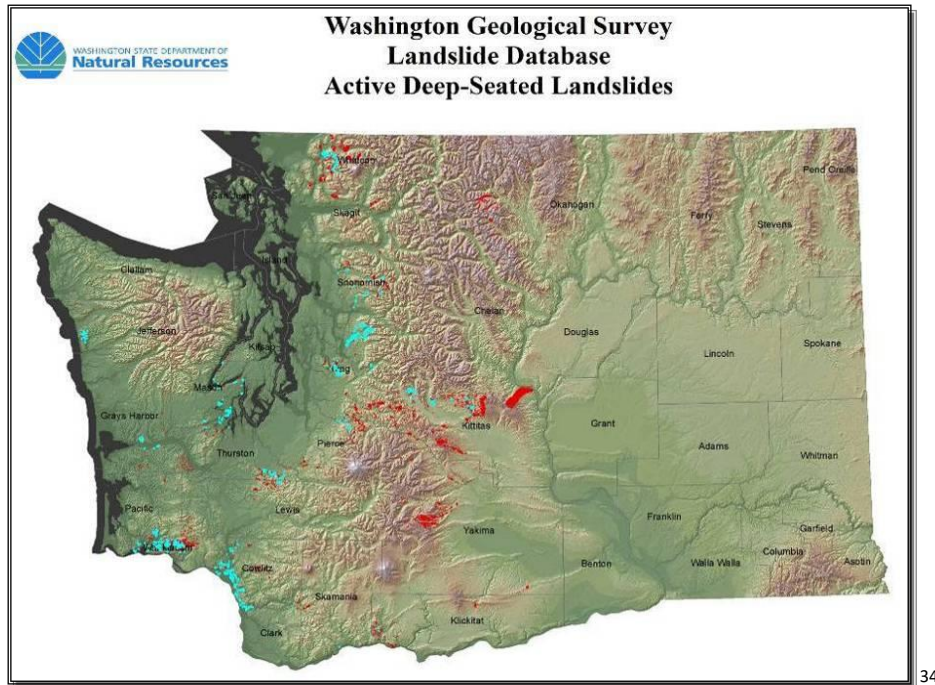
³² Tetra Tech. DMA 2000 Hazard Mitigation Plan. Onondaga County, New York. April 2010.

³³ Radbruch-Hall, Dorothy H., et al. "Landslide Overview Map of the Conterminous United States." Geological Survey Professional Paper 1183. United States Department of the Interior. Washington. 1982.

utilities, and take lives. Sinkholes affect roads and utilities. Losses often go unrecorded because insurance claims are not filed, no report is made to emergency management, there is no media coverage, or the transportation damages are recorded as regular maintenance.

Significant landslide events (those resulting in disasters) are rarer, but several have been recorded in the State. Major events had a significant impact on transportation, communities, and natural resources in 1977, 1979, 1986, 1989, 1997, 1998, 2006 (x2), 2007 (x2), 2009, and 2014. The significant event of 2014 was the Oso Mudslide that caused 43 deaths and destroyed 49 homes or other structures.

Figure 4.4. Washington Geological Survey Landslide Database.



Land stability cannot be absolutely predicted with current technology. The best design and construction measures are still vulnerable to slope failure. The amount of protection, usually correlated to cost, is proportional to the level of risk reduction. Debris and vegetation management is integral to prevent landslide damages. Corrective measures help but can often leave the property vulnerable to risk.

The following characteristics may be indicative of a landslide hazard area.

- Bluff retreat caused by sloughing of bluff sediments, resulting in a vertical bluff face with little vegetation
- Pre-existing landslide area
- Tension or ground cracks along or near the edge of the top of a bluff
- Structural damage caused by settling and cracking of building foundations and separation of steps from the main structure

³⁴ Washington DNR. Washington Geological Survey, Landslide Database. "Washington Landslide Blog." Washington Department of Natural Resources. Available online at <http://slidingthought.files.wordpress.com>.

- Toppling, bowed or jack-sawed trees
- Gullying and surface erosion
- Mid-slope ground water seepage from a bluff face

By studying the effects of landslides in slide prone areas we can plan for future landslides. More needs to be done to educate the public and to prevent development in vulnerable areas. WAC 365-190-080 states that geologically hazardous areas pose a threat to the health and safety of citizens when incompatible development is sited in areas of significant hazard. Some hazards can be mitigated by engineering, design, or construction so that risks are acceptable. When technology cannot reduce the risk to acceptable levels, building in hazardous areas should be avoided.³⁵

Stream and riverbank erosion, road building or other excavation can remove the toe or lateral slope and exacerbate landslides. Seismic or volcanic activity often triggers landslides as well. Urban and rural living with excavations, roads, drainage ways, landscape watering, logging, and agricultural irrigation may also disturb the solidity of landforms, triggering landslides. In general, any land use changes that affects drainage patterns or that increase erosion or change ground-water levels can augment the potential for landslide activity.

Landslides are a recurrent menace to waterways and highways and a threat to homes, schools, businesses, and other facilities. The unimpeded movement over roads—whether for commerce, public utilities, school, emergencies, police, recreation, or tourism—is essential to the normal functioning of Lincoln County. The disruption and dislocation of these or any other routes caused by landslides can quickly jeopardize travel and vital services. Although small slumps on cut and fill slopes along roads and highways is relatively common, nearly all the landslide risk in Lincoln County is associated with the steeper slopes along the Columbia River on the northern border. Most of the new development within the County is occurring along these slopes; thus, there are increasingly more structures and infrastructure at risk in this landslide prone area.

Second-Order Hazard Events

Landslide events are often caused by other types of hazard events, but the costs of cleaning up after a landslide including road and other infrastructure repairs can often dwarf the damages of the initial hazard. The following chart outlines the interconnection between landslides and other types of hazard events.

Related Causal Events	Related Effects
Flood	Transportation System
Earthquakes	
Wildland Fire	

³⁵ Canning, Douglas J. “Geologically Hazardous Areas”. Shorelands and Environmental Assistance Program. Washington Department of Ecology. Olympia, Washington.

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Severe Weather

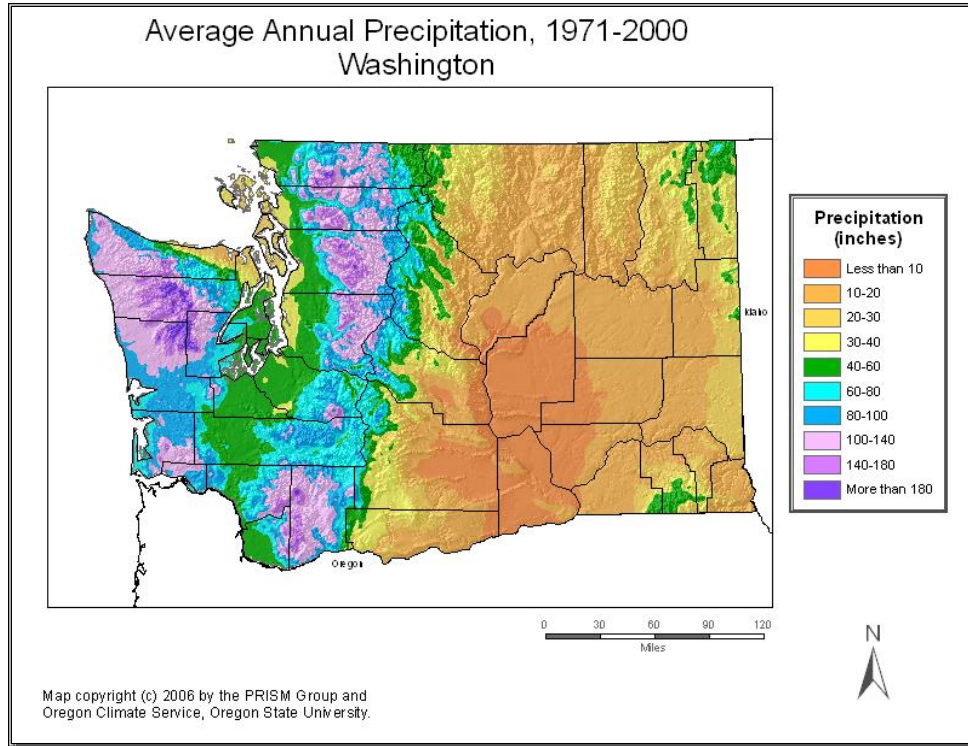
The overall weather patterns that affect Lincoln County are prevalent throughout eastern Washington. This section of the State is part of the large inland basin between the Cascade and Rocky Mountains. In an easterly and northerly direction, the Rocky Mountains shield the inland basin from the winter season's cold air masses traveling southward across Canada. In a westerly direction, the Cascade Range forms a barrier to the easterly movement of moist and comparatively mild air in winter and cool air in summer. Some of the air from each of these source regions reaches this section of the State and produces a climate which has some of the characteristics of both continental and marine types. Most of the air masses and weather systems crossing eastern Washington are traveling under the influence of the prevailing westerly winds. Infrequently, dry continental air masses enter the inland basin from the north or east. Major disaster declarations related to severe storms in Washington occurred in 1962, 1972, 1974, 1975, 1977, 1979, 1983, 1986 (x3), 1990 (x2), 1991, 1993, 1996, 1997, 2003, 2006 (x2), 2007 (x2), 2009 (x2), 2011, 2012 (x2), 2015, and 2016.

Lincoln County has a semi-arid continental type of climate which is hot and dry in the summer and cold and moderately humid in the winter. Temperatures are quite uniform over most of the county because terrain does not vary more than 1,200 feet from the lowest to highest elevations. Precipitation varies from an arid condition in the western part of the county to semi-arid conditions in the northeast. The entire area lies in the dry intermontane basin between the Cascades and the Rocky Mountain System.

The summer season of June through September is dry, characterized by occasional local showers or hail storms. The winter is cloudy and moderately humid with most precipitation received as snowfall. Winter rains and snow melt are absorbed by loam soils. A generally reliable snow cover through mid-winter protects winter wheat and barley sprouts from freezing temperatures. Precipitation is a major controlling factor in agriculture. Most crop farming is in a zone of 10 to 20-inch annual precipitation near the reliability margin for growing wheat. Climatic conditions require adherence to a dry farming system of summer fallowing grain crops and fall seeding to take advantage of maximum precipitation during the winter months. Precipitation in the northcentral Washington region is unreliable. Fluctuations in snow fall and rainfall, creating top soil moisture deficiencies, have caused failures or low yields of grain crops in the past.

During the coldest months, a loss of heat by radiation at night and moist air crossing the Cascades and mixing with the colder air in the inland basin results in cloudiness and occasional freezing drizzle. A "chinook" wind which produces a rapid rise in temperature occurs a few times each winter. Frost penetration in the soil depends to some extent on the vegetative cover, snow cover and the duration of low temperatures. In an average winter, frost in the soil can be expected to reach a depth of 10 to 20 inches. During a few of the colder winters, with little or no snow cover, frost has reached a depth of 25 to 35 inches.

Figure 4.5. Annual Precipitation Map for Washington³⁶.



Cold continental air moving southward through Canada will occasionally cross the higher mountains and follow the north-south valleys into the Columbia Basin. On clear, calm winter nights, the loss of heat by radiation from over a snow cover produces ideal conditions for low temperatures. The lowest temperature in the State, -48° F, was recorded December 30, 1965, at Mazama and Winthrop just to the northwest of Lincoln County.³⁷

Storms are naturally occurring atmospheric disturbances manifested in strong winds accompanied by rain, snow, or other precipitation, and often by thunder or lightning. All areas within this region are vulnerable to severe local storms. The affects are generally transportation problems and loss of utilities. When transportation accidents occur, motorists are stranded and schools and businesses close. The affects vary with the intensity of the storm, the level of preparation by local jurisdictions and residents, and the equipment and staff available to perform tasks to lessen the effects of severe local storms.

³⁶ PRISM Group. "Average Annual Precipitation, 1971-2000: Washington". PRISM Climate Service. Oregon State University. 2006. Available online at http://www.prism.oregonstate.edu/state_products/index.phtml?id=WA.

³⁷ WRCC. "Historical Climate Information: Climate Extremes by State". Western Regional Climate Center. Available online at <http://www.wrcc.dri.edu/>. Accessed March 2011.

Second-Order Hazard Events

Severe weather is often the causal factor in damages from other types of hazard incidents such as flood or wildland fire. The following chart outlines the interconnection between severe weather and other types of hazard events.

Table 4.5. Second-Order Hazards Related to Severe Weather Events.

Related Causal Events	Related Effects
None	Drought
	Crop Loss
	Tornado
	Wildland Fire
	Flood

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Wildland Fire

An informed discussion of fire mitigation is not complete until basic concepts that govern fire behavior are understood. In the broadest sense, wildland fire behavior describes how fires burn; the manner in which fuels ignite, how flames develop and how fire spreads across the landscape. The three major physical components that determine fire behavior are the fuels supporting the fire, topography in which the fire is burning, and the weather and atmospheric conditions during a fire event. At the landscape level, both topography and weather are beyond our control. We are powerless to control winds, temperature, relative humidity, atmospheric instability, slope, aspect, elevation, and landforms. It is beyond our control to alter these conditions, and thus impossible to alter fire behavior through their manipulation. When we attempt to alter how fires burn, we are left with manipulating the third component of the fire environment; fuels which support the fire. By altering fuel loading and fuel continuity across the landscape, we have the best opportunity to determine how fires burn.

A brief description of each of the fire environment elements follows to illustrate their effect on fire behavior.

Weather

Weather conditions contribute significantly to determining fire behavior. Wind, moisture, temperature, and relative humidity ultimately determine the rates at which fuels dry and vegetation cures, and whether fuel conditions become dry enough to sustain an ignition. Once conditions can sustain a fire, atmospheric stability and wind speed and direction can have a significant effect on fire behavior. Winds fan fires with oxygen, increasing the rate at which fire spreads across the landscape. Weather is the most unpredictable component governing fire behavior, constantly changing in time and across the landscape.

Topography

Fires burning in similar fuel conditions burn dramatically different under different topographic conditions. Topography alters heat transfer and localized weather conditions, which in turn influence vegetative growth and resulting fuels. Changes in slope and aspect can have significant influences on how fires burn. Generally speaking, north slopes tend to be cooler, wetter, more productive sites. This can lead to heavy fuel accumulations, with high fuel moistures, later curing of fuels, and lower rates of spread. In contrast, south and west slopes tend to receive more direct sun, and thus have the highest temperatures, lowest soil and fuel moistures, and lightest fuels. The combination of light fuels and dry sites lead to fires that typically display the highest rates of spread. These slopes also tend to be on the windward side of mountains. Thus, these slopes tend to be “available to burn” a greater portion of the year.

Slope also plays a significant role in fire spread, by allowing preheating of fuels upslope of the burning fire. As slope increases, rate of spread and flame lengths tend to increase. Therefore, we can expect the fastest rates of spread on steep, warm south and west slopes with fuels that are exposed to the wind.

Fuels

Fuel is any material that can ignite and burn. Fuels describe any organic material, dead or alive, found in the fire environment. Grasses, brush, branches, logs, logging slash, forest floor litter, conifer needles, and buildings are all examples. The physical properties and characteristics of fuels govern how fires burn. Fuel

loading, size and shape, moisture content and continuity and arrangement all influence fire behavior. The smaller and finer the fuels, the faster the potential rate of fire spread. Small fuels such as grass, needle litter and other fuels less than a quarter inch in diameter are most responsible for fire spread. In fact, “fine” fuels, with high surface to volume ratios, are considered the primary carriers of surface fire. This is apparent to anyone who has ever witnessed the speed at which grass fires burn. As fuel size increases, the rate of spread tends to decrease, as surface to volume ratio decreases. Fires in large fuels generally burn at a slower rate, but release much more energy, burn with much greater intensity. This increased energy release, or intensity, makes these fires more difficult to control. Thus, it is much easier to control a fire burning in grass than to control a fire burning in timber.

When burning under a forest canopy, the increased intensities can lead to torching (single trees becoming completely involved) and potentially development of crown fire (fire carried from tree crown to tree crown). That is, they release much more energy. Fuels are found in combinations of types, amounts, sizes, shapes, and arrangements. It is the unique combination of these factors, along with the topography and weather, which determine how fires will burn.

The study of fire behavior recognizes the dramatic and often-unexpected affect small changes in any single component has on how fires burn. It is impossible to speak in specific terms when predicting how a fire will burn under any given set of conditions. However, through countless observations and repeated research, some of the principles that govern fire behavior have been identified and are recognized.

Wildfire Hazard Assessment

Lincoln County was analyzed using a variety of models managed on a Geographic Information System (GIS) system. Physical features of the region including roads, streams, soils, elevation, and remotely sensed images were represented by data layers. Field visits were conducted by specialists from Northwest Management, Inc. and others. Discussions with area residents and local fire suppression professionals augmented field visits and provided insights into forest health issues and treatment options. This information was analyzed and combined to develop an objective assessment of wildland fire risk in the region.

Historic Fire Regime

Historical variability in fire regime is a conservative indicator of ecosystem sustainability, and thus, understanding the natural role of fire in ecosystems is necessary for proper fire management. Fire is one of the dominant processes in terrestrial systems that constrain vegetation patterns, habitats, and ultimately, species composition. Land managers need to understand historical fire regimes, the fire return interval (frequency) and fire severity prior to settlement by Euro-Americans, to be able to define ecologically appropriate goals and objectives for an area. Moreover, managers need spatially explicit knowledge of how historical fire regimes vary across the landscape.

Many ecological assessments are enhanced by the characterization of the historical range of variability which helps managers understand: (1) how the driving ecosystem processes vary from site to site; (2) how these processes affected ecosystems in the past; and (3) how these processes might affect the ecosystems of today and the future. Historical fire regimes are a critical component for characterizing the historical range of variability in fire-adapted ecosystems. Furthermore, understanding ecosystem departures provides the

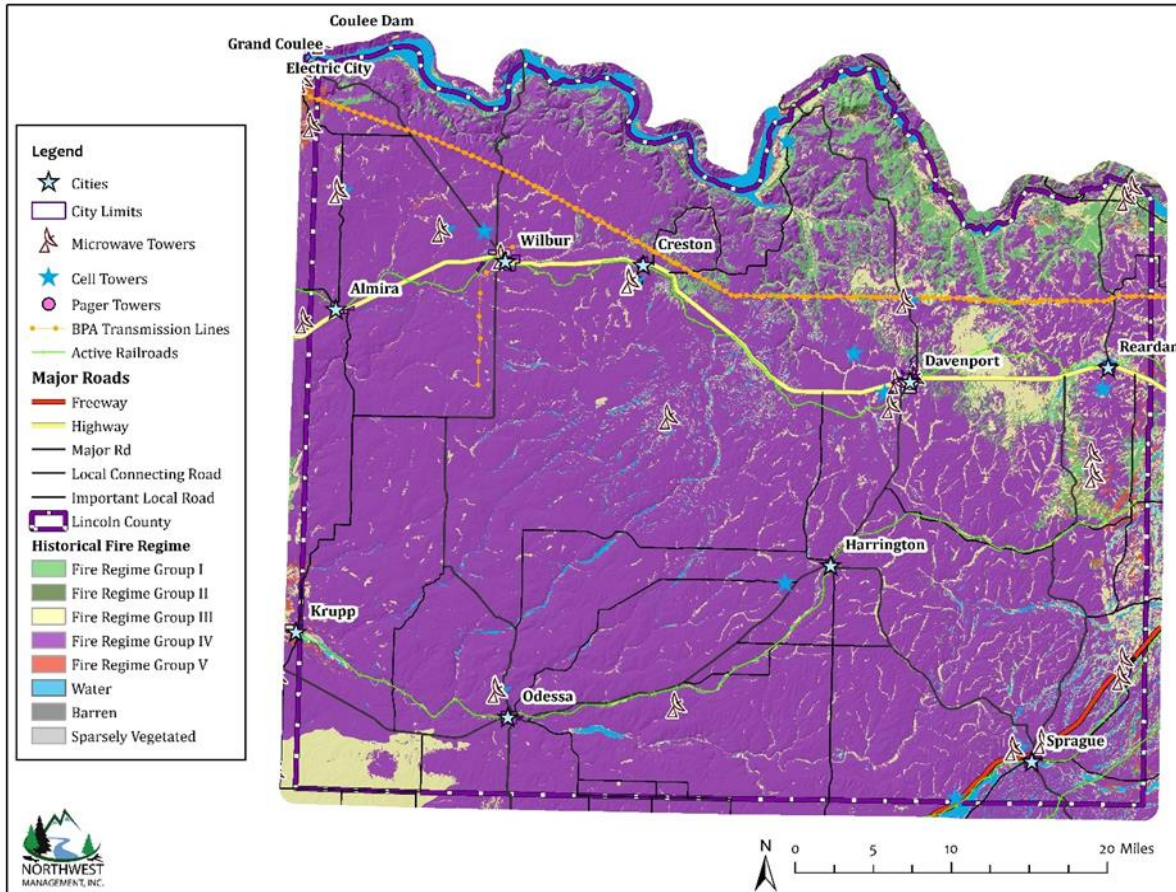
necessary context for managing sustainable ecosystems. Land managers need to understand how ecosystem processes and functions have changed prior to developing strategies to maintain or restore sustainable systems. In addition, the concept of departure is a key factor for assessing risks to ecosystem components. For example, the departure from historical fire regimes may serve as a useful proxy for the potential of severe fire effects from an ecological perspective.

Table 4.6. Assessment of Historic Fire Regimes in Lincoln County, Washington.

Regime	Description	Percent
1	<= 35 Year Fire Return Interval, Low and Mixed Severity	5%
2	<= 35 Year Fire Return Interval, Replacement Severity	<1%
3	35 - 200 Year Fire Return Interval, Low and Mixed Severity	10%
4	35 - 200 Year Fire Return Interval, Replacement Severity	83%
5	> 200 Year Fire Return Interval, Any Severity	<1%
	Water	1%
	Barren	<1%
	Sparsely Vegetated	<1%
Total		100%

The table above shows the amount of acreage in each defined historic fire regime in Lincoln County. The historic fire regime model in Lincoln County shows that much of the northern rim and channeled scabland areas historically had a 35 to 200-year fire return interval and typically experienced stand replacement severity fires. Areas historically characterized as open rangelands that have now been converted to agriculture also had a greater than 35-year fire return interval, but these areas burned at lower intensities. There are also small pockets in the northeastern corner of Lincoln County that historically had a less than 35-year fire return interval and burned at low to mixed severity. This difference is likely due to the more variable topography and presence of forest stands in this area.

Figure 4.6. Historic Fire Regime in Lincoln County, Washington.



Vegetation Condition Class

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning.^{38,39} Coarse scale definitions for historic fire regimes have been developed by Hardy et al⁴⁰ and Schmidt et al⁴¹ and interpreted for fire and fuels management by Hann and Bunnell.

³⁸ Agee, J. K. *Fire Ecology of the Pacific Northwest forests*. Oregon: Island Press. 1993.

³⁹ Brown, J. K. "Fire regimes and their relevance to ecosystem management." *Proceedings of Society of American Foresters National Convention*. Society of American Foresters. Washington, D.C. 1995. Pp 171-178.

⁴⁰ Hardy, C. C., et al. "Spatial data for national fire planning and fuel management." *International Journal of Wildland Fire*. 2001. Pp 353-372.

⁴¹ Schmidt, K. M., et al. "Development of coarse scale spatial data for wildland fire and fuel management." *General Technical Report, RMRS-GTR-87*. U.S. Department of Agriculture, Forest Service. Rocky Mountain Research Station. Fort Collins, Colorado. 2002.

A vegetation condition class (VCC) is a classification of the amount of departure from the historic regime.⁴² The three classes are based on low (VCC 1), moderate (VCC 2), and high (VCC 3) departure from the central tendency of the natural (historical) regime.^{43,44} The central tendency is a composite estimate of vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated natural disturbances. Low departure is considered to be within the natural (historical) range of variability, while moderate and high departures are outside.

An analysis of Vegetation Condition Classes in Lincoln County shows that the majority land in the county that has not been converted to agriculture (31%) is considered highly departed (55%) from its historic fire regime and associated vegetation and fuel characteristics. Less than 1% has a low departure and over 11% is considered moderately departed.

Table 4.7. Assessment of Vegetation Condition Class in Lincoln County, Washington.

Condition Class	Percent
Fire Regime Condition Class I	<1%
Fire Regime Condition Class II	11%
Fire Regime Condition Class III	55%
Water	1%
Urban	2%
Barren	<1%
Sparsely Vegetated	<1%
Agriculture	31%
Total	100%

The current Vegetation Condition Class model shows that much of Lincoln County is considered to be highly departed. A concentration of the highly departed vegetation occurs throughout the county. In addition, a majority of the county is dominated by various shrub species with a grass understory consisting of bluebunch wheatgrass, Idaho fescue, and other grass species. The current structure and density of the shrublands in many areas makes it susceptible to health issues from competition, insects, and disease. The current fire severity model suggests that a higher severity fire than historical norms would be expected in these areas.

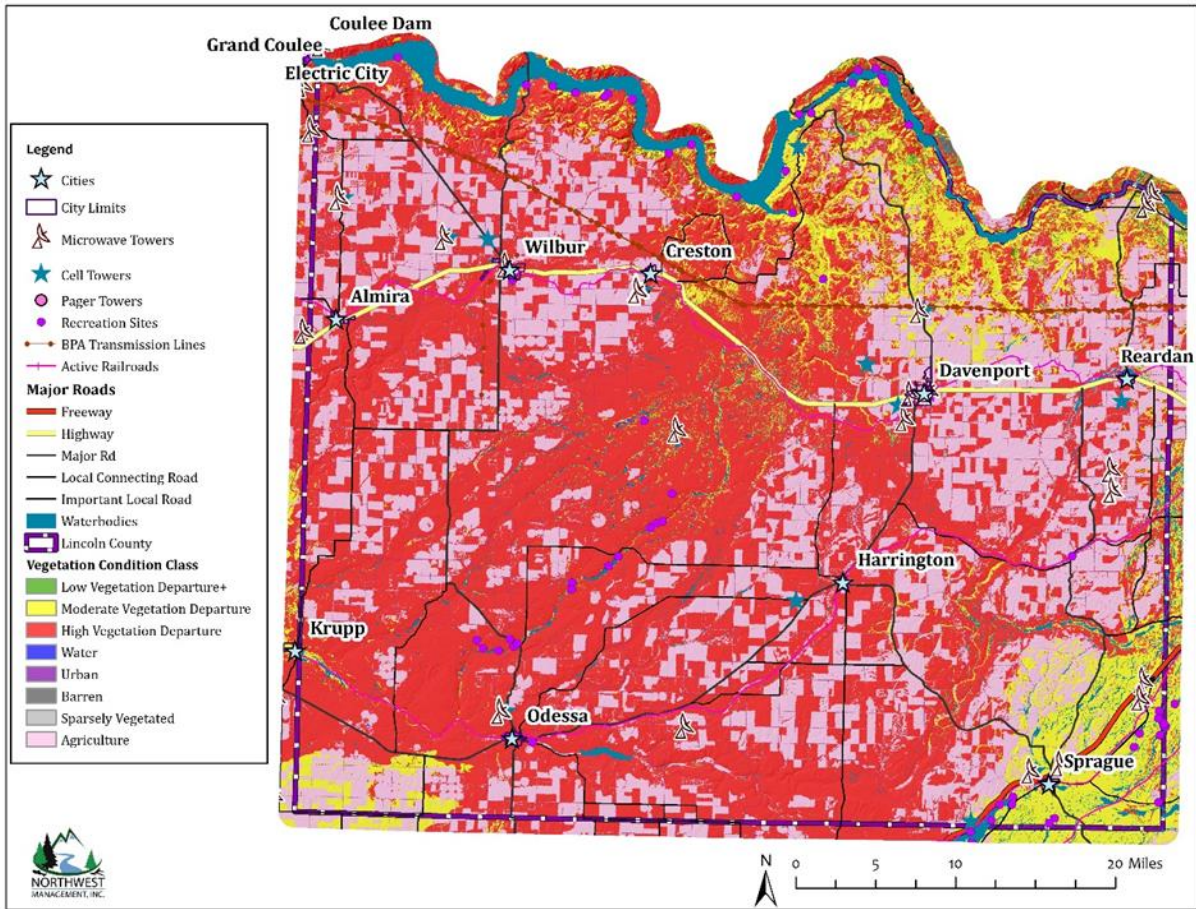
A map depicting Vegetation Condition Class as well as a more in-depth explanation of VCC is presented in Appendices 1 and 3.

⁴² Hann, W. J. and D. L. Bunnell. "Fire and land management planning and implementation across multiple scales." International Journal of Wildland Fire. 2001. Pp 389-403.

⁴³ Hardy, C. C., et al. "Spatial data for national fire planning and fuel management." International Journal of Wildland Fire. 2001. Pp 353-372.

⁴⁴ Schmidt, K. M., et al. "Development of coarse scale spatial data for wildland fire and fuel management." General Technical Report, RMRS-GTR-87. U.S. Department of Agriculture, Forest Service. Rocky Mountain Research Station. Fort Collins, Colorado. 2002.

Figure 4.7. Vegetation Condition Class in Lincoln County, Washington.



Wildland Urban Interface

The wildland-urban interface (WUI) has gained attention through efforts targeted at wildfire mitigation; however, this analysis technique is also useful when considering other hazards because the concept looks at where people and structures are concentrated in any region.

A key component in meeting the underlying need for protection of people and structures is the protection and treatment of hazards in the wildland-urban interface. The wildland-urban interface refers to areas where wildland vegetation meets urban developments or where forest fuels meet urban fuels such as houses. The WUI encompasses not only the interface (areas immediately adjacent to urban development), but also the surrounding vegetation and topography. Reducing the hazard in the wildland-urban interface requires the efforts of federal, state, and local agencies and private individuals.⁴⁵ “The role of [most] federal agencies in the wildland-urban interface includes wildland firefighting, hazard fuels reduction, cooperative prevention and education, and technical experience. Structural fire protection [during a wildfire] in the wildland-urban

⁴⁵ Norton, P. Bear Valley National Wildlife Refuge Fire Hazard Reduction Project: Final Environmental Assessment. Fish and Wildlife Services, Bear Valley Wildlife Refuge. June 20, 2002.

interface is [largely] the responsibility of Tribal, state, and local governments".⁴⁶ The role of the federal agencies in Lincoln County is and will be much more limited. Property owners share a responsibility to protect their residences and businesses and minimize danger by creating defensible areas around them and taking other measures to minimize the risks to their structures.⁴⁷ With treatment, a wildland-urban interface can provide firefighters a defensible area from which to suppress wildland fires or defend communities against other hazard risks. In addition, a wildland-urban interface that is properly treated will be less likely to sustain a crown fire that enters or originates within it.⁴⁸

By reducing hazardous fuel loads, ladder fuels, and tree densities, and creating new and reinforcing existing defensible space, landowners can protect the wildland-urban interface, the biological resources of the management area, and adjacent property owners by:

- minimizing the potential of high-severity ground or crown fires entering or leaving the area;
- reducing the potential for firebrands (embers carried by the wind in front of the wildfire) impacting the WUI. Research indicates that flying sparks and embers (firebrands) from a crown fire can ignite additional wildfires as far as 1¼ miles away during periods of extreme fire weather and fire behavior;⁴⁹
- improving defensible space in the immediate areas for suppression efforts in the event of wildland fire.

Three WUI conditions have been identified (Federal Register 66(3), January 4, 2001) for use in wildfire control efforts. These include the Interface Condition, Intermix Condition, and Occluded Condition. Descriptions of each are as follows:

- **Interface Condition** – a situation where structures abut wildland fuels. There is a clear line of demarcation between the structures and the wildland fuels along roads or back fences. The development density for an interface condition is usually 3+ structures per acre;
- **Intermix Condition** – a situation where structures are scattered throughout a wildland area. There is no clear line of demarcation; the wildland fuels are continuous outside of and within the developed area. The development density in the intermix ranges from structures very close together to one structure per 40 acres; and

⁴⁶ USFS. 2001. United States Department of Agriculture, Forest Service. Wildland Urban Interface. Web page. Date accessed: 25 September 2001. Accessed at: <http://www.fs.fed.us/r3/sfe/fire/urbanint.html>

⁴⁷ USFS. 2001. United States Department of Agriculture, Forest Service. Wildland Urban Interface. Web page. Date accessed: 25 September 2001. Accessed at: <http://www.fs.fed.us/r3/sfe/fire/urbanint.html>

⁴⁸ Norton, P. Bear Valley National Wildlife Refuge Fire Hazard Reduction Project: Final Environmental Assessment. Fish and Wildlife Services, Bear Valley Wildlife Refuge. June 20, 2002.

⁴⁹ McCoy, L. K., et al. Cerro Grand Fire Behavior Narrative. 2001.

- **Occluded Condition** – a situation, normally within a city, where structures abut an island of wildland fuels (park or open space). There is a clear line of demarcation between the structures and the wildland fuels along roads and fences. The development density for an occluded condition is usually similar to that found in the interface condition and the occluded area is usually less than 1,000 acres in size.

In addition to these classifications detailed in the Federal Register, Lincoln County has included two additional classifications to augment these categories:

- **Rural Condition** – a situation where the scattered small clusters of structures (ranches, farms, resorts, or summer cabins) are exposed to wildland fuels. There may be miles between these clusters.
- **High Density Urban Areas** – those areas generally identified by the population density consistent with the location of incorporated cities, however, the boundary is not necessarily set by the location of city boundaries or urban growth boundaries; it is set by very high population densities (more than 7-10 structures per acre).

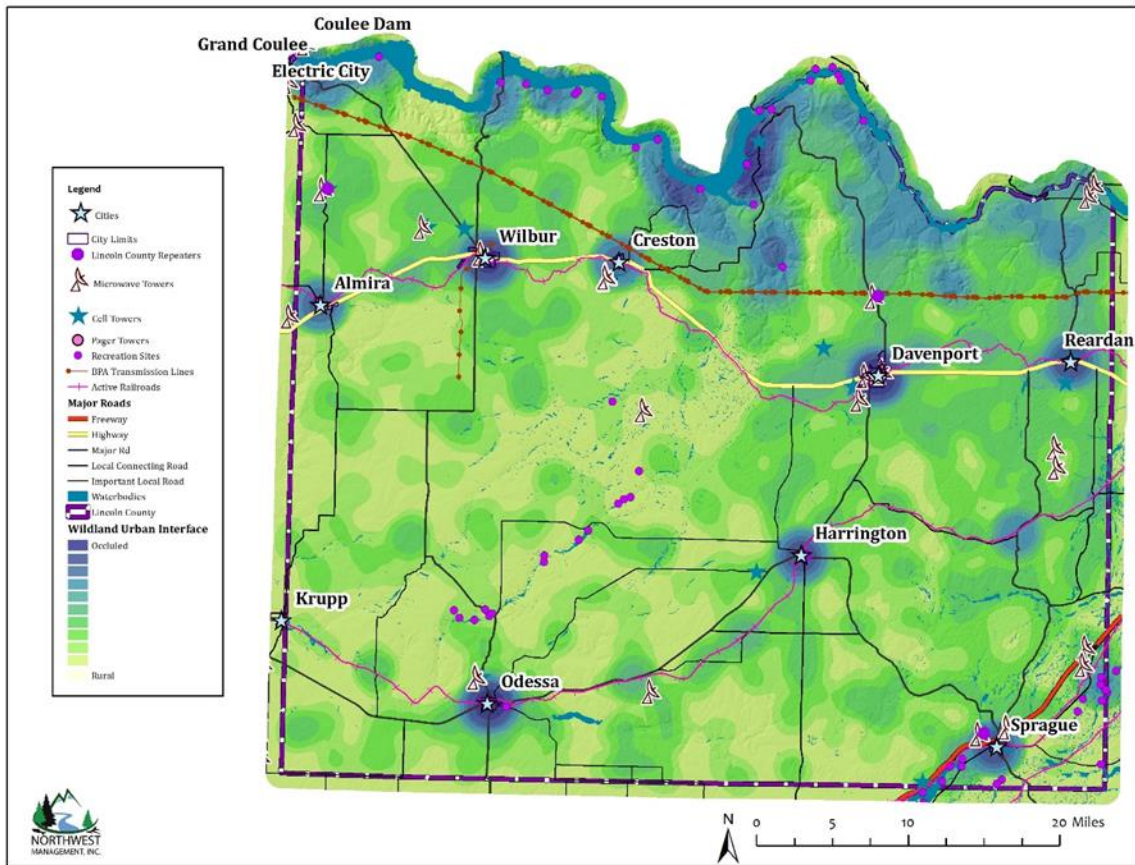
Lincoln County’s wildland-urban interface (WUI) is based on population density. Relative population density across the county is estimated using a GIS-based kernel density population model that uses object locations to produce, through statistical analysis, concentric rings or areas of consistent density. To graphically identify relative population density across the county, structure locations are used as an estimate of population density. For this analysis, physical addresses were used as an estimate of structure location. Lincoln County’s GIS department produced a 911 address data layer that was used to represent structure location as input for the model. The resulting output identified the extent and level of population density throughout the county. Highly populated areas are easily discernable from low population areas using this method, which enables the determination of urban versus rural populations. Rural areas of the WUI have an approximate density of one structure per 40 acres. The model also showed several small islands where no structures were recorded. Based on the planning committee’s review and discussion, the final WUI boundary output was adjusted to incorporate the non-populated areas (no structures) due to their small size and scattered nature as well as their location in high fire risk areas.

By evaluating structure density in this way, WUI areas can be identified on maps by using mathematical formulae and population density indexes. The resulting population density indexes create concentric circles showing high density areas, interface, and intermix condition WUI, as well as rural condition WUI (as defined above). This portion of the analysis allows us to “see” where the highest concentrations of structures are in reference to high risk landscapes, limiting infrastructure, and other points of concern.

The WUI, as defined here, is unbiased and consistent, allows for edge matching with other counties, and most importantly – it addresses all the county, not just federally identified communities at risk. It is a planning tool showing where homes and businesses are located and the density of those structures leading to identified WUI categories. It can be determined again in the future, using the same criteria, to show how the WUI has changed in response to increasing population densities. It uses a repeatable and reliable analysis process that is unbiased.

The Healthy Forests Restoration Act makes a clear designation that the location of the WUI is at the determination of the county or reservation when a formal and adopted CWPP is in place. It further states that the federal agencies are obligated to use this WUI designation for all Healthy Forests Restoration Act purposes. The Lincoln County Community Wildfire Protection Plan planning committee evaluated a variety of different approaches to determining the WUI for the county and selected this approach and has adopted it for these purposes. In addition to a formal WUI map for use by the federal agencies, it is hoped that it will serve as a planning tool for the county, the Washington Department of Natural Resources, and local fire districts.

Figure 4.8. Wildland-Urban Interface Map for Lincoln County, Washington.



Second-Order Hazard Events

Wildland fires can be caused naturally by lightning or by various technological sources. Wildland fire can also be a secondary effect of another type of hazard. The following chart outlines the interconnection between wildland fire and other types of hazard events.

Table 4.8. Second-Order Hazards Related to Wildland Fire Events.

Related Causal Events	Related Effects
Severe Weather	Structural/Urban Fire
Drought	Civil Unrest
Earthquake	Landslide
Transportation Systems	Transportation Systems
Hazardous Materials	
Structural/Urban Fire	

Avalanche

An avalanche is a rapid flow of snow down slope from either natural triggers or human activity. Typically occurring in mountainous terrain, an avalanche can mix air and water with the descending snow. Powerful avalanches have the capability to entrain ice, rocks, trees, and other material on the slope. Avalanches are primarily composed of flowing snow and are distinct from mudslides, rock slides, rock avalanches, and serac collapses on an icefall.⁵⁰ Avalanches are uncommon in Lincoln County due to the arid climate, but the steep northern aspects on the northern border of the county do have the potential for significant damages caused by avalanches in heavier snow fall years.

There are two types of avalanches; point release (loose snow) and slab. A loose snow or point release avalanche has a trademark tear drop or upside-down V track in the snow. As the name suggests this is essentially loose or unconsolidated snow that initiated from a point source, at or near the surface of the snowpack, commonly near exposed rock. During the typical settling process during and after a storm, snow tends to become unstable before it begins to bond together. This can result in loose snow avalanches. Adding heat to the snowpack can also cause the surface layers to loose their strength and sluff, or produce a point release avalanche, which is why they are often seen near rocks. The added heat absorbed by the darker colored rock can weaken or melt the surrounding snow faster.

Loose snow avalanches are generally low hazard events as their size is often too small to present a significant danger, but this is not always the case. Late in the spring or after a heavy rain when the snowpack is saturated with water, it is possible for fairly large and destructive point release avalanches to occur.

Figure 4.9. Photo of Loose Snow Avalanche.



The much more dangerous avalanche that is responsible for the vast majority of fatalities is the slab avalanche. A slab avalanche is a cohesive layer of snow that fractures (breaks) within the snowpack and propagates (spreads) out as a unit, sliding on another layer of snow or the ground. Every time snow falls it adds a new layer to the winter pack. Over time, many of these layers will settle and become surprisingly stiff and brittle. If after every storm the new snow settles and bonds to the layer below it, the sheets become generally stable snowpack.

If a layer of snow doesn't bond to the pack below, as it settles it becomes more brittle and successive snows add more weight. Unless something changes, eventually the added weight will cause the buried layer to break. Slab avalanches are generally much more dangerous than a point release.

⁵⁰ Wikipedia. "Avalanche". Wikimedia Foundation, Inc. March 2011. Available online at <http://en.wikipedia.org/wiki/Avalanche>.

A slab avalanche can range from less than a few cubic meters in size to massive catastrophic releases that destroy entire villages. The vast majority of avalanche fatalities are caused by a slab avalanche.

Figure 4.10. Photo of Slab Avalanche.



An avalanche can also come in either a dry or wet variety. As the name suggests, a dry avalanche involves snow that is dry and relatively cold (for snow). A dry avalanche can exceed 200km/hr and may produce a powder cloud as the avalanche gains speed. If there has been a significant amount of rain, or temperatures are regularly above freezing, then the snow will become moist, wet, or even saturated; this is a wet avalanche. A wet avalanche is different in that they tend to move more slowly, do not produce powder clouds, and

they follow the natural terrain features such as gulleys or troughs more accurately. A wet avalanche also has more mass and an even greater destructive potential than a dry avalanche.⁵¹

Because avalanche conditions are the result of weather patterns and topography, it is extremely difficult to forecast the precise degree of danger for any specific feature or slope. Local weather variations can produce significant differences in the local avalanche hazard. It is; however, possible to identify general patterns and even particular slopes, aspects, and features of special concern. By monitoring the weather patterns of a given region throughout the winter and making regular field observations, it is possible to give an accurate assessment of the avalanche danger. None of the slopes along the northern border of Lincoln County have been identified as having any avalanche danger on a regular basis. Most of the concern in this area would be associated with small slides along roadways after heavy snow falls. This area has a primarily northern aspect; thus, snow can accumulate throughout the winter if temperatures remain consistently below freezing.

Avalanches have killed more than 190 people in the past century in Washington State, exceeding deaths from any other natural hazard. One of the nation's worst avalanche disasters occurred in 1910 when massive avalanches hit two trains stopped on the west side of Stevens Pass; 96 people were killed. Avalanches kill one to two people, on average, every year in Washington, although many more are involved in avalanche accidents that do not result in fatalities. Avalanches occur in four mountain ranges in the state – the Cascade Range, which divides the state east and west, the Olympic Mountains in northwest Washington, the Blue Mountains in southeast Washington, and the Selkirk Mountains in northeast Washington. The potential avalanche season in Lincoln County begins in late November and continues until early spring.

⁵¹ The Avalanche Site. "An Introduction to Avalanche Basics." Shadow Light Productions. Available online at <http://www.virtualmountains.ca/>. Accessed March 2011.

Second-Order Hazard Events

Avalanche events are usually caused by a series of weather-related events, but other types of hazards can trigger an avalanche. The following chart outlines the interconnection between avalanche and other types of hazard events.

Table 4.9. Second-Order Hazards Related to Avalanche Events.

Related Causal Events	Related Effects
Severe Weather	Transportation System
Earthquakes	

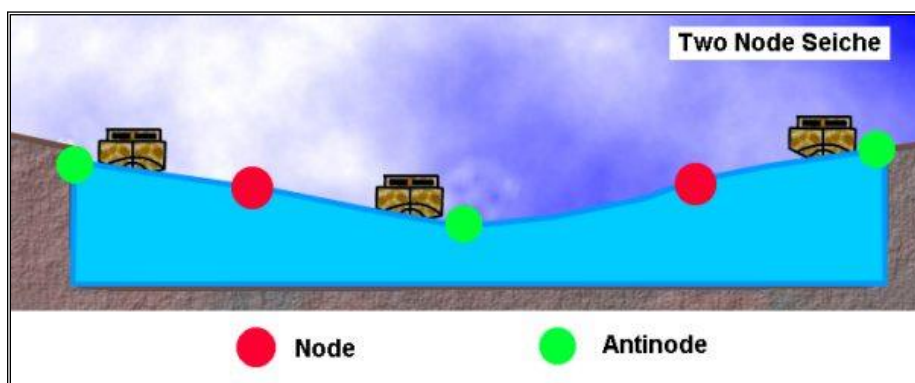
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Seiche

While a true tsunami will never strike Lincoln County, the Lake Roosevelt shoreline on the northern fringe of the County, is subject to the danger presented by a seiche, a sudden, large wave that can cause loss of life and property damage. Seiches (pronounced “saysh”) are similar to tsunamis but are typically defined as standing waves on a closed or semi-closed body of water such as rivers, reservoirs, ponds, and lakes. Seiches are caused by seismic activity or storm fronts moving rapidly across a large body of water. The US Army Corp of Engineers definition of a seiche does not include landslides as a causal factor; however, when they occur on a closed or semi-closed body of water, landslide caused waves are often referred to as seiches rather than tsunamis.⁵²

The effect of a seiche is caused by resonances in a body of water that has been disturbed by one or more of several factors, most often meteorological effects (wind and atmospheric pressure variations), seismic activity, or landslides. Gravity always seeks to restore the horizontal surface of a body of liquid water, as this represents the configuration in which the water is in hydrostatic equilibrium. Vertical harmonic motion produces an impulse that travels the length of the basin at a velocity that depends on the depth of the water. The impulse is reflected from the end of the basin generating interference. Repeated reflections produce standing waves with one or more nodes, or points, that experience no vertical motion. The frequency of the oscillation is determined by the size of the basin, its depth and contours, and the water temperature.⁵³

Figure 4.11. Illustration of a Two-Node Seiche.



Although highly sophisticated tsunami warning systems exist along the Pacific coast, inland seiches have the potential to cause extreme damage to waterways and shoreline communities due to their infrequency and the lack of a warning system. Residences, businesses, and other resources along the Lake Roosevelt shoreline where these localized events might occur may be severely damaged by a series of high waves.

To date, seiches on Lake Roosevelt have exclusively been the result of landslides. Reports of these events suggest that only one wave hit the shoreline opposite of a landslide. The two major geologic parameters that

⁵² Earthguide. “The Motion of a Seiche.” University of California. April 2006. Available online at http://earthguide.ucsd.edu/earthguide/diagrams/waves/swf/wave_seiche.html.

⁵³ Wikipedia. “Seiche.” Wikipedia Foundation, Inc. Available online at <http://en.wikipedia.org/wiki/Seiche>. Accessed March 17, 2011.

affect the generation of a water wave from a landslide are the volume of the slide mass and the motion of the mass as it reaches the water.

Lake Roosevelt Seiches (Tsunamis)

Landslides into Lake Roosevelt generated numerous seiches (commonly recorded as tsunamis) from 1944 to 1953 after Grand Coulee Dam created the lake on the Columbia River. Most seiches on Lake Roosevelt have generated large waves (30 to 60 feet in height) that struck the opposite shore of the lake, with some waves observed miles from the source. At least seven seiches have been recorded on Lake Roosevelt since 1944⁵⁴, but only two reportedly caused damage.

February 23, 1951 – A 100,000 to 200,000 cubic yard landslide just north of Kettle Falls created a wave that picked up logs at the Harter Lumber Company Mill and flung them through the mill 10 feet above lake level.

October 13, 1952 – A landslide 98 miles upstream of Grand Coulee Dam created a wave that broke tugboats and barges loose from their moorings at the Lafferty Transportation Company six miles away. It also swept logs and other debris over a large area above lake level.⁵⁵

Second Order Hazard Events

Seiches are always caused by some other type of hazard or weather event and, while they can be damaging, they do not trigger other types of hazard incidents. The following chart outlines the interconnection between seiches and other types of hazard events.

Table 4.10. Second-Order Hazards Related to Seiche Events.

Related Causal Events	Related Effects
Landslide	None
Severe Weather	
Earthquake	

⁵⁴ Sliding Thought Blog. Washington’s Landslide Blog. Available online at <http://slidingthought.wordpress.com/about/>. April 2009.

⁵⁵ Washington Military Department Emergency Management Division. [Washington State Hazard Mitigation Plan](http://www.emd.wa.gov/plans/washington_state_hazard_mitigation_plan.shtml). Available online at http://www.emd.wa.gov/plans/washington_state_hazard_mitigation_plan.shtml. January 2008.

Volcano

The Cascade Range of the Pacific Northwest has more than a dozen potentially active volcanoes. Cascade volcanoes tend to erupt explosively, and on average two eruptions occur per century—the most recent were at Mount St. Helens, Washington (1980–86 and 2004–8), and Lassen Peak, California (1914–17). On May 18, 1980, after 2 months of earthquakes and minor eruptions, Mount St. Helens, Washington, exploded in one of the most devastating volcanic eruptions of the 20th century. Although less than 0.1 cubic mile of molten rock (magma) was erupted, 57 people died, and damage exceeded \$1 billion. Fortunately, most people in the area were able to evacuate safely before the eruption because public officials had been alerted to the danger by U.S. Geological Survey (USGS) and other scientists. To help protect the Pacific Northwest’s rapidly expanding population, USGS scientists at the Cascades Volcano Observatory in Vancouver, Washington, monitor and assess the hazards posed by the region’s volcanoes.⁵⁶

There are no active volcanoes in Lincoln County; however, communities in this area could be directly affected by an eruption from any one of the Cascade volcanoes. During an eruption, such as the 1980 eruption of Mount St. Helens, Lincoln County is not likely to be directly affected by lava flows, pyroclastic flows, landslides, or lahars; however, this region may be indirectly impacted due to damming of waterways, reduced air and water quality, acid rain, and ash fallout.

An explosive eruption blasts solid and molten rock fragments (tephra) and volcanic gases into the air with tremendous force. The largest rock fragments (bombs) usually fall back to the ground within 2 miles of the vent. Small fragments (less than about 0.1 inch across) of volcanic glass, minerals, and rock (ash) rise high into the air, forming a huge, billowing eruption column.

Eruption columns can grow rapidly and reach more than 12 miles above a volcano in less than 30 minutes, forming an eruption cloud. The volcanic ash in the cloud can pose a serious hazard to aviation. During the past 15 years, about 80 commercial jets have been damaged by inadvertently flying into ash clouds, and several have nearly crashed because of engine failure. Large eruption clouds can extend hundreds of miles downwind, resulting in ash fall over enormous areas; the wind carries the smallest ash particles the farthest. Ash from the May 18, 1980, eruption of Mount St. Helens, Washington, fell over an area of 22,000 square miles in the Western United States. Heavy ash fall can collapse buildings, and even minor ash fall can damage crops, electronics, and machinery.

Volcanoes emit gases during eruptions. Even when a volcano is not erupting, cracks in the ground allow gases to reach the surface through small openings called fumaroles. More than ninety percent of all gas emitted by volcanoes is water vapor (steam), most of which is heated ground water (underground water from rain fall and streams). Other common volcanic gases are carbon dioxide, sulfur dioxide, hydrogen sulfide, hydrogen, and fluorine. Sulfur dioxide gas can react with water droplets in the atmosphere to create acid rain, which causes corrosion and harms vegetation. Carbon dioxide is heavier than air and can be trapped in low areas in concentrations that are deadly to people and animals. Fluorine, which in high concentrations is toxic, can be

⁵⁶ Dzurisim, Dan, et al. “Living with Volcanic Risk in the Cascades.” U.S. Geological Survey – Reducing the Risk from Volcano Hazards. USGS. Vancouver, Washington. 1997.

adsorbed onto volcanic ash particles that later fall to the ground. The fluorine on the particles can poison livestock grazing on ash-coated grass and also contaminate domestic water supplies.⁵⁷

The volcanoes of the Cascade Range, which stretches from northern California into British Columbia, have produced more than 100 eruptions, most of them explosive, in just the past few thousand years. However, individual Cascade volcanoes can lie dormant for many centuries between eruptions, and the great risk posed by volcanic activity in the region is therefore not always apparent.

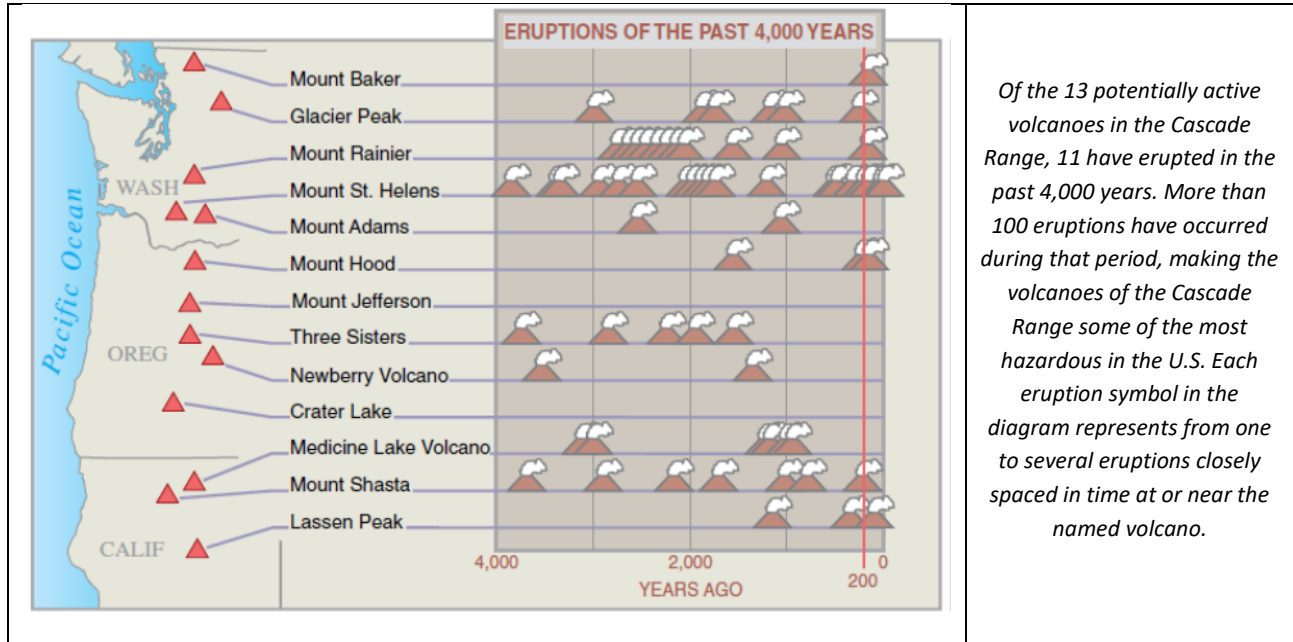
When Cascade volcanoes do erupt, high-speed avalanches of hot ash and rock (pyroclastic flows), lava flows, and landslides can devastate areas 10 or more miles away; and huge mudflows of volcanic ash and debris, called lahars, can inundate valleys more than 50 miles downstream. Falling ash from explosive eruptions can disrupt human activities hundreds of miles downwind, and drifting clouds of fine ash can cause severe damage to jet aircraft even thousands of miles away. Erupting Cascade volcanoes are more prone than other U.S. volcanoes to explosive volcanic activity, resulting in pyroclastic flows. These are hot, often incandescent mixtures of volcanic fragments and gases that sweep along close to the ground at speeds up to 450 mph.

Because the population of the Pacific Northwest is rapidly expanding, the volcanoes of the Cascade Range in Washington, Oregon, and northern California are some of the most dangerous in the United States. Although Cascade volcanoes do not often erupt (on average, about two erupt each century), they can be dangerous because of their violently explosive behavior, their permanent snow and ice cover that can fuel large volcanic debris flows (lahars), and their proximity to various critical infrastructure, air routes, and populated areas.⁵⁸

⁵⁷ Myers, Bobbie, et al. "What are Volcano Hazards?" U.S. Geological Survey. Vancouver, Washington. July 2004.

⁵⁸ Dzurisim, Dan, et al. "Living with Volcanic Risk in the Cascades." U.S. Geological Survey – Reducing the Risk from Volcano Hazards. USGS. Vancouver, Washington. 1997.

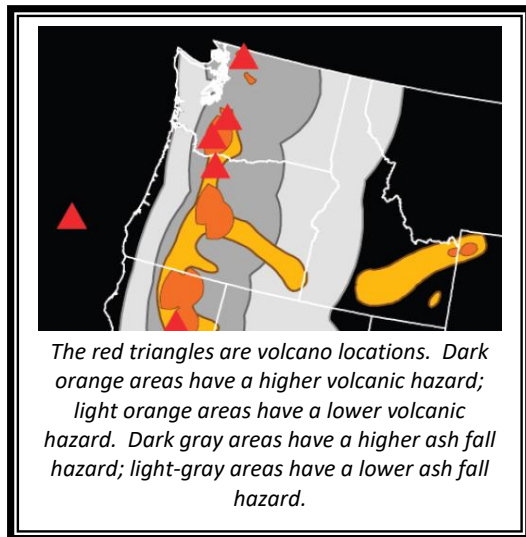
Figure 4.12. Record of Cascade Range Volcanic Eruptions.



Washington

Mount Baker erupted in the mid-1800s for the first time in several thousand years. Activity at steam vents (fumaroles) in Sherman Crater, near the volcano’s summit, increased in 1975 and is still vigorous, but there is no evidence that an eruption is imminent. **Glacier Peak** has erupted at least six times in the past 4,000

Figure 4.13. Volcanic Hazard.



about 1,000 years ago.

Oregon

Mount Hood last erupted about 200 years ago, producing pyroclastic flows, lahars, and a prominent lava dome (Crater Rock) near the volcano’s summit. Most recently, a series of steam blasts occurred between 1856 and 1865. **Mount Jefferson** last erupted more than 20,000 years ago. However, eruptions nearby have

years. About 13,000 years ago, an especially powerful series of eruptions deposited volcanic ash at least as far away as Wyoming. **Mount Rainier** has produced at least ten eruptions and numerous lahars in the past 4,000 years. It is capped by more glacier ice than the rest of the Cascade volcanoes combined, and parts of Rainier’s steep slopes have been weakened by hot, acidic volcanic gases and water. These factors make this volcano especially prone to landslides and lahars. **Mount St. Helens** is the most frequently active volcano in the Cascades. During the past 4,000 years, it has produced many lahars and a wide variety of eruptive activity, from relatively quiet outflows of lava to explosive eruptions much larger than that of May 18, 1980. **Mount Adams** has produced few eruptions during the past several thousand years. This volcano’s most recent activity was a series of small eruptions

produced several lava flows and small volcanic cones in the past 10,000 years. Three Sisters Volcanic Center in central Oregon includes five large volcanoes—**North Sister, Middle Sister, South Sister, Broken Top, and Mount Bachelor**. About 2,000 years ago, eruptions occurred on South Sister, as well as from several small volcanoes north of North Sister. Since 1997, a broad area centered 3 miles west of South Sister has domed upward by more than 8 inches. Scientists think that this doming reflects the ongoing accumulation of magma at a depth of 3 to 4 miles. The outcome of this activity is uncertain, but there is no evidence that an eruption is imminent. The USGS and its partners have increased monitoring efforts in the area to detect any changes that might warrant more concern. **Newberry Volcano**, a broad shield covering more than 500 square miles, is capped by Newberry Crater, a large volcanic depression (caldera) 5 miles across. Its most recent eruption was about 1,300 years ago. **Crater Lake** occupies a 6-mile-wide caldera formed 7,700 years ago when the summit of an ancient volcano (referred to as Mount Mazama) collapsed during a huge explosive eruption. More than 10 cubic miles of magma was erupted, 10 times as much as in any other eruption in the Cascades during the past 10,000 years. Smaller eruptions ending about 5,000 years ago formed Wizard Island and several submerged cones and lava domes on the lake floor.

After the 1980 eruption of Mount St. Helens, Congress provided increased funding that enabled the USGS to establish a volcano observatory for the Cascade Range. Located in Vancouver, Washington, the David A. Johnston Cascades Volcano Observatory (CVO) was named for a USGS scientist killed at a forward observation post by the May 18, 1980 eruption.

Scientists at CVO quickly recognized that it was not economically feasible to fully monitor all potentially active Cascade volcanoes. To address this and similar problems elsewhere in the United States and abroad, the USGS developed a suite of portable volcano-monitoring instruments—essentially, a portable volcano observatory. In the Pacific Northwest, when regional networks of earthquake sensors, operated in cooperation with the University of Washington’s Pacific Northwest Seismic Network, detect unusual seismic activity at a volcano, CVO staff will rapidly deploy this portable equipment to evaluate the hazard and, if needed, provide timely warnings to local officials and the public.

CVO also uses remote sensing as an early-detection tool. A technique called interferometric synthetic-aperture radar (InSAR) allows scientists to measure subtle movements of the ground surface, using radar images obtained by Earth-orbiting satellites. The current ground doming at Three Sisters was first detected using this technique.⁵⁹

Second-Order Hazard Events

Volcanic events can result in many other types of hazard-related incidents. While an eruption will most likely be the primary source of damages in the surrounding area, this type of event has a much larger impact area. Volcanic events have often resulted in damages from ash fallout many miles away from the eruption. The following chart outlines the interconnection between volcanic eruptions and other types of hazard events.

⁵⁹ Dzurisim, Dan, et al. “Living with Volcanic Risk in the Cascades.” U.S. Geological Survey – Reducing the Risk from Volcano Hazards. USGS. Vancouver, Washington. 1997.

Table 4.11. Second-Order Hazards Related to Volcanic Events.

Related Causal Events	Related Effects
Earthquake	Severe Weather
	Crop Loss
	Wildland Fire
	Transportation System
	Civil Unrest

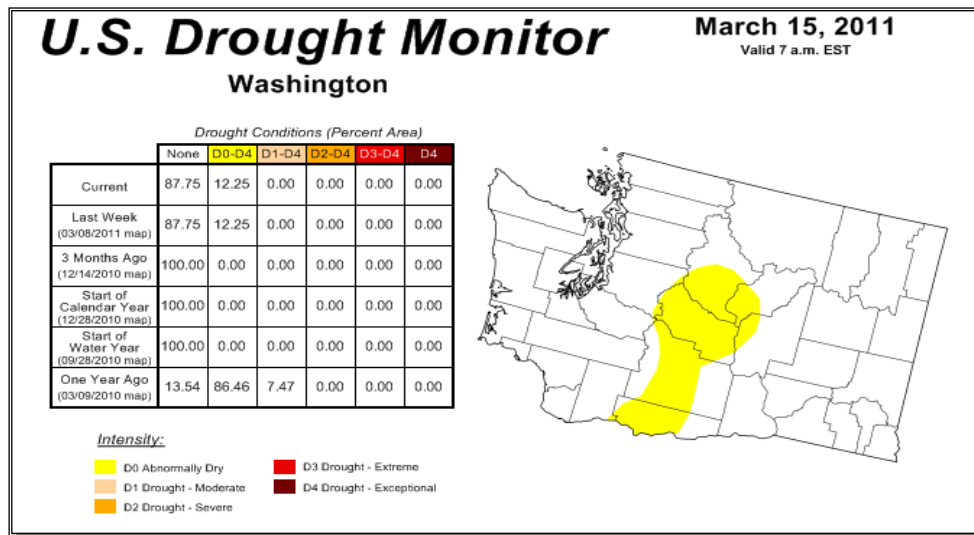
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Drought

A drought is a long period of abnormally low precipitation that persists long enough to produce a serious hydrologic imbalance.⁶⁰ Drought is a normal part of virtually every climate on the planet, even relatively wet climates. It is the most complex of all-natural hazards, and it affects more people than any other hazard. The impacts of drought are greater than the impacts of any other natural hazard. They are estimated to be between \$6 billion and \$8 billion annually in the United States⁶¹ and occur primarily in agriculture, transportation, recreation and tourism, forestry, and energy sectors. With drought, there is an increase in wildfire potential, and trees are more susceptible to insects like the bark beetle. Social and environmental impacts are also significant, although it is difficult to quantify these impacts. Drought is typically measured in terms of water availability in a defined geographical area. It is common to express drought with a numerical index that ranks severity.

In the past century, Washington State has experienced several drought cycles including several that lasted for more than a single season (1928-32, 1992-94, and 1996-97). The most severe droughts occurred in 1977 and 2001. The most recent drought affecting eastern Washington counties occurred in 2005 but was less severe than the 2001 cycle. Drought can have a widespread impact on the environment and the economy, depending on its severity, although it typically does not result in loss of life or damage to property.

Figure 4.14. U.S. Drought Monitor Map for Washington.



Drought indices assimilate thousands of bits of data on rainfall, snowpack, streamflow, and other water supply indicators into a comprehensible big picture. A drought index value is typically a single number, far more useful than raw data for decision making. The U.S. Drought Monitor is a synthesis of multiple indices and impacts that represents a consensus of federal and academic scientists.⁶²

Unlike most states,

Washington has a statutory definition of drought, consisting of two parts:

⁶⁰ Interagency Hazard Mitigation Team. 2000. State Hazard Mitigation Plan. Oregon State Police – Office of Emergency Management. Salem, Oregon.

⁶¹ Wilhite, Donald A. "Drought Management". Water Encyclopedia – Science and Issues. 2011. Available online at <http://www.waterencyclopedia.com/Da-En/Drought-Management.html>.

⁶² National Drought Mitigation Center. "U.S. Drought Monitor". Available online at <http://drought.unl.edu/dm/monitor.html>. February 2010.

1. An area has to be experiencing or projected to experience a water supply that is below 75 percent of normal.
2. Water users within those areas will likely incur undue hardships because of the shortage.⁶³

Drought results from a deficiency of precipitation from statistically normal (long-term average) amounts that, when extended over a season or especially over a longer period, is insufficient to meet the demands of human activities. All types of drought originate from a deficiency of precipitation that results in water shortages for some activity (such as crop production) or for some group (such as farmers).

Droughts differ from one another in three essential characteristics: intensity, duration, and spatial coverage. Drought is normally grouped by type: meteorological, hydrological, agricultural, and socioeconomic. The impacts associated with drought usually take 3 months or more to develop, but this time can vary considerably, depending on the timing of the initiation of the precipitation deficiency.

Meteorological - Meteorological drought is expressed solely based on the degree of dryness in comparison to some normal or average amount and the duration of the dry period. Thus, intensity and duration are the key characteristics of this type of drought.

Agricultural - Agriculture is usually the first economic sector to be affected by drought because soil moisture content is often quickly depleted, especially if the period of moisture deficiency is associated with high temperatures and windy conditions. Agricultural drought links various characteristics of meteorological drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, and soil water deficits.

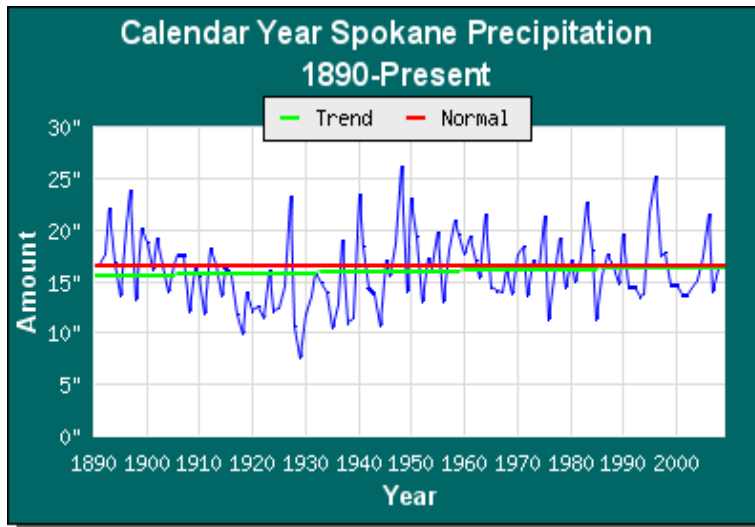
Hydrological - Hydrological droughts are associated with the effects of periods of precipitation shortfall on surface or subsurface water supply (e.g. streamflow, reservoir and lake levels, and ground water) rather than with precipitation shortfalls. Hydrological droughts usually lag the occurrence of meteorological and agricultural droughts because more time elapses before precipitation deficiencies are detected in reservoirs, groundwater, and other components of the hydrologic system. As a result, impacts of hydrological drought are out of phase with impacts of other drought types. Also, water in hydrological storage systems such as reservoirs, rivers, and groundwater often are used for multiple and competing purposes, further complicating the sequence and quantification of impacts. Water uses affected by drought can include purposes as varied as power generation, flood control, irrigation, drinking water, industry, and recreation.

Socioeconomic - Socioeconomic drought associates the supply and demand of some economic good or service with elements of meteorological, hydrological, and agricultural drought. In socioeconomic drought, deficiencies of precipitation are linked directly to the supply of some commodity or economic good (e.g. water, hay, or hydroelectric power). Increases in population can alter substantially the demand for these economic goods over time. The incidence of socioeconomic

⁶³ News Release. "Drought report looks at 2005, makes recommendations for future". Department of Ecology, State of Washington. February 9, 2006. Access Washington.

drought can increase because of a change in the frequency of meteorological drought, a change in societal vulnerability to water shortages, or both.⁶⁴

Figure 4.15. Precipitation Record 1890 – Present.



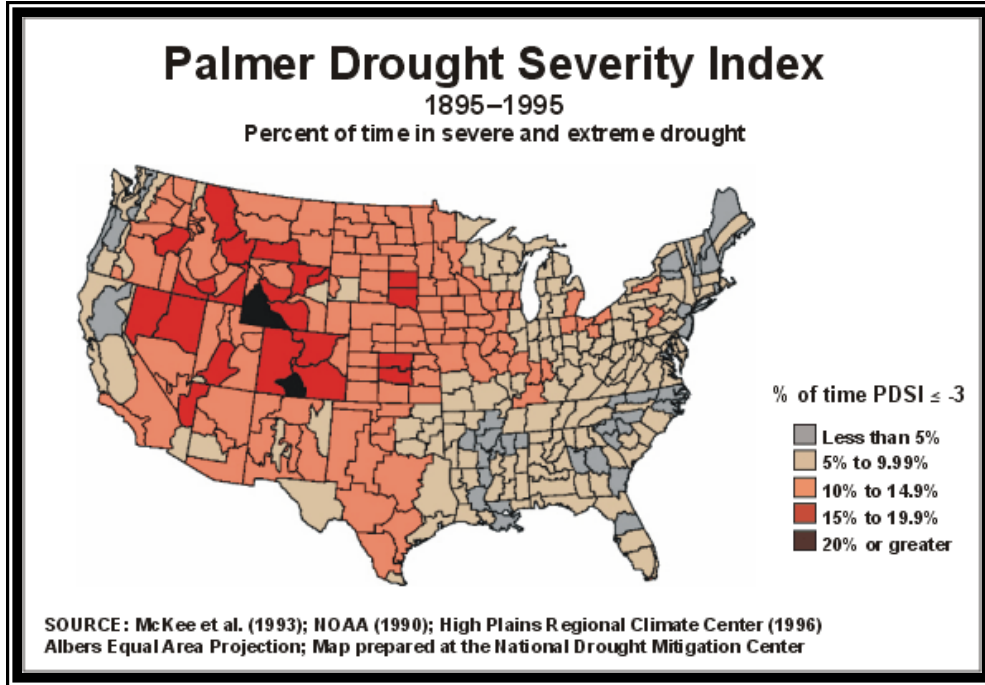
The major causes of droughts in Washington are either low snow accumulations from either low precipitation or warm winter temperatures; or by warm weather in the late winter-early spring that causes early melt of the snowpack. Most of the state's annual precipitation occurs during the winter. Precipitation in northeastern Washington is normally stored as snow that slowly melts during the spring and summer, maintaining stream and river flows. This is the primary source of water for irrigation and municipal use.

In 1965, W.C. Palmer developed an index to measure the departure of the moisture supply. Palmer based his index on the supply-and-demand concept of the water balance equation, considering more than just the precipitation deficit at specific locations. The objective of the Palmer Drought Severity Index (PDSI), as this index is now called, was to provide measurements of moisture conditions that were standardized so that comparisons using the index could be made between locations and between months. It is most effective at measuring impacts sensitive to soil moisture conditions, such as agriculture.⁶⁵

⁶⁴ Wilhite, Donald A. "Drought Management". *Water Encyclopedia – Science and Issues*. 2011. Available online at <http://www.waterencyclopedia.com/Da-En/Drought-Management.html>.

⁶⁵ Hayes, Michael J. "Drought Indices." National Drought Mitigation Center. Available online at <http://drought.unl.edu/whatis/indices.htm#pdsi>. 2006.

Figure 4.16. Palmer Drought Severity Index Map.



Currently, reliable forecasts of drought are not attainable for temperate regions of the world more than a season in advance. However, based on a 100-year history with drought, the state as a whole can expect severe or extreme drought at least 5 percent of the time in the future. As the historical Palmer Drought Severity Index indicates, between 1895-1995, Lincoln County was in severe or extreme drought conditions 10-14.9% of the time. From 1985-95, the County was in severe or extreme drought conditions 20-30% of the time and from 1976-77, Lincoln County was in severe or extreme drought conditions 30-40% of the time.

Second-Order Hazard Events

Although droughts are not caused by other types of hazard events, they can result in other types of hazard incidents, especially long-term drought conditions. Wildland fire ignition potential and damage potential are much higher during periods of drought due to the lower moisture content in vegetation and generally lower relative humidity. The following chart outlines the interconnection between drought and other types of hazard events.

Table 4.12. Second-Order Hazards Related to Drought Events.

Related Causal Events	Related Effects
None	Structural/Urban Fire
	Crop Loss
	Wildland Fire
	Civil Unrest

Chapter 5

Jurisdictional Vulnerability Assessment

IN THIS SECTION:

- Lincoln County Annex
- City of Davenport Annex
- City of Sprague Annex
- Town of Almira
- Town of Creston
- Town of Harrington
- Town of Odessa
- Town of Reardan
- Town of Wilbur
- Lincoln Hospital District
- Odessa Memorial Healthcare Center

Chapter 5
Vulnerability
Assessment

Jurisdictional Risk and Vulnerability Assessments

The Lincoln County HMP planning committee reviewed many of the natural and man-made hazards that have affected or pose a potential risk to people or property throughout the County. The committee agreed that nine natural hazards identified in the Washington State Enhanced Hazard Mitigation Plan⁶⁶ carry the greatest potential risk for Lincoln County. These hazards are flood, earthquake, landslide, severe weather, wildland fire, avalanche, seiche, volcano and drought, and they were included in the risk assessment for each jurisdiction. The planning committee recognizes that there are additional hazards, particularly man-made hazards, which may also affect Lincoln County, but these hazards will not be included in the HMP at this time. Additional hazards may be reviewed for inclusion during subsequent annual and 5-year evaluations of the HMP.

As part of the updated risk and vulnerability assessment, each member of the planning committee was asked to fill out a critical infrastructure worksheet identifying and locating all structures, infrastructure, and culturally significant sites that the loss or damage of which would have a significant impact on the community. This exercise also included all communication, hazardous materials storage, transportation, and emergency response infrastructure. The list from each member was compiled and added to a GIS database. The critical infrastructure database was used to develop maps and address each type of hazard risk in each jurisdiction.

Furthermore, Lincoln County's existing parcel master listing has been converted to an accessible GIS database. This database allowed the planning committee to map every parcel within the County and city jurisdictions as well as assign an accurate assessed value of both land and improvements for each parcel. This data was combined with the hazard vulnerability models to develop the risk assessments and loss estimations for each jurisdiction.

To be eligible for project funds under the Flood Mitigation Assistance (FMA) program authorized by the National Flood Insurance Act of 1968, as amended, communities are required under 44 CFR 79.6(d)(1) to have a mitigation plan that addresses flood hazards. On October 31, 2007, FEMA published amendments to the 44 CFR Part 201 at 72 Federal Register 61720 to incorporate mitigation planning requirements for the FMA program, which combined the Local Mitigation Plan requirement for all hazard mitigation assistance programs under 44 CFR 201.6 to include the FMA as well as the HMGP, PDM, and SRL programs thus eliminating duplicative mitigation planning regulations. The purpose of the flood sections in the following annexes is to fulfill the requirements for both the FMA program and the Local Hazard Mitigation Plan.

Lincoln County Annex

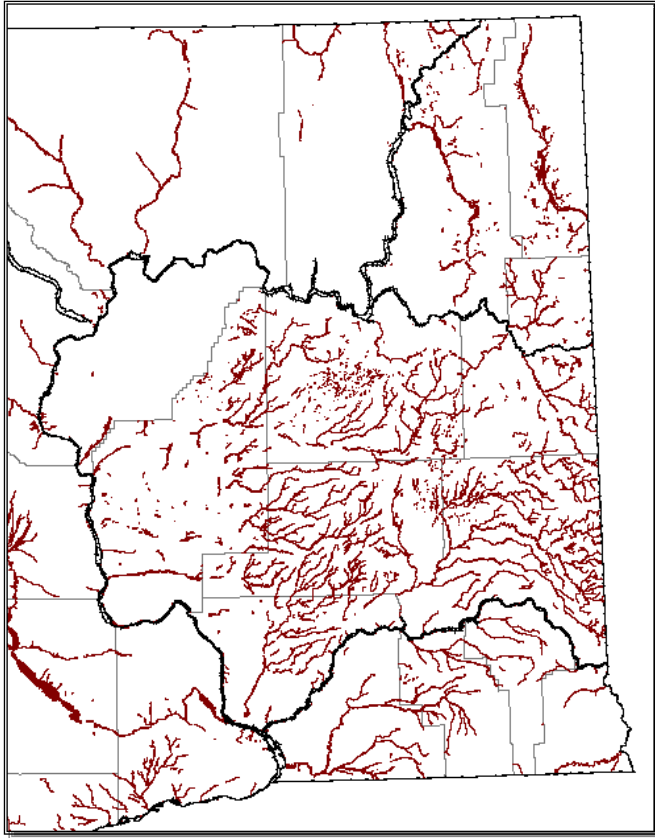
Flood Profile

The flood history record in Lincoln County is limited to flash floods and relatively small riverine flooding along minor drainages. Although many areas of the county flood on a regular basis, no damages have occurred due to naturally functioning floodplains. Nearly all flood damages within Lincoln County have occurred within the

⁶⁶ "Washington State Enhanced Hazard Mitigation Plan". Washington Military Department Emergency Management Division, 2013. <https://mil.wa.gov/other-links/enhanced-hazard-mitigation-plan>.

incorporated communities. High intensity rainfall, rain-on-snow and rain-on-frozen soil events have been prominent causes for flooding through the hydrologic record. Floods in Lincoln County may occur at any time between November and June with flash floods from thunderstorms occurring most commonly during the summer months.

Figure 5.1. FEMA 100 Year Riverine Flood Hazard Areas in Eastern Washington.

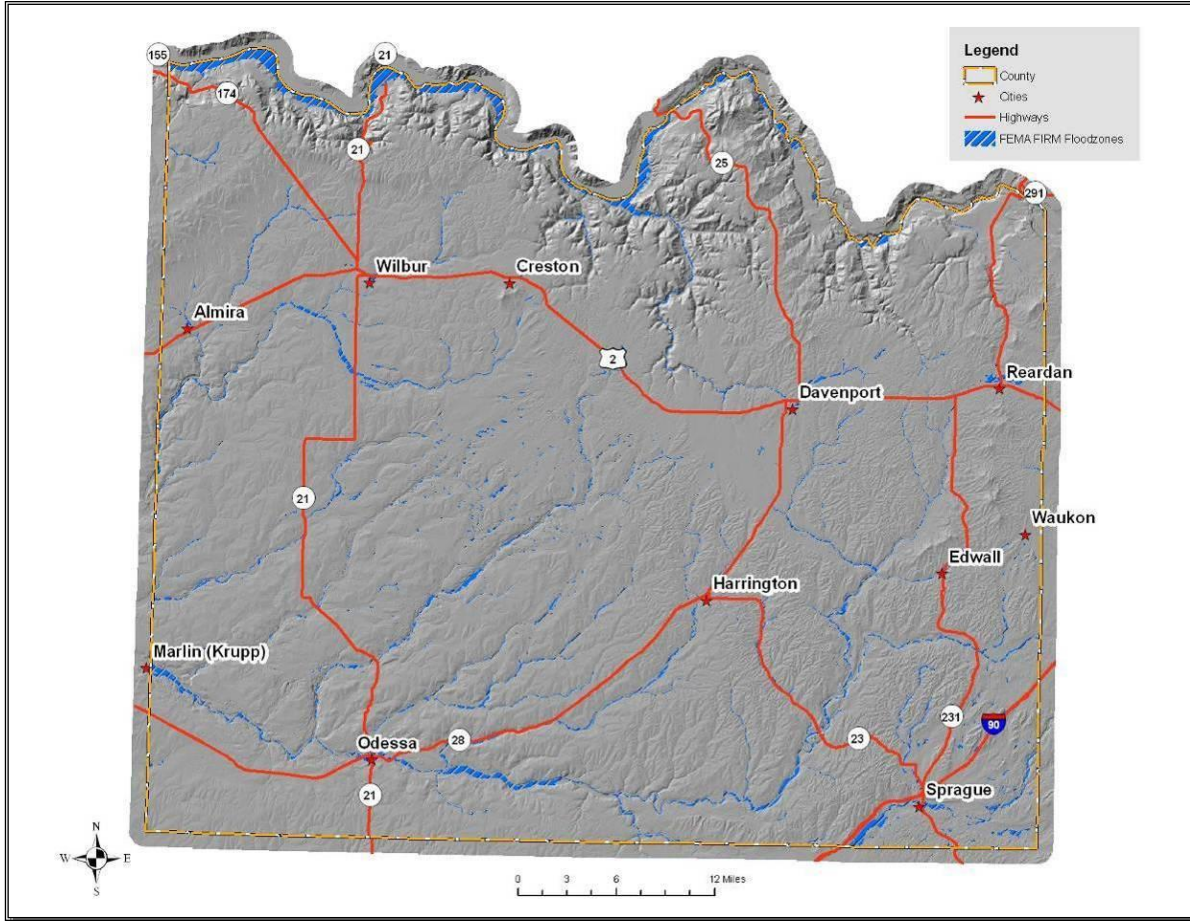


The only major watershed in Lincoln County is the Columbia River which delineates the northern border of the County. There is very little risk of flooding along the Columbia River as this area is part of the Lake Roosevelt Reservoir. The water level of Lake Roosevelt is monitored and highly regulated for the purposes of providing not only irrigation water to the surrounding agricultural developments and hydroelectric power, but also to provide flood control for communities along this major drainage.

Lincoln County does, however, contain multitudes of small tributaries that meander through mostly large, flat floodplains. These drainages are highly susceptible to flash flood events resulting from thunderstorms, rain-on-snow events, or rapid snowmelt. Riverine flooding is also a common occurrence. Because most of these waterways are shallow, channels are often breached with floodwaters occupying wide floodplains for days at a time. Some of the more significant of these

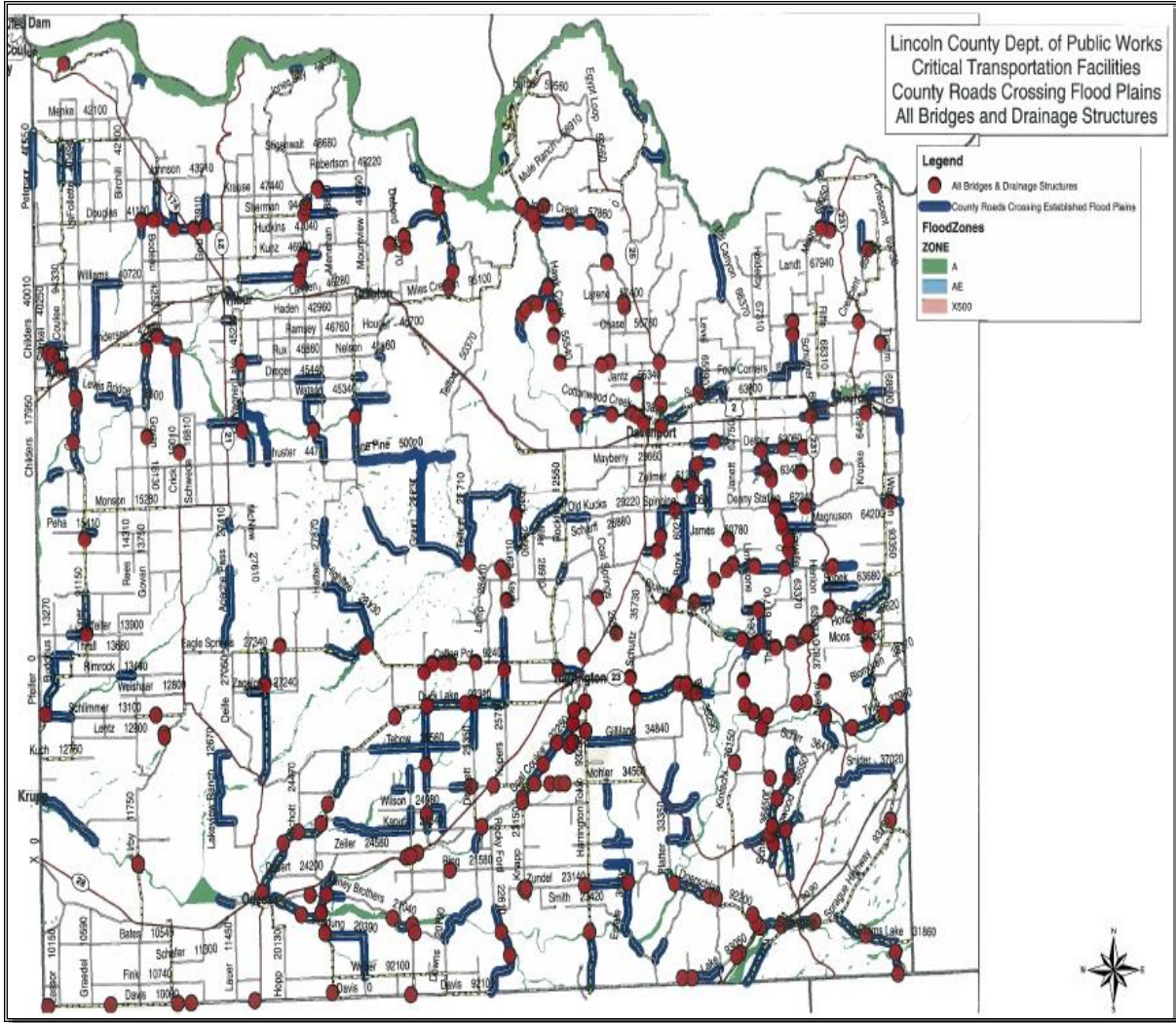
drainages include Lake Creek, Crab Creek, Sinking Creek, Wilson Creek, Hawk Creek, Duck Creek, Rock Creek, and Bluestem Creek. Most of these watersheds originate in Lincoln County and eventually drain into the Columbia River (either on the north end of the County or to the west in Grant County) or Moses Lake. Hundreds of secondary tributaries drain into these waterways.

Figure 5.2. FEMA Floodplains in Lincoln County, Washington.



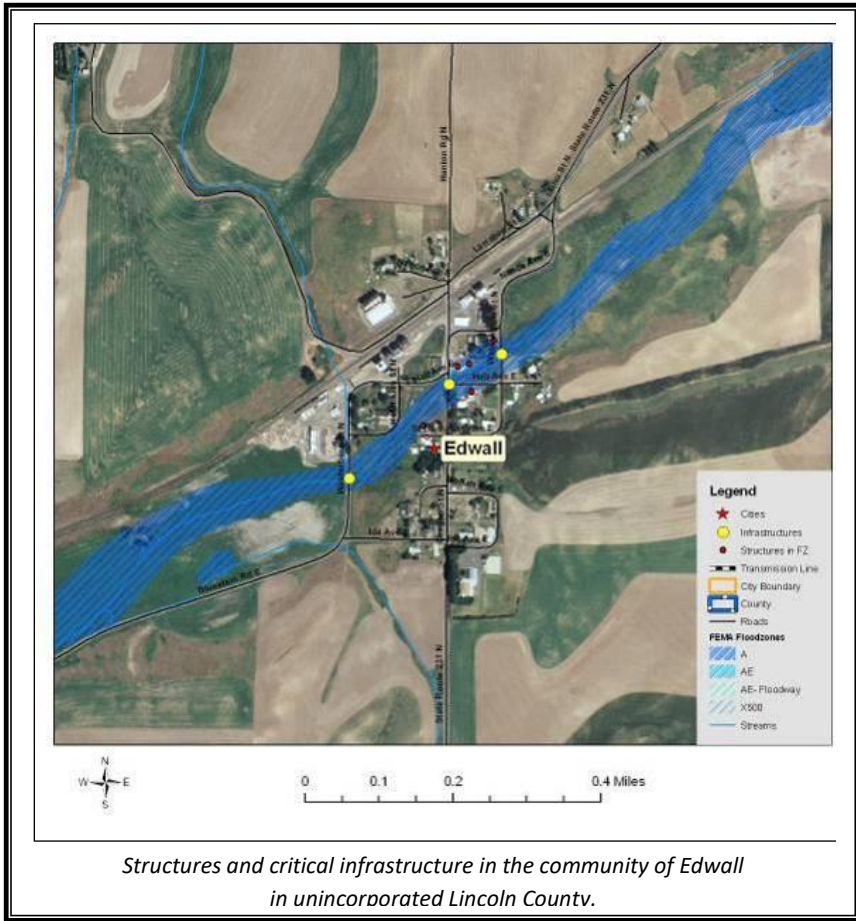
Any magnitude flood event may cause damage or blockages at drainage structures or to road segments. These types of events are difficult to anticipate; however, Lincoln County does maintain a prioritized list of all road segments and infrastructure within established floodplain areas. The transportation infrastructure in Lincoln County has been categorized by priority and significance in the event of natural or man-caused disasters. The priority for repairs or maintenance in an emergency event is given to roads, bridges, and structures on minor arterials (FFC 6), major collectors (FFC 7), and local access routes serving areas of rural residential development (FFC 8). Second-priority infrastructure may become first priorities during a localized event. Lincoln County maintains its transportation infrastructure inventory and priority classification system as a GIS database at the Public Works office.

Figure 5.3. Critical Transportation Facilities Crossing Designated Floodplains.



Sediment has built up in many of the stream channels in Lincoln County. This buildup and subsequent vegetative growth has narrowed channels and restricted the capacity of the stream. These channel restrictions can prevent the stream from following its natural meandering course, which can contribute to changes in the floodplain.

Figure 5.4. FEMA Floodplain in Unincorporated Community of Edwall.



Edwall is a small, unincorporated community on the eastern side of Lincoln County. The floodplain in Edwall is caused by a small tributary of Crab Creek. The stream flows in a southwesterly direction through the middle of the community. This stream has caused minor flood damages in the past due to rapid runoff caused by rain-on-snow or major storm events and channel blockages.

Participation in the National Flood Insurance Program (NFIP) and subsequent adoption of the Uniform Building Codes, or more stringent local building codes, provide basic guidelines to communities on how to regulate development. When a county participates in the NFIP it enables property owners in the county to

insure against flood losses. By employing wise floodplain management, a participating county can protect its citizens against much of the devastating financial loss resulting from flood disasters. Careful local management of development in the floodplains results in construction practices that can reduce flood losses and the high costs associated with flood disasters to all levels of government.

An important part of being an NFIP community is the availability of low-cost flood insurance for those homes and businesses within designated flood plains, or in areas that are subject to flooding, but that are not designated as Special Flood Hazard Areas.

Table 5.1. NFIP Policy Statistics as of 6/14/2018 in Lincoln County.

Community Name	Policies In-Force	Insurance In-Force	Written Premium In-Force	FIRM Effective Date	Floodplain Ordinance/ Manager	CRS Ranking
Lincoln County (unincorporated)	14	\$1,740,600	7,458	9/30/1988	Yes/Yes	-
Almira	-	-	-	9/30/1988	No/No	-
Creston	-	-	-	9/30/1988	Yes/Yes	-
Harrington	2	\$490,000	629	9/30/1988	Yes/Yes	-
Odessa	33	\$3,563,500	24,918	9/30/1988	Yes/Yes	-
Sprague	12	\$1,482,900	12,509	9/30/1988	Yes/Yes	-
Wilbur	27	\$3,095,700	19,688	9/30/1988	Yes/Yes	-
Reardan	-	-	-	-	No/No	-
Davenport	-	-	-	-	No/No	-

Overall participation by individuals and business in the NFIP appears to be low relative to the number of structures within the floodplain. There are several potential reasons for this.

- A lack of knowledge about the existence of the availability of low-cost flood insurance.
- Home and business owners unaware of their vulnerability to flood events.
- Current cost of insurance is prohibitive.

The first two reasons can be addressed through public education. The third could be addressed by all communities in the county taking advantage of the Community Rating System (CRS). To encourage communities to go beyond the minimum requirements and further prevent and protect against flood damage, the NFIP established the Community Rating System (CRS). To qualify for CRS, communities can do things like make building codes more rigorous, maintain drainage systems, and inform residents of flood risk. In exchange for becoming more flood-ready, the CRS community's residents are offered discounted premium rates. Based on your community's CRS ratings, you can qualify for up to a 45% discount of your annual flood insurance premium.

Local Event History

January-February 2017 Flood – Severe winter storms produced heavy precipitation, causing flooding and compromised and damaged many roads. Levels of damage varied from surface erosion to complete road failure. The City of Sprague declared a state of emergency due to flooding which threatened bridges.

Probability of Future Occurrence

The probability of flood events occurring in Lincoln County is high. Low magnitude flood events can be expected several times each year. However, due to the flat topography and drainage infrastructure, the impacts of these events are slight and usually amount to minor and temporary traffic issues throughout the county. There have been large-magnitude and high-impact flood events, but these are not likely in any given year. These types of flood events have the highest probability of occurrence in the winter or early spring. Minor flash flood events are expected annually most likely because of summer thunderstorms or rain-on-snow events.

Lincoln County is not considered to be one of the more at-risk and flood-vulnerable counties in Washington according to the State of Washington Hazard Mitigation Plan. Lincoln County is also not in the top percentage of Washington counties having a high frequency of floods causing damage. The Washington State Hazard Mitigation Plan also reports that Lincoln County has zero repetitive loss properties. Properties receiving two or more claim payments of more than \$1,000 from the National Flood Insurance Program within any rolling 10-year period are considered repetitive loss properties by FEMA.⁶⁷

Impacts of Flood Events

Due to the lack of large, swift bodies of water in Lincoln County, the probability of a flood-related fatality is low. Nevertheless, flash flood events or accidents could result in a death or injury. First responders or other persons could be pinned under debris and drowned or receive trauma from debris being carried along the waterway. Once flood waters recede, mold can grow in wet material causing a public health hazard. Flood waters may contain sewage and hazardous chemicals that could be left on people's property following a flood event. Furthermore, water and food may be contaminated, and heat and electricity may be inoperable for a period of time. Although the probability of these types of impacts occurring at a moderate to large scale is very low, all these factors could contribute to a decline in current and long-term health of Lincoln County residents.

The continuity of operations for Lincoln County and most other jurisdictions within the county will not be compromised due to a flood event. The delivery of some services may be hindered by localized flooding in certain areas; however, due to the availability of alternative routes, this is not a significant concern. Damage to facilities, equipment, or files could impact certain organizations or public services depending on the extent of damage and duration of the event.

Flood events in Lincoln County are most likely to affect private property by damaging homes, businesses, barns, equipment, livestock, and vehicles. Both water and contaminants can damage or permanently ruin equipment. Flood waters can also erode land. This particularly an issue when lands supporting roads, power lines, pipelines, sewage control facilities, levees, bridges, and other infrastructure are damaged by erosion.

In Lincoln County, it is unlikely that flood events would cause any long-term environmental impacts. Some environmental impacts that may be realized by localized flooding could include erosion of stream banks, loss of riparian plant life, or contamination by chemicals or sewage. Flooding in some areas may have some environmental benefits such as establishing meanders that slow the streamflow, replenishing wetland areas, and replenishing the soil with nutrients from sediment.

Flooding in Lincoln County is not likely to have a significant or long-term effect on the local economy. Depending on the magnitude of the event, individual residents and businesses may be adversely impacted, but the economic viability of the community will not be affected. Severe damage to transportation infrastructure may have a short-term impact on certain communities due to the presence of state and U.S. highway routes, but alternative routes are available.

⁶⁷ "Washington State Enhanced Hazard Mitigation Plan". Washington Military Department Emergency Management Division, 2013. <https://mil.wa.gov/other-links/enhanced-hazard-mitigation-plan>

Value of Resources at Risk

There are approximately 114 structures totaling an estimated \$8.5 million within the FEMA-identified floodplains (100- and 500-year) in unincorporated areas of Lincoln County. The per structure value is based on a countywide average home estimate of \$74,296 and does not reflect the replacement cost of a structure. According to Lincoln County Emergency Management and the State Hazard Mitigation Plan, there are currently no repetitive loss properties within Lincoln County. The average damage to structures was estimated based on the parcel's location as either completely within or out of the flood zone. The estimated value of contents is ½ the value of the improvements equating to an additional \$4.2 million in potential losses. The damages will most likely not be equally distributed between buildings based on building materials, building location, and flood location. However, these estimates provide a basic approximation.

Critical infrastructure located within the identified floodplain for unincorporated areas includes numerous road segments, 52 bridges or other drainage structures, the Lincoln Hill boat launch, the Seven Bays boat launch and marina, the Fort Spokane boat launch, the Detillion boat launch, and the Keller Ferry. The replacement value of a bridge in Lincoln County averages \$1 million while other types of drainage structures typically average \$500,000 according to Lincoln County Public Works.

Earthquake Profile

Based on historical records, Lincoln County has not experienced any seriously damaging earthquakes in recorded history. Several distant earthquakes produced intensities strong enough to be felt in eastern Washington, but no earthquake epicenters were recorded for the region. All earthquakes in eastern Washington have been shallow and most are at depths less than 6 kilometers. The largest earthquake in eastern Washington since 1969 was a shallow, magnitude 4.4 event northwest of Othello on December 20, 1973. Some of the most active earthquake areas in eastern Washington are near Entiat, south of Lake Chelan, and in the Saddle Mountains, south of Vantage. Many of the earthquakes in eastern Washington occur in clusters near the Saddle Mountains in folded volcanic rocks, which were extruded in southeastern Washington from 16.5 to 6 million years ago.⁶⁸

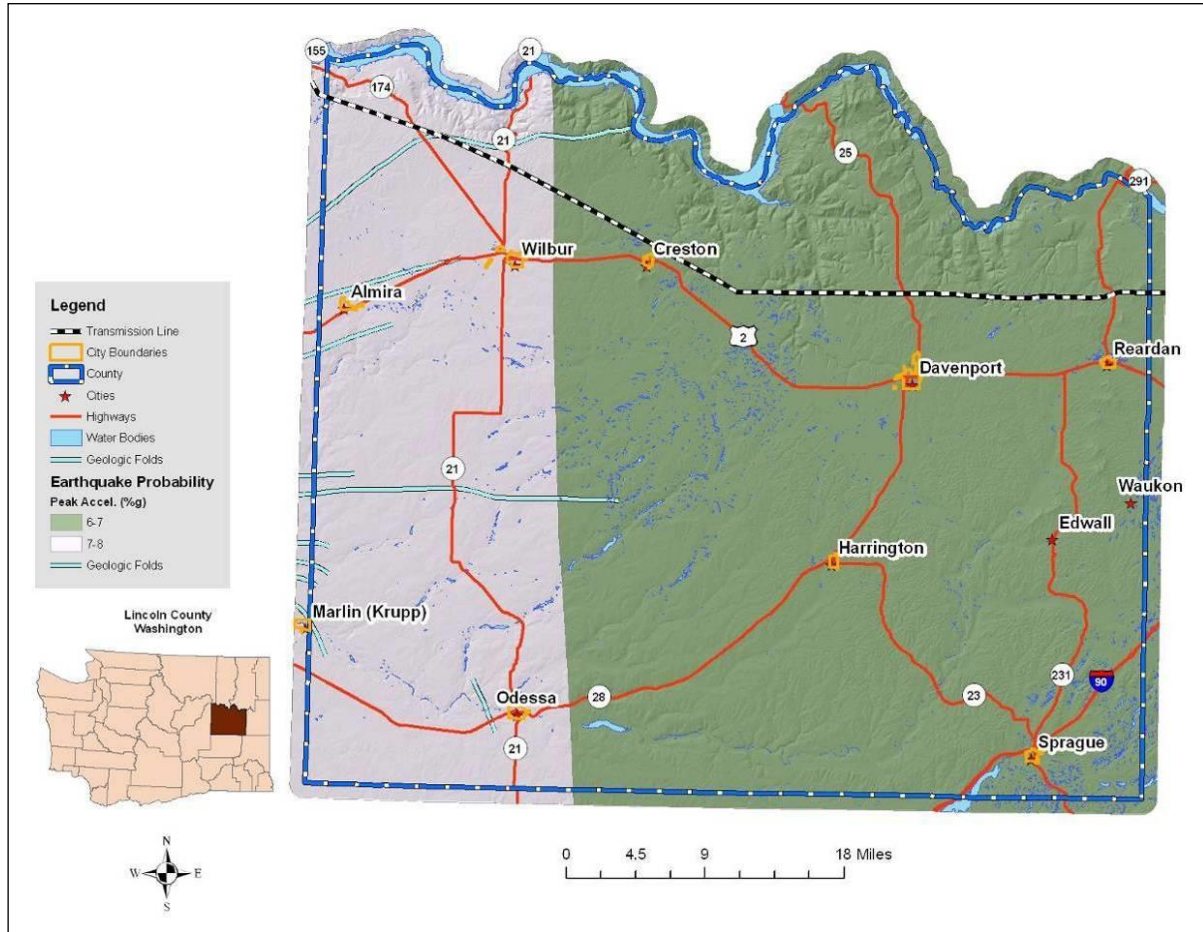
Probability of Future Occurrence

There are at least seven known geologic folds in the western part of Lincoln County. These folds reach into the County from the west and dead-end. Peak ground acceleration (pga) in percent g is a measure of the ground motion, which decreases, the further you are from the earthquake. The USGS Shaking Hazard maps for the United States are based on current information about the rate at which earthquakes occur in different areas and on how far strong shaking extends from quake sources. Colors on the map show the levels of horizontal shaking that have a 1-in-10 chance of being exceeded in a 50-year period. Shaking is expressed as a percentage of "g" (g is the acceleration of a falling object due to gravity). This map is based on seismic activity and fault-slip rates and considers the frequency of occurrence of earthquakes of various magnitudes. Locally, this hazard may be greater than that shown, because site geology may amplify ground motions. As

⁶⁸ Noson, Linda Lawrance, Anthony Qamar, and Gerald Thorsen. "Washington State Earthquake Hazards". Washington Division of Geology and Earth Resources Information Circular 85. Olympia, Washington, 1988. http://file.dnr.wa.gov/publications/ger_ic85_earthquake_hazards_wa.pdf.

seen in Figure 5.5, much of the western third of Lincoln County has 10% chance of exceeding a 7-8% pga in the next 50 years. This probability trends downwards to a 6-7% pga on the eastern two-thirds of the County.⁶⁹ No specific jurisdictions or special districts were identified as having differing issues or levels of risk associated with this hazard.

Figure 5.5. Regional Earthquake Probability Map.



Impacts of Earthquake Events

Past events suggest that an earthquake in the Lincoln County area would cause little to no damage. Nonetheless, severity can increase in areas that have softer soils, such as unconsolidated sediments.

Although unlikely in Lincoln County, buildings that collapse can trap and bury people, putting lives at risk and creating cleanup costs. Upgrading existing buildings to resist earthquake forces is more expensive than meeting code requirements for new construction; thus, a high number of structures in Lincoln, particularly those built prior to seismic code requirements, remain at risk. Many critical facilities are housed in older buildings that are not up to current seismic codes.

⁶⁹ USGS. 2008 United States National Seismic Hazard Maps. U.S. Geological Survey. U.S. Department of Interior. Available online at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>. October 2009.

Communities in Lincoln County can expect some structural failure of older multistory unreinforced masonry buildings because of even lower intensity earthquakes. Cornices, frieze, and other heavy decorative portions of these types of structures may fail. The potential impacts of a substantial earthquake event are highly variable. Many of the structures and infrastructure throughout the county may not incur any damages at all; however, damage to roads, bridges, unreinforced masonry, chimneys, foundations, water lines, sewer lines, natural gas pipelines, and many other components are at risk. Fires can also be a secondary hazard to structures sustaining earthquake damage. The economic losses to business in the area may be very high if owners are forced to stop production or close their doors for even just a day.

Because structural damage by earthquakes is typically not complete destruction, but rather tends to be subtle cracking or settling that undermines the stability of the structure. These types of repairs can be very costly. Additionally, changes to the water table or even the topography can significantly impact local municipal and private wells and could result in the loss of traditional land uses.

Value of Resources at Risk

HAZUS®-MH MR5⁷⁰ is a regional earthquake loss estimation model that was developed by FEMA and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake loss estimations at a regional scale. To estimate potential earthquake losses in Lincoln County, HAZUS was used to model a scenario based on the parameters of the nearest historic epicenter. The modeled earthquake occurred near Chelan, Washington (latitude 47.90, longitude -120.3) and was a 7.3 magnitude shallow crustal event, i.e. the most likely type of earthquake event to occur in Lincoln County. The HAZUS model estimated direct earthquake damages, induced earthquake damage, social impacts, and economic losses. It should be noted that the figures have a high degree of uncertainty and should only be used for general planning purposes.

For the modeled earthquake scenario, the HAZUS software reported no expected damage to essential facilities including hospitals, schools, emergency operations centers, police stations, and fire stations. There are an estimated 8,000 buildings in Lincoln County with a total building replacement value (excluding contents) of \$773 million. Approximately 94% of the buildings and 72% of the building value is associated with residential housing. The software also reported that 4 residential structures would be moderately damaged and 20 would be slightly damaged. Only 1 commercial building is expected to incur slight damages. Most residential structures expected to be damaged are manufactured homes.

The replacement value of the transportation and utility lifeline systems is estimated to be \$3.4 million and \$267 million, respectively. HAZUS estimated that no damages to the transportation system, potable water and electric power system, or the utility system facilities would be expected. The HAZUS model also does not project any casualties or sheltering because of the earthquake scenario.

⁷⁰ FEMA. Hazuz®-MH MR5. Department of Homeland Security. Federal Emergency Management Agency, Mitigation Division. Washington, D.C. November 2010.

Figure 5.6. Summary of Utility System Pipeline Damage from HAZUS.

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	5,581	7	2
Waste Water	3,348	3	1
Natural Gas	2,232	1	0
Oil	0	0	0

HAZUS estimated the long-term economic impacts for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within Lincoln County. HAZUS estimated that there would be approximately \$30,000 in economic losses attributed to bridge repairs, \$70,000 in economic losses from repairs to airport facilities, and \$10,000 in economic losses from repairs to the Keller Ferry facility. Minor economic losses are also expected due to repair of potable water distribution lines (\$30,000), wastewater facilities and distribution lines (\$40,000), natural gas distribution lines (\$10,000), and electrical power facilities (\$40,000).

The only known publicly accessible unreinforced masonry structure in unincorporated Lincoln County is the Guardhouse at Fort Spokane. This building is a historical structure built in the late 1800s by the Army and is currently used as a Visitor’s Center from May to September. The value of this structure is not determinable.

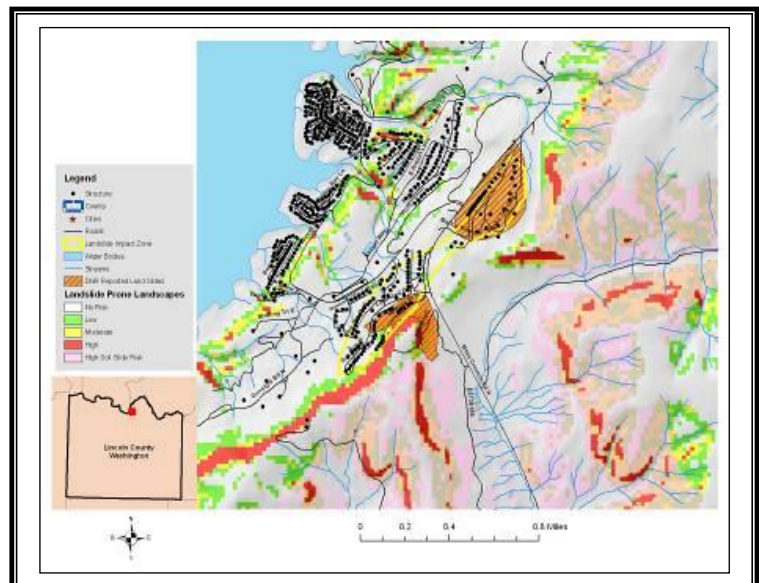
Unreinforced masonry (URM) structures and unreinforced chimneys of homes will likely be damaged in the event of an earthquake. Damaged or collapsed chimneys could result in the secondary hazard of fire. Nonstructural damage caused by falling and swinging objects may be considerable after any magnitude earthquake. Damage to some older, more fragile bridges and land failure causing minor slides along roadways may isolate some residents.

Landslide Profile

To date, there is no recorded history of major landslides occurring in Lincoln County; however, there is evidence of past landslides along the Columbia River on the northern edge of Lincoln County. The probability of a major landslide event in Lincoln County is moderate to low. Nevertheless, there are some areas in Lincoln County that have specific landslide concerns. Areas that are generally prone to landslides are:

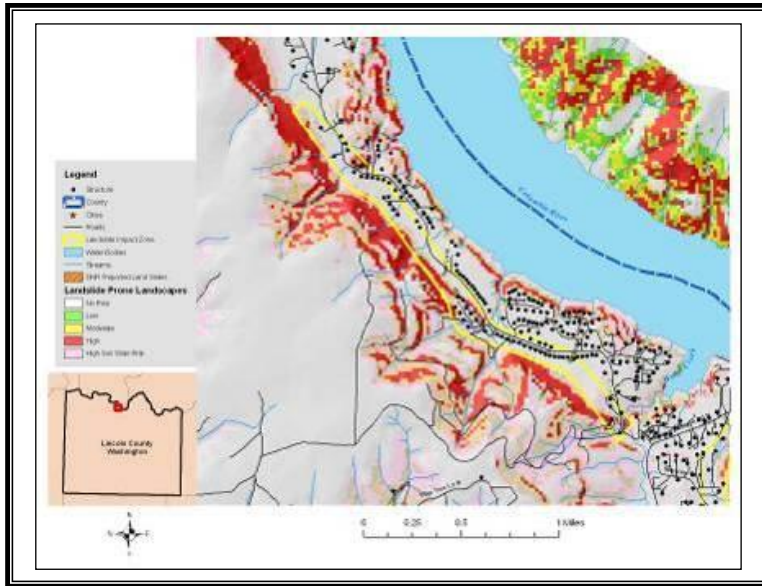
- On existing landslides, old or recent
- On or at the base or top of slopes
- In or at the base of minor drainage hollows

Figure 5.7. Seven Bays Landslide Impact Zone.



- At the base or top of an old fill slope
- At the base or top of a steep cut slope

Figure 5.8. Sterling Valley Landslide Impact Zone



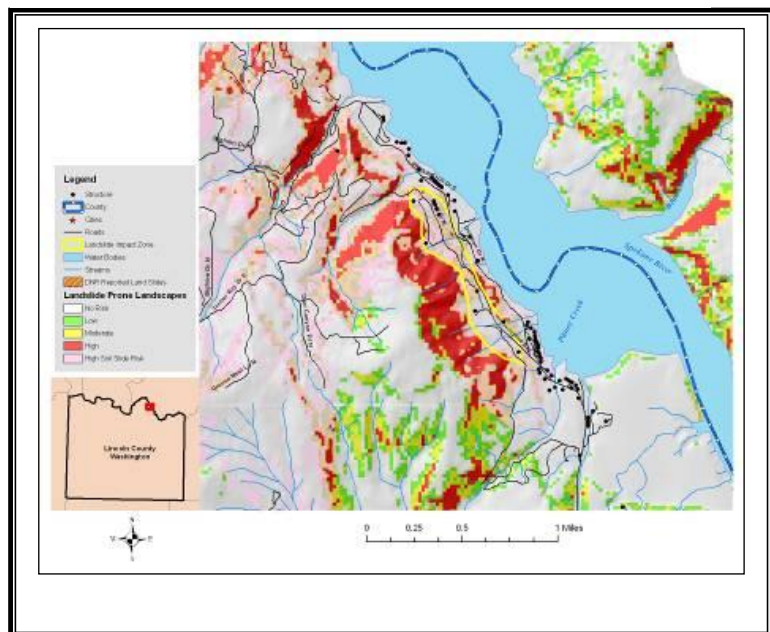
The only major landslide potential in Lincoln County occurs along the Columbia River drainage. While ancient alluvial fans provide evidence of historic landslides, the occurrence of new landslides and the reactivation of old landslides increased dramatically with the filling of reservoirs behind the Grand Coulee and Chief Joseph dams. Drawdowns for flood control and power generation also trigger new landslides and/or reactivate and extend old ones. Some of the landslide complexes extend for thousands of feet along the lakeshore, have head scarps in terraces 300 feet or more above reservoir level and extend well below its surface. With landslide activity common along hundreds of miles of shoreline, one

hazard in such a setting is waves generated by fast-moving landslide masses.

Most of the population in Lincoln County has a low risk of landslides; however, homes and infrastructure located in or at the mouth of drainages have an elevated risk. Additionally, sections of some primary access routes are in low to moderate landslide prone areas. There is a moderate probability of small slides occurring on slopes ranging from 5-35%. This type of slide is common on the eyebrows of hills, especially where there has been soil disturbance. Generally, these low angle slides will have a low velocity and will not impact structures or infrastructure.

Soil factors that increase the potential for landslide are soils developed from parent materials high in schist and granite, and soils that are less permeable containing a resistive or hardpan layer. These soils tend to exhibit higher landslide potential under saturated conditions than do well-drained soils. To identify the high-risk soils in Clearwater County, the NRCS State Soils Geographic Database (STATSGO) layer was used to identify the

Figure 5.9. Porcupine Bay Landslide Impact Zone



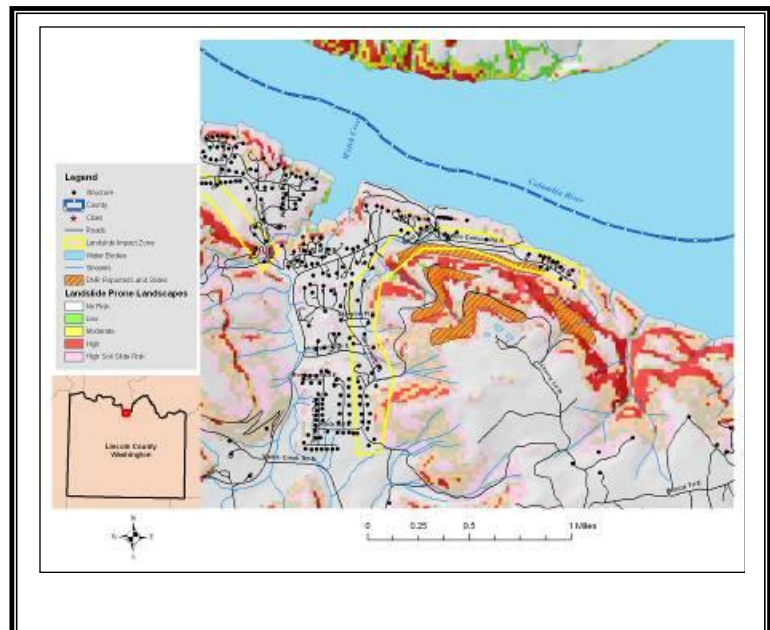
location and characteristics of all soils in the County. The specific characteristics of each major soil type within the County were reviewed. Soils information that suggested characteristics pertaining to very low permeability and/or developed a hardpan layer and soils developed from schist and granite parent material were selected as soils with potential high landslide risk. High-risk soils magnify the effect slope has on landslide potential. Soils identified as having high potential landslide risk are further identified only in areas with slopes between 14° and 30° (25-60%). It is these areas that traditionally exhibit the highest landslide risk due to soil characteristics within a given landscape.

To portray areas of probable landslide risk due to slope related factors, slope models were used to identify areas of low, moderate and high risk. This analysis identified the low risk areas as slopes in the range of 20°-25° (36-46%), moderate as 26°-30° (48-60%) and high risk as slopes in the range of 31°-60° (60-173%). Slopes that exceeded 60° (173%) were considered low risk since sliding most likely had already occurred relieving the area of the potential energy needed for a landslide. From the coverage created by these two methods, it is possible to depict areas of assumed risk and their proximity to development and human activity. With additional field reconnaissance the areas of high risk can be further defined by overlaying additional data points identifying actual slide locations, thus improving the resolution by specifically identifying the highest risk areas. This method of analysis is like a method developed by the Clearwater National Forest in north central Idaho.⁷¹

The Seven Bays, Porcupine Bay, Sterling Valley, and Redwine Canyon Landslide Impact Zones encompass relatively large population clusters along the Lake Roosevelt shoreline. In addition to the residences, landslides in these Impact Zones may affect several of county access roads. In many cases, there is only one well-maintained access route into the residential areas; thus, a closure or temporary delay could cause serious traffic concerns and possibly isolated some residents for an extended period.

Many of the slopes and hillsides in these impact zones are comprised by material deposited by past landslides. In fact, much of the lower slopes near the valley floors are alluvial fans created by sediment being carried downstream and deposited at the mouths of the numerous small drainages. The Washington Department of Natural Resources has mapped areas of past landslide events in the Seven Bays and Redwine Canyon Impact Zones. The presence of deposited

Figure 5.10. Redwine Canyon Landslide Impact Zone



⁷¹ McClelland, D.E., et al. 1977. Assessment of the 1995 and 1996 floods and landslides on the Clearwater National Forest Part 1: Landslide Assessment. Northern Region U.S. Forest Service. December 1977.

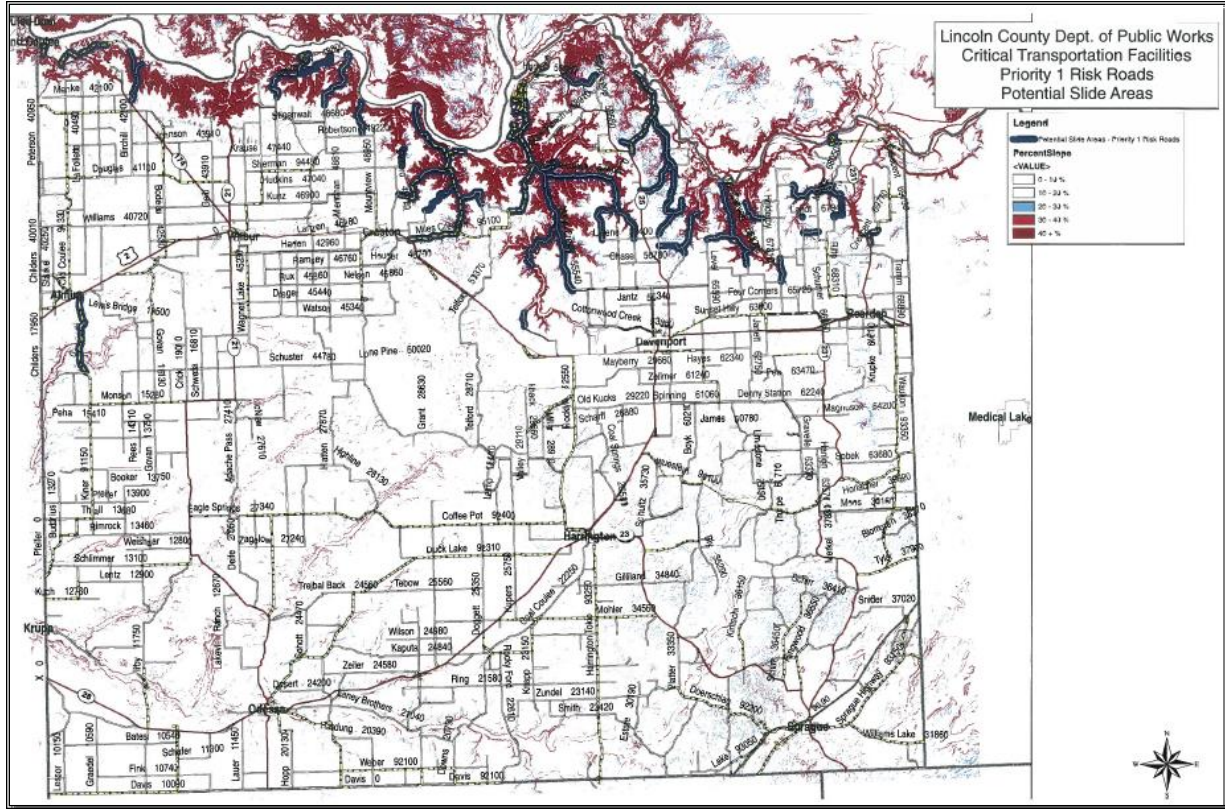
material indicates the historic occurrence of high-energy, short duration floods and debris flows in these chutes in response to severe climatic conditions, such as thunderstorms and rain-on-snow events. These events are historically infrequent, with recurrence cycles on the order of years to decades. However, they can result in significant damage to buildings and infrastructure, disrupt travel, reduce water quality, and jeopardize safety.

The largest landslides typically occur where human development or disturbance has exposed landslide-prone sediments to steep topography. The abundance of development within the Landslide Impact Zones, both residential and roadway, is likely further undermining the stability of the slope. Today, initiation and reactivation of landslides is closely tied to unusual climatic events and land-use changes. Even small landslide activity on the upper slopes can transform into high-energy debris flows that endanger roads, buildings, and people below. Landslide debris is highly unstable when modified through natural variations in precipitation, artificial cuts, fills, and changes to surface drainage and ground water.

Wildfires in these impact zones could cause a domino effect of multiple hazards. Higher intensity fires not only remove most of the vegetation, but they also cause soils to become hydrophobic or water repellent for a period after the fire. This combination leads to unusually high runoff after rain showers or during the spring runoff season. As streams and rivers begin to reach and exceed flood stage, bank failures and channel migration are common. Road building and other soil disturbances tend to exacerbate this effect leading to even more severe land and soil slides.

Lincoln County has classified the transportation infrastructure by priority and significance in the event of a natural or man-caused disaster. The priority for repairs or maintenance in an emergency event is given to roads, bridges, and structures on minor arterials (FFC 6), major collectors (FFC 7), and local access routes serving areas of rural residential development (FFC 8). Lincoln County maintains its transportation infrastructure inventory and priority classification system as a GIS database at the Public Works office.

Figure 5.11. Critical Transportation Facilities in Higher Potential Landslide Areas.



Local Event History

April 2017 Landslide – The Porcupine Bay Road accesses a National Park Service campground, boat ramp and some residences was blocked by a landslide in early April of 2017. This was a major slide that did not damage homes or cause injuries but did cause a portion of the Porcupine Bay Road and guardrail to slough off.

Figure 5.12. Porcupine Bay Road



Probability of Future Occurrence

Most of the landslide potential in Lincoln County occurs in the steep canyons along the Columbia River. The canyons associated with Columbia River and Lake Roosevelt have a high propensity for slides based on the steeper slopes, unstable soils, and history of occurrence. Wildfires and/or severe storms that saturate the soils could lead to major slide events in these areas.

Nevertheless, not all the Lake Roosevelt shoreline is at risk to landslides and development has only occurred in specific areas rather than along the entire extent of the shore. The probability of occurrence of major, high velocity landslide events in this area, including those caused by severe local storms, is moderate. The probability of other areas in Lincoln County experiencing a landslide event is very low.

Impacts of Landslide Events

In Lincoln County, minor landslides along toe-slopes and roadways occur annually with minimal impact to residents. Major landslides in northern Lincoln County could cause property damage, injury, and death and may adversely affect a variety of resources. For example, water supplies, fisheries, sewage disposal systems, forests, dams, and roadways can be affected for years after a slide event. The negative economic effects of landslides include the cost to repair structures, loss of property value, disruption of transportation routes, medical costs in the event of injury, and indirect costs such as lost timber and lost fish stocks.

Water availability, quantity, and quality can be affected by landslides and would have a very significant economic impact on Lincoln County. The loss or redistribution of water would affect agricultural crops grown in certain areas, ranching activities, and personal and municipal wells.

Value of Resources at Risk

The cost of cleanup and repairs of roadways is difficult to estimate due to the variable circumstances with each incident including size of the slide, proximity to a State or County shop, and whether the slide occurred on the cut slope or the fill slope. Other factors that could affect the cost of the damage may include culverts, streams, and removal of debris. This type of information is impossible to anticipate; thus, no repair costs for damaged roadways have been estimated.

Table 5.2. Landslide Impact Zones in Lincoln County.

Landslide Impact Zone	Number of Structures	Value of Structures at Risk
Seven Bays	90	\$8,638,662
Porcupine Bay	10	\$959,851
Sterling Valley	52	\$4,991,227
Redwine Canyon	44	\$4,223,346
Total	196	\$18,813,085

Slides in the identified Impact Zones are more likely to be larger and more damaging as weaknesses in the underlying rock formations give way. Although infrequent, this type of slide has the potential to not only block, but destroy road corridors, dam waterways, and demolish structures. The highest risk areas in these impact zones are typically at the higher elevations where slopes exceed 25% grade. There are numerous homes in each of these impact zones. Single slide events will not likely impact the entire population, but rather individual structures. Many of the main access and secondary roads could also be at risk from slides initiated in these impact zones.

Severe Weather

Severe weather in Lincoln County ranges from the commonly occurring thunderstorms to hail, high winds, tornadoes, drought, dense fog, lightning, and snow storms.

All of Lincoln County is at risk to severe winter weather events and there is a high probability of their continued occurrence in this area. Due to topography and climatologic conditions, the higher elevations are often the most exposed to the effects of these storms. Commonly, higher elevations in the County will receive snowfall, while areas along the Lake Roosevelt shoreline may not. Periodically though, individual storms can

generate enough force to impact the entire County at one time. From high winds to ice storms to freezing temperatures, there are all types of winter storms that take place during the course of any given year. Winter conditions can change very rapidly. It is not uncommon to have a snowstorm at night with sunshine the next day. Lincoln County is not considered to be among the most vulnerable counties to winter storms and blizzards in Washington according to the Washington State Hazard Mitigation Plan.⁷²

In Lincoln County, ice storms occur when a layer of warm air is between two layers of cold air. Frozen precipitation melts while falling into the warm air layer, and then proceeds to refreeze in the cold layer above the ground. If the precipitate is partially melted, it will land on the ground as sleet. However, if the warm layer completely melts the precipitate, becoming rain, the liquid droplets will continue to fall, and pass through a thin layer of cold air just above the surface. This thin layer of air then cools the rain to a temperature below freezing (0 °C). However, the drops themselves do not freeze, a phenomenon called supercooling. When the supercooled drops strike the ground or anything else below 0 °C, they instantly freeze, forming a thin film of ice that can build up on trees, utilities, roads, and other structures, infrastructure, and personal property.⁷³

Figure 5.13. Lincoln County Road in Winter



Due to their relative frequency and minimal severity, severe thunderstorms are not well documented in Lincoln County. Their impacts are limited and do not significantly affect the communities enough to declare a disaster. The secondary impacts of thunderstorms, floods, are emphasized within the flood sections of this document. Areas most vulnerable to this type of storm are those subject to a strong southwesterly flow of moist, unstable air that generates strong, sometimes violent thunderstorms with one or more of the following characteristics: strong damaging winds, large hail, waterspouts, or tornados.

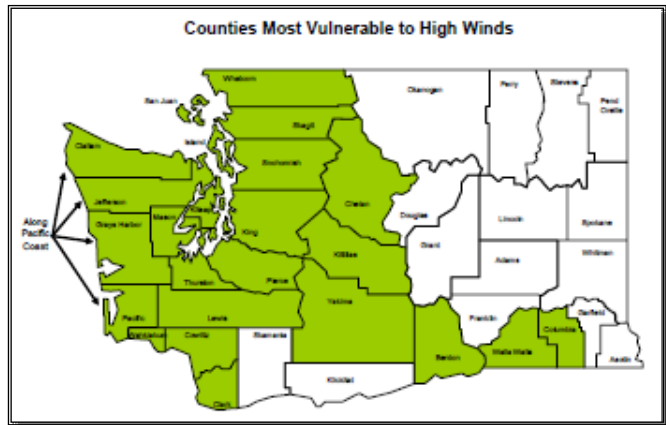
Hail can occur in any strong thunderstorm, which means hail is a threat everywhere. Hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere. Large hail stones can fall at speeds faster than 100 miles per hour. Hail damage in Washington is very small in comparison with damage in areas of the central part of the United States. Often the hail that occurs does not grow to a size larger than one-half inch in diameter, and the areas affected are usually small. Quite often hail comes during early spring storms, when it is mostly of the small, soft variety with a limited damaging effect. Later, when crops are more mature and more susceptible to serious damage, hail occurs in widely scattered spots in connection with summer thunderstorms.

⁷² “Washington State Enhanced Hazard Mitigation Plan”. Washington Military Department Emergency Management Division, 2013. <https://mil.wa.gov/other-links/enhanced-hazard-mitigation-plan>.

⁷³ Wikipedia. “Ice Storm”. Wikimedia Foundation, Inc. March 2011. Available online at http://en.wikipedia.org/wiki/Ice_storm.

Windstorms are frequent in Lincoln County and they have been known to cause substantial damage. Under most conditions, the County's highest winds come from the south or southwest. Due to the abundance of agricultural development in Lincoln County, crop damage due to high winds can have disastrous effects on the local economy. In the case of extremely high winds, some buildings may be damaged or destroyed. Wind damages will generally be categorized into four groups: 1) structure damage to roofs, 2) structure damage from falling trees, 3) damage from wind-blown dust on sensitive receptors, or 4) wind driven wildfires. Structural injury from damaged roofs is not uncommon in Lincoln County. Airborne particulate matter increases during high wind events. When this occurs, sensitive receptors including the elderly and those with asthma are at increased risk to complications. The National Weather Service defines high winds as sustained winds of 40 mph or gusts of 58 mph or greater, not caused by thunderstorms, expected to last for an hour or more. Areas most vulnerable to high winds are those affected by a strong pressure difference from deep storms originating over the Pacific Ocean; an outbreak of very cold, Arctic air originating over Canada; or air pressure differences between western and eastern Washington that primarily affect the Columbia River Gorge, Cascade Mountain passes, ridges and east slopes, and portions of the Columbia Basin. Lincoln County is not considered to be one of the most vulnerable to high winds in Washington State according to the Washington State Hazard Mitigation Plan.⁷⁴

Figure 5.14. Counties Most Vulnerable to High Winds



Lincoln County and the entire region are at increased risk to wildfires during high wind events. Ignitions can occur from a variety of sources including downed power lines, lightning, or arson. Once ignited, only wildfire mitigation efforts around the community and scattered homes will assist firefighters in controlling a blaze. Details about wildfire mitigation are discussed in the wildland fire annexes of this Multi - Hazard Mitigation Plan.

A tornado is formed by the turbulent mixing of layers of air with contrasting temperature, moisture, density, and wind flow. This mixing accounts for most of the tornadoes occurring in April and May, when cold, dry air from the north or northwest meets warm, moister air moving up from the south. If this scenario was to occur and a major tornado was to strike a populated area in Lincoln County, damage could be widespread. Businesses could be forced to close for an extended period, and routine services such as telephone or power could be disrupted. The National Weather Service defines a tornado as a violently rotating column of air that contacts the ground; tornados usually develop from severe thunderstorms. Areas most vulnerable to tornado are those subject to severe thunderstorms or those with a recurrence rate of 5 percent or greater, meaning the County experiences one damaging severe thunderstorm event at least once every 20 years.

⁷⁴ "Washington State Enhanced Hazard Mitigation Plan". Washington Military Department Emergency Management Division, 2013. <https://mil.wa.gov/other-links/enhanced-hazard-mitigation-plan>.

According to the Tornado Project⁷⁵ and the National Climatic Data Center⁷⁶, there were 6 reports of tornadoes in Lincoln County between 1880 and 2000. They occurred in May 1957 (F0), April 1972 (F3), August 1978 (F1), May 1979 (F1), May 1997 (F1), and June 2009 (F0-1). There were 5 separate funnel clouds in the Davenport and Creston areas associated with the June 2009 event. The 1972 tornado was recorded as an F3 on the Fujita Tornado Scale, which correlates to approximately 158 to 206 mile per hour winds. This storm caused 1 injury.

Local Event History

August 2014 Dust Storm - On August 12th, 2014 a dust storm, or haboob, made its way across Lincoln County ahead of thunderstorms blanketing the region in extremely low visibility. Winds generated during this event ranged from 40 to 50 mph. Many residents in the region lost power and there were numerous traffic accidents resulting from haboob. The National Weather Service says the state of Washington should expect these types of dust storms every couple of years.

Figure 5.15. Picture of Lincoln County Haboob.



November 2015 Severe Weather- On January 8, 2016, Governor Jay Inslee requested a major disaster declaration due to severe storms, straight-line winds, flooding, landslides, and mudslides during the period of November 12-21, 2015. The Governor requested a declaration for Public Assistance for 31 counties and Hazard Mitigation statewide.

February 2017 Severe Weather - On April 5, 2017, Governor Jay Inslee requested a major disaster declaration due to severe winter storms, flooding, landslides, and mudslides during the period of January 30 to February 22, 2017. The Governor requested a declaration for Public Assistance for 15 counties and Hazard Mitigation statewide.

Probability of Future Occurrence

The probability of Lincoln County experiencing a severe weather event on an annual basis is very high.

Extreme cold, snow accumulation, and wind events are common occurrences between November and March. Major winter storms are expected at least twice each year during the winter season; however, these weather patterns rarely last more than a few days. Severe ice storms also occur in Lincoln County during the winter

⁷⁵ Tornado Project. 1999. St. Johnsbury, Vermont. Available online at <http://www.tornadoproject.com/alltorns/watorn.htm#Columbia>.

⁷⁶ National Climatic Data Center. 2010. *Storm Events Database*. NOAA Satellite and Information Service. U.S. Department of Commerce. Available online at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>.

months. Severe and damaging ice storms have occurred in Lincoln County twice in the last 5 years. The probability of this type of event is moderate to high annually.

Wind events are also common in Lincoln County and can occur throughout the year. Wind is often associated with winter storms during the winter and thunderstorms during the warmer months but can also occur without additional storm influences. Significant wind events are expected 3-5 times annually.

Several major thunderstorms are expected in Lincoln County each year between April and September; however, these types of events rarely cause serious damage.

Lincoln County has a moderate probability of experiencing a damaging hail storm in any given year. These types of events most frequently occur in the spring but can occur throughout the summer as well.

Tornadoes are relatively rare, but the conditions for a funnel cloud to form are reported in Lincoln County several times each year. Nevertheless, based on the historical record of tornadoes in this area, the probability for a small tornado to occur in Lincoln County is low. The probability of a higher magnitude tornado occurring in this area is extremely low.

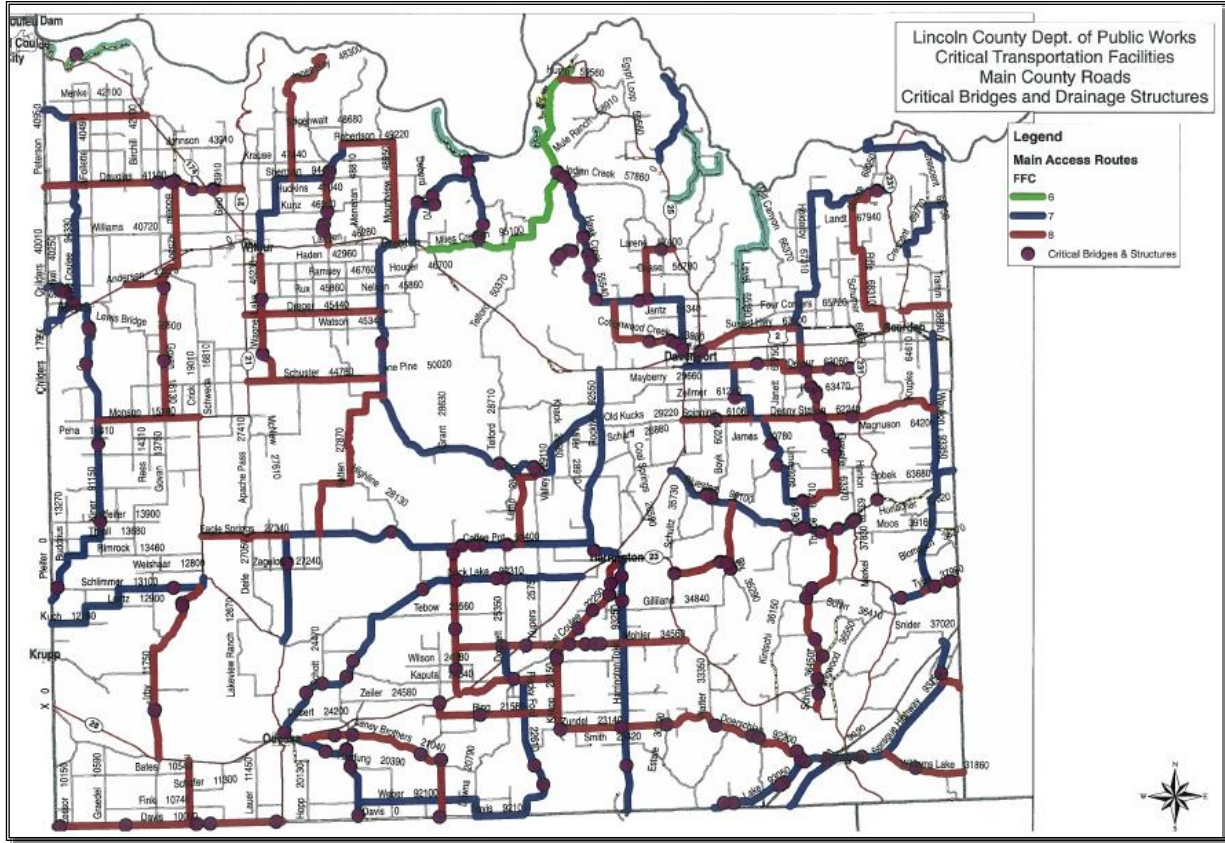
Impacts of Severe Weather Events

Winter storms with heavy snow, high winds, and/or extreme cold can have a considerable impact on Lincoln County; however, most residents are well accustomed to the severe winter conditions in this part of Washington. Power outages and unplowed roads are a frequent occurrence throughout many parts of the County, but most residents are prepared to handle the temporary inconvenience. Snow loads on roofs, ice-slides off roofs onto vehicles or other buildings, and damaged frozen pipes are also potential hazards associated with winter weather. These events represent a significant hazard to public health and safety, a substantial disruption of economic activity, and a constant threat to structures during the winter months.

Lincoln County has experienced several “ice storms” in recent memory. The freezing rain from an ice storm covers everything with a heavy layer of ice that can cause hazardous road conditions resulting in numerous accidents. Trees have been heavily damaged as branches break from the weight of the ice. The weight of the ice can also snap power lines and bring down utility poles. The loss of power during the winter months can last from a few hours to a few days and is particularly dangerous for those relying on electrical heat. The loss of a heat source can cause hypothermia, frost bite, or even death and can also lead to damages caused by frozen pipes.

Many types of severe weather events tend to impact transportation routes and related infrastructure, especially snow and thunderstorms. Lincoln County has classified the transportation infrastructure by priority and significance in the event of a natural or man-caused disaster. The priority for repairs or maintenance in an emergency event is given to roads, bridges, and structures on minor arterials (FFC 6), major collectors (FFC 7), and local access routes serving areas of rural residential development (FFC 8). Lincoln County maintains its transportation infrastructure inventory and priority classification system as a GIS database at the Public Works office.

Figure 5.16. Critical Transportation Facilities in Lincoln County.



Wind usually accompanies snow storms in Lincoln County; thus, large accumulations are not common as much of the snow is blown away. Commonly, heavy drifting is the cause of disruptions to normal commuting activities (delays and inability to plow roads and driveways). High wind events during the spring and summer months could lead to crop damages as well.

The potential impacts of a severe hail storm in Lincoln County include crop damage, downed power lines, downed or damaged trees, broken windows, roof damage, and vehicle damage. Hail storms can, in extreme cases, cause death by exposure. The most common direct impact from ice storms to people is traffic accidents. The highest potential damage from hail storms in Lincoln County is the economic loss from crop damage. Even small hail can cause significant damage to young and tender plants and fruit. Trees can also be severely damaged by hail.

So far, tornadoes have not had any serious impacts on Lincoln County residents. Minor damages may occur because of the high winds associated with a tornado.

Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Lincoln County. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. Additionally, due to the lack of significant topographic features, the wind tends to blow much of the snow accumulation away. Snow plowing in Lincoln

County occurs from a variety of departments and agencies. The state highways are maintained by the State of Washington. Plowing of county roads is done by the County Road Department and the road departments of the individual cities. Lincoln County has developed a pre-determined list of critical routes to prioritize the plowing of arterials and other main access routes. Private landowners are responsible for maintaining their own driveways or other private roads.

Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on Lincoln County residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer ones. More rural parts of the County are sometimes better prepared to deal with power outages for a few days due to the frequent occurrence of such events; however, prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Lincoln County schools are occasionally closed during and right after a severe winter storm because of cold temperatures and snow-covered roads.

Thunderstorms do occur within Washington affecting all counties, but usually are localized events. Their impacts are limited and do not significantly affect the communities enough to declare a disaster. The loss potential from flooding that results from severe thunderstorms can be significant in Lincoln County.

Although the financial impacts of hail can be substantial and extended, accurately quantifying these impacts is problematic. Hail typically causes direct losses to structures and other personal property as well as to the extensive agricultural development in Lincoln County. Potential losses to agriculture can be disastrous. They can also be very localized; thus, individual farmers can have significant losses, but the event may not drastically affect the economy of the County. Furthermore, crop damage from hail will also be different depending on the time of year and the type of crop. Most farmers carry insurance on their crops to help mitigate the potential financial loss resulting from a localized hail storm. Federal and state aid is available for County's with declared hail disasters resulting in significant loss to local farmers as well as the regional economy. Homeowners in Lincoln County rarely incur severe damage to structures (roofs); however, hail damage to vehicles is not uncommon. The damage to vehicles is difficult to estimate because the number of vehicles impacted by a specific ice storm is unknown. Additionally, most hail damage records are kept by various insurance agencies.

It is difficult to estimate potential losses in Lincoln County due to windstorms and tornadoes. Construction throughout the County has been implemented in the presence of high wind events, and therefore, the community has a higher level of preparedness to high wind events than many other areas experiencing lower average wind speeds.

Losses based on wind and tornado damage are estimated as follows:

- 3% of the buildings damaged causing 50% of value loss (loss could be from downed or damaged trees, damaged outbuildings, damaged fences/poles, damage to siding, damaged landscaping etc.)
- 5% of the buildings received damage to roof (requiring replacement of roof equaling \$3,000)

Damages associated with sensitive receptor irritation have not been estimated. We have also not estimated the potential for a large-scale wildfire event associated with high winds. Based on the data provided by the County, there are 3,913 total parcels in unincorporated Lincoln County with a total value of approximately \$375.6 million. Using the criteria outlined above an estimate of the impact of high winds on the County has been made. The potential wind and tornado damage to all buildings is estimated at approximately \$5.6 million. The estimated damage to roofs is approximately \$588,000.

Wildland Fire Profile

The Lincoln County Community Wildfire Protection Plan⁷⁷ provides a comprehensive analysis of the wildland fire risks and recommended protection and mitigation measures for all jurisdictions in Lincoln County. The information in the "Wildland Fire" sections of this Lincoln County Annex is excerpted from that more detailed document.

Lincoln County is in northeast Washington. The county encompasses approximately 2,311 square miles and has an elevation range of 980 to 3,500 feet above sea level. Land is owned by private individuals, corporations, the state of Washington, and the federal government. Federal lands are managed by the Bureau of Land Management, National Park Service, and the Bureau of Reclamation. State lands include parcels managed by the Washington Department of Natural Resources and Washington Department of Fish and Wildlife. Lincoln, the seventh largest county in the state, is bordered on the west by Grant County, to the south by Adams and Whitman County, to the east by Spokane County, and to the north by Stevens County, Ferry County, and a small part of Okanogan County. Lincoln County lies within the channeled scablands of the Columbia Basin, a region formed by ice age flooding and windblown volcanic ash. Many small pothole lakes are scattered throughout the scoured basalt scablands connected by Lake Creek and Crab Creek on the southern and eastern side of the county. The terrain is predominantly flat with alternating rolling hills and shallow canyons or coulees. Along the northern boundary the topography becomes steep as it plunges into wide valleys formed by the Spokane and Columbia Rivers. The mild climate, abundance of sunshine and low annual precipitation results in an environment that is potentially very prone to wildland fire. Although much of the native grasslands have been converted for agricultural purposes, there are many areas of native

⁷⁷ King, Tera and V. Bloch. 2008. Lincoln County Community Wildfire Protection Plan. Northwest Management, Inc. Moscow, Idaho.

vegetation and fallow farm land that cures early in the summer and remains combustible until winter. If ignited, these areas burn rapidly, potentially threatening people, homes, and other valued resources.

Cover vegetation and wildland fuels exhibited across the county have been influenced by massive geologic events during the Pleistocene era that scoured and shifted the earth's surface leaving areas of deep rich soil interspersed with rocky canyons and deep valleys. In addition to the geological transformation of the land, wildland fuels vary within a localized area based on slope, aspect, elevation, management practices, and past disturbances. Geological events and other factors have created distinct landscapes that exhibit different fuel characteristics and wildfire concerns.

Lincoln County has four predominant landscapes types that exhibit distinct terrain and wildland fuels: agricultural lands, channeled scablands, western river breaks, and eastern river breaks. These landscapes, although intermixed in some areas, exhibit specific fire behavior, fuel types, suppression challenges, and mitigation recommendations that make them unique from a planning perspective.

The gentle terrain that dominates Lincoln County facilitates extensive farming and ranching operations. Agricultural fields occasionally serve to fuel a fire after curing; burning in much the same manner as low grassy fuels. Fires in grass and rangeland fuel types tend to burn at relatively low intensities with moderate flame lengths and only short-range spotting. Common suppression techniques and resources are generally quite effective in this fuel type. Homes and other improvements can be easily protected from direct flame contact and radiant heat through adoption of precautionary measures around structures. Rangelands with a significant shrub component will have much higher fuel loads with greater spotting potential than grass and agricultural fuels. Although fires in agricultural and rangeland fuels may not present the same control problems as those associated with large, high intensity fires in timber, they can cause significant damage if precautionary measures have not been taken prior to a fire event. Wind driven fires in these fuel types spread rapidly and can be difficult to control. During extreme drought and when pushed by high winds, fires in agricultural and rangeland fuels can exhibit extreme rates of spread, which complicates suppression efforts.

Forest and woodland fuels are mostly present in the canyons and river breaks on sloping terrain less favorable to clearing for agricultural development. A patchwork of ponderosa pine and Douglas-fir stands occupy sheltered areas on favorable soil where moisture is not a limiting factor. Wooded areas tend to be on steep terrain intermingled with grass and shrubland providing an abundance of ladder fuels which lead to horizontal and vertical fuel continuity. These factors, combined with arid and windy conditions characteristic of the river valleys in the region, can result in high intensity fires with large flame length and fire brands that may spot long distances. Such fires present significant control problems for suppression resources and often results in large wildland fires.

Development is rapidly occurring along the Spokane and Columbia River breaks on the north side of the county. Many people have purchased small tracts of land in this location and built dwellings amongst the trees and shrubland. Scenic vistas and rolling topography with proximity to Lake Roosevelt National Recreation Area make this area desirable. However, the risk of catastrophic loss from wildfires in this area is significant. Fires igniting along the bottom of the canyon have the potential to grow at a greater rate of speed on the steeper slopes and rapidly advance to higher elevations. Within the forest and woodland areas, large fires may easily produce spot fires up to 2 miles away from the main fire, compounding the problem and

creating fires on many fronts. Fire suppression efforts that minimize loss of life and structures in this area are largely dependent upon access, availability and timing of equipment, prior fuels mitigation activities, and public awareness.

Local Event History

Detailed records of wildfire ignitions and extents from the Washington Department of Natural Resources (DNR) and Bureau of Land Management (BLM) have been analyzed. In interpreting these data, it is important to keep in mind that the information represents only the lands protected by the agency specified and may not include all fires in areas covered only by local fire departments or other agencies.

The Federal and State agencies database of wildfire ignitions (1973-2015) used in this analysis includes ignition and extent data within their jurisdictions. During this period, the agencies recorded an average of 12 wildfire ignition per year resulting in an average total burn area of 7,848 acres per year. The highest number of ignitions (22) occurred 1998, while the greatest number of acres burned in a single year occurred in 2007 with over 62,700 acres burned. According to this dataset, most fires occurring in Lincoln County are human caused; however, naturally ignited caused fires occur as well. The unknown caused fires contribute to a significant number of acres burned in Lincoln County. These could be ‘unknown’ because of a lack of qualified fire investigator(s) in the County.

Table 5.3. Summary of ignitions in Lincoln County from state and federal databases 1973-2015.

Cause	Acres Burned	Percent	Number of Ignitions	Percent
Human-caused	264	61%	134,357	48%
Natural	114	26%	29,210	10%
Unknown	57	13%	118,972	42%
Total	435	100%	282,530	100%

Figure 5.17. Summary of Lincoln County Ignitions by Cause (2008 - 2018).

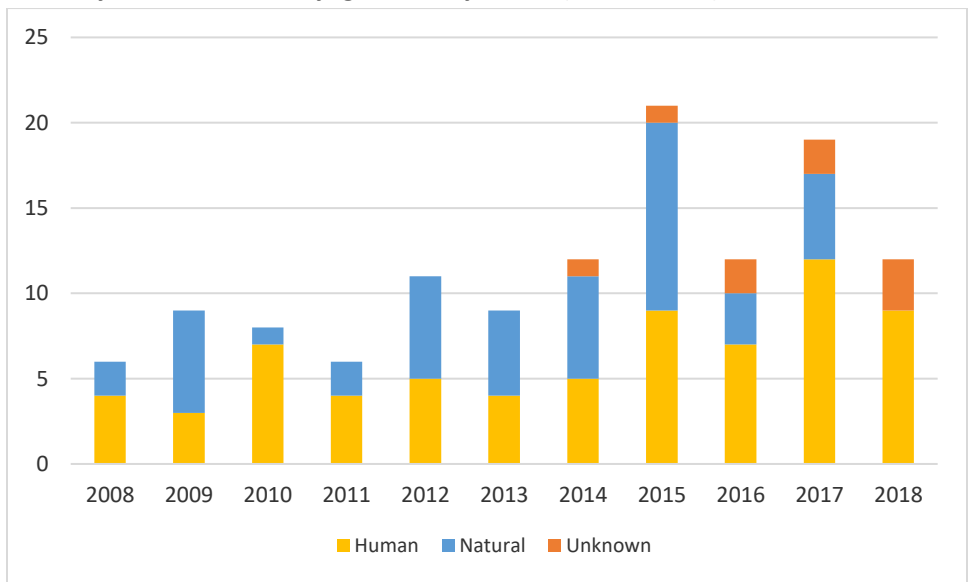
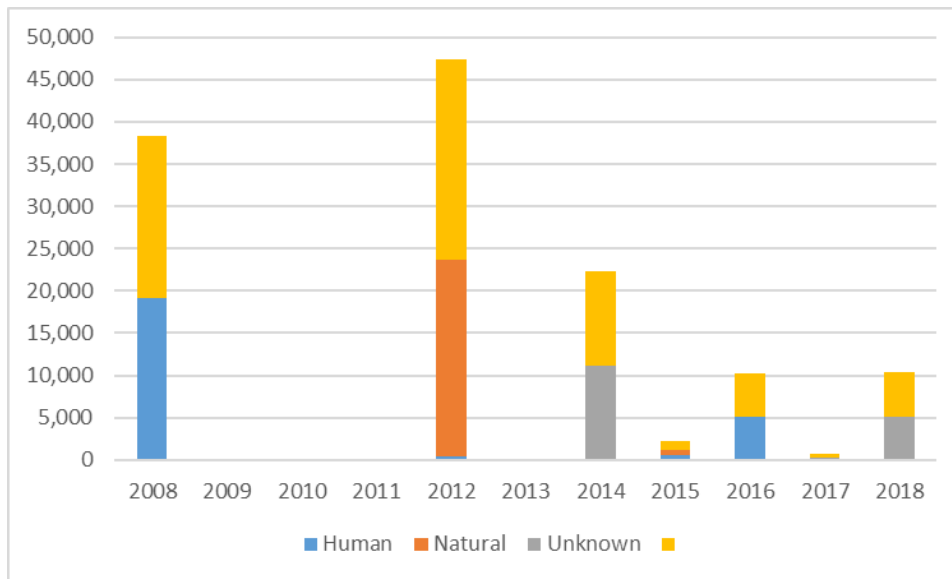


Figure 5.18. Summary of Lincoln County Acres by Cause (2008-2018).



Probability of Future Occurrence

Fire was once an integral function of most ecosystems in northeastern Washington. The seasonal cycling of fire across the landscape was as regular as the July, August and September lightning storms plying across the canyons and mountains. Depending on the plant community composition, structural configuration, and buildup of plant biomass, fire resulted from ignitions with varying intensities and extent across the landscape. Shorter return intervals between fire events often resulted in less dramatic changes in plant composition.⁷⁸ The fires burned from 1 to 47 years apart, with most at 5- to 20-year intervals.⁷⁹ With infrequent return intervals, plant communities tended to burn more severely and be replaced by vegetation different in composition, structure, and age.⁸⁰ Native plant communities in this region developed under the influence of fire, and adaptations to fire are evident at the species, community, and ecosystem levels. Fire history data (from fire scars and charcoal deposits) suggest fire has played an important role in shaping the vegetation in the Columbia Basin for thousands of years.

Ideally, historical fire data would be used to estimate the annual probability for fires in Lincoln County. However, current data are not adequate to make credible calculations because the data for local, state, and federal responsibility areas are not reported by the same criteria. Nevertheless, the data reviewed above provide a general picture of the level of wildland-urban interface fire risk for Lincoln County overall. Based

⁷⁸ Johnson, C. G. 1998. *Vegetation Response after Wildfires in National Forest of Northeastern Oregon*. 128 pp.

⁷⁹ Barrett, J. W. 1979. *Silviculture of ponderosa pine in the Pacific Northwest: The state of our knowledge*. USDA Forest Service. General Technical Report PNW-97. Pacific Northwest Forest and Range Experiment Station. Portland, Oregon. 106pp.

⁸⁰ Johnson, C.G.; et al. 1994. *Biotic and Abiotic Processes of Eastside Ecosystems: the Effects of Management on Plant and Community Ecology, and on Stand and Landscape Vegetation Dynamics*. Gen. Tech. Report PNW-GTR-322. USDA-Forest Service. PNW Research Station. Portland, Oregon. 722pp.

on the historical information available, Lincoln County has a very high probability of wildland fires occurring on an annual basis, with larger fires occurring every 2 to 5 years.

Ignition potential is also high throughout the County. Recreational areas, major roadways, debris burning, and agricultural equipment are typically the most likely human ignition sources. Lightning is also a common source of wildfires in Lincoln County.

Impacts of Wildland Fire Events

Wildland fires, big and small, are dangerous to both Lincoln County residents and emergency response personnel. Wildland fire suppression activities have a very high frequency of injuries, such as heat exhaustion and smoke inhalation, and have caused numerous deaths nationwide. Fire events in Lincoln County typically result in a multi-department and agency response effort; thus, coordinating activities and ensuring everyone's safety is paramount.

Residents with property in the path of wildland fire will likely suffer the greatest impacts through loss of structures and/or the value of any timber or agricultural crops on their land. Many fires require an evacuation of nearby residences to ensure the safety of citizens. Evacuation procedures require the coordination of law enforcement and fire service organizations and may involve temporary sheltering in extreme cases.

Lincoln County, like most areas, has sensitive populations, such as elderly residents and children, who may be affected by air quality during a wildland fire. Smoke and particulates can severely degrade air quality, triggering health problems. In areas heavily impacted by smoke, people with breathing problems might need additional services from doctors or emergency rooms.

Commerce in Lincoln County and the rest of the region may also be interrupted by wildland fires. Transportation corridors will likely be temporarily closed or slowed due to a fire burning in the area. Heavy smoke from a wildfire several miles away could be dense enough to make travel unsafe on roadways.

The environmental impacts from a fire are dependent on the vegetation present and the intensity of the fire. Most of the rangeland and forest ecosystems present in Lincoln County are adapted to periodic fire events and are benefitted by occasional, low intensity burns. On the other hand, overcrowded forest conditions or over mature stands of sage brush will likely burn much more intensely than occurred historically. These types of fires tend to result in a high rate of mortality in the vegetation and often adversely impact soil conditions. High intensity fires are also much more dangerous and difficult to suppress.

Lincoln County is actively pursuing funds to help with wildland fire mitigation projects and public education programs. While mitigation efforts will significantly improve the probability of a structure's survivability, no amount of mitigation will guarantee survival.

Value of Resources at Risk

It is difficult to estimate potential losses in Lincoln County due to wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard.

Typically, structures located in forested areas without an adequate defensible space or fire-resistant landscaping have the highest risk of loss. Nevertheless, homes and other structures located in the grasslands or agricultural regions are not without wildfire risk. Grass fires are often the most dangerous due to high rates of spread. Fires in this fuel type are considered somewhat easier to suppress given the appropriate resources, but they can also be the most destructive.

Avalanche Profile

There have been no reported damages or lives lost due to an avalanche in Lincoln County. The northern border of the County along Lake Roosevelt has the highest propensity for avalanches due to the steeper terrain; however, this area rarely accumulates a significant amount of snow. Any avalanche danger in this area would most likely be associated with drifts or other small accumulations sliding onto a road. There are currently no avalanche mitigation programs occurring in Lincoln County.

Probability of Future Occurrence

The probability of an avalanche along the northern border of Lincoln County is low. The most significant risk is associated with small slides along roadsides, which occurs occasionally, but with little impact.

Impacts of Avalanche Events

It is unlikely that residents of Lincoln County would experience any significant impact from an avalanche. Damage to cut or fill slopes along roads in the northern fringe of the County may occur due to small snow slides carrying debris. Slides onto roads would likely require removal by Lincoln County Public Works but pose very little danger.

Value of Resources at Risk

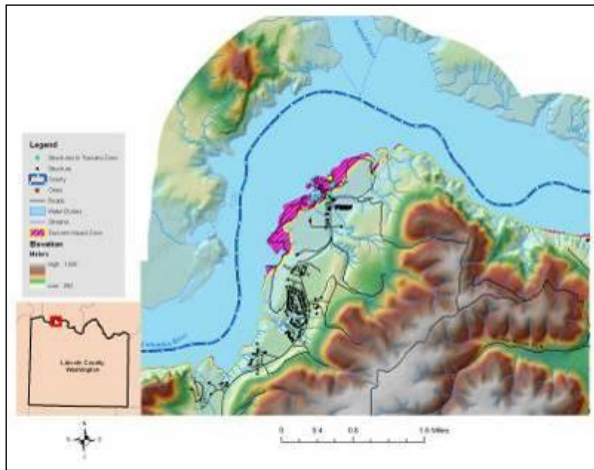
Lincoln County has no assets at significant risk of avalanches due to the topography and low snow accumulations.

Seiche Profile

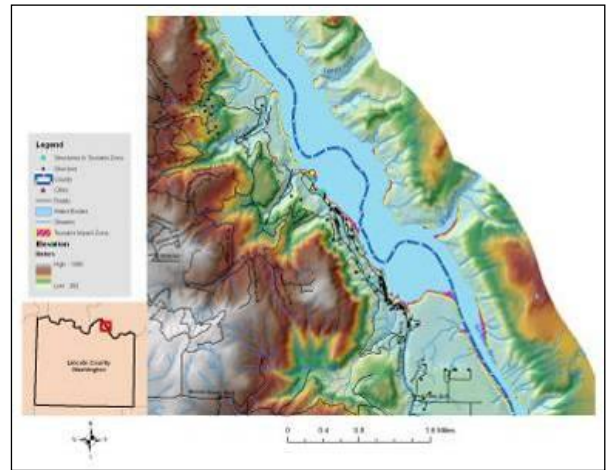
The northern border of Lincoln County is formed by the Columbia River. There is a moderate probability of landslides causing localized seiches in this vicinity. The shores of Lake Roosevelt have been subject to several hundred landslides since the reservoir was filled during construction of Grand Coulee Dam in the 1930's and early 1940's. The greatest percentage of landslide activity occurred during initial filling of the reservoir, but many slope failures also have been caused by intermittent drawdown of the reservoir level. In addition, occasional slope failures have occurred as natural phenomena, related more to wet winters than to fluctuations of the reservoir.⁸¹

Figure 5.19. Community Seiche Profiles

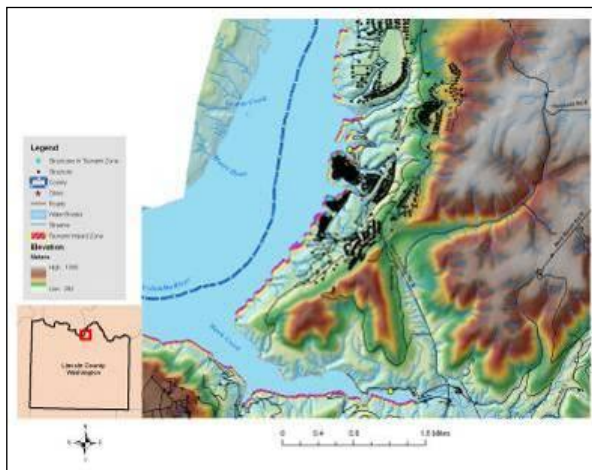
⁸¹ Highland, Lynn M. and Robert L. Schuster. "Significant Landslide Events in the United States." U.S. Geologic Survey. Available online at http://landslide.usgs.gov/docs/faq/significantls_508.pdf.



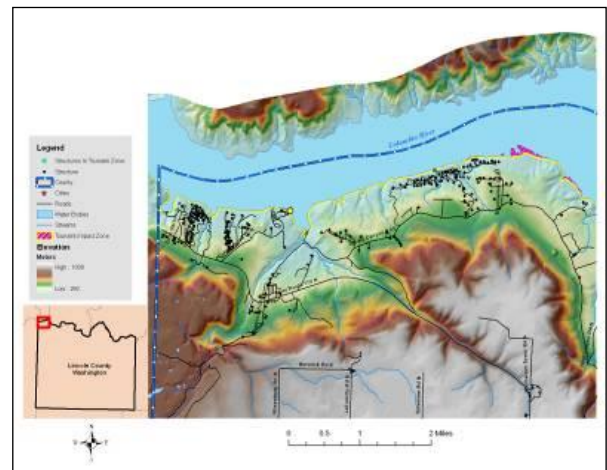
Keller



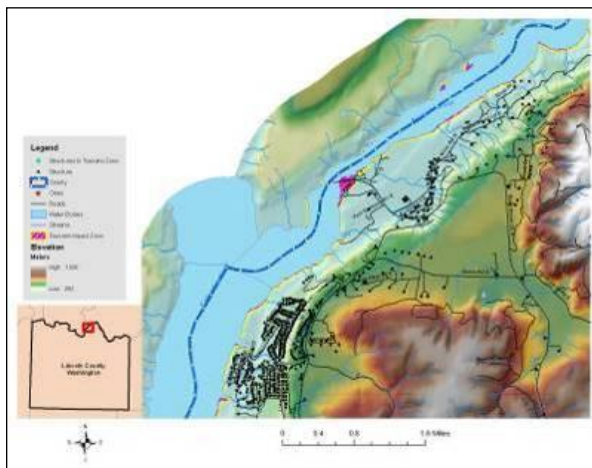
Porcupine Bay



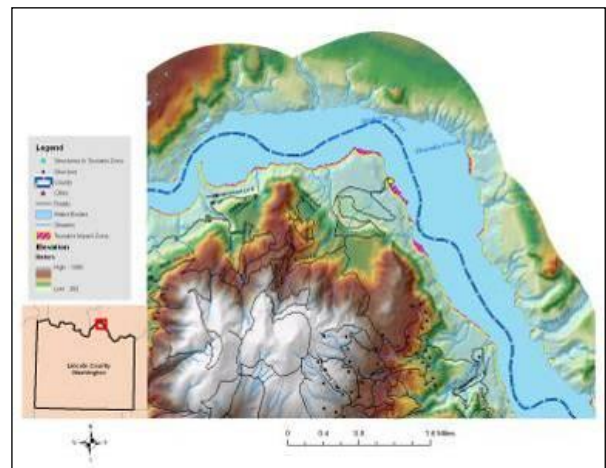
Seven Bays



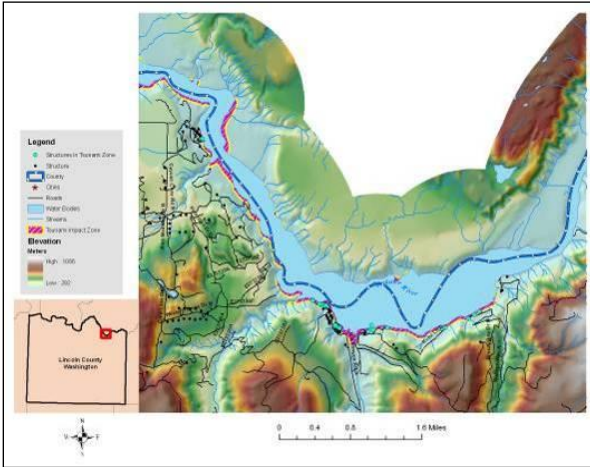
Spring Canyon



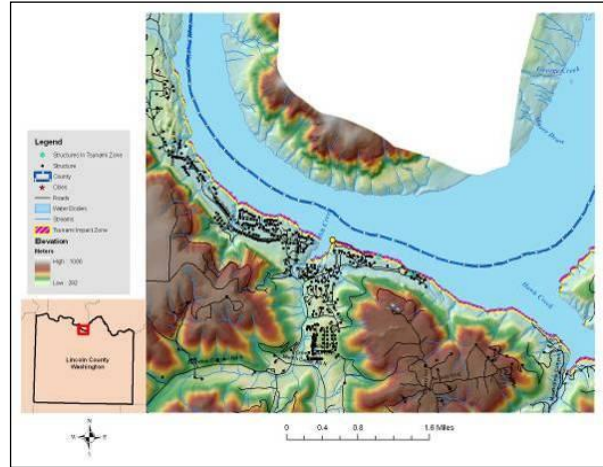
Fort Spokane



Detillion



Arrowhead Bay



Hawk Creek

Based on past events, it was determined that most of the landslides along Lake Roosevelt had produced a 30 foot or less wave on the opposite shore. For the purposes of this document, the Lincoln County shoreline was evaluated to determine where and what type of development or resources were in this potential Impact Zone. The Seiche Impact Zone is based on a 32.8-foot (10 meter) wave hitting above the Lake Roosevelt full pool level. The maps above depict the Impact Zone in areas with significant development or infrastructure at risk.

Local Event History

There have been no seiche events since the last version of the plan was approved. The event below was the last known event that affected Lincoln County.

August 2009 Seiche – A large landslide occurred near the Blue Creek drainage on the Spokane Indian Reservation side of the Spokane Arm of Lake Roosevelt. This resulted in a 12-foot wave hitting Porcupine Campground on the southern shores less than a thousand yards across the Lake. Numerous people were in the water at Porcupine Bay during the event. Damage to National Park Service facilities including log booms, docks, and a swim platform was estimated at \$250,000.

Figure 5.20. August 2009 Seiche



Probability of Future Occurrence

The probability of a seiche causing a direct impact on Lincoln County is unknown but believed to be moderate based on recent events. The probability of landslides continuing to occur along Lake Roosevelt as a function of saturated soils, changing land uses, or fluctuations in the reservoir level is high; however, the location of these slides is difficult to predict. Additionally, the size of the landslide will determine the size of the wave and the potential impact on the opposite shore.

Impacts of Seiche Events

Due to the lower population density and the lack of infrastructure within approximately 30 feet of the Lake Roosevelt shoreline, it is unlikely that a seiche would cause significant damages within the County. However, depending on the location, direction that the wave propagates, time of day, and time of year, property damages, casualties, and possibly fatalities from a seiche could be high within an impacted area, particularly if a seiche wave collides directly with an intensely populated recreational area.

Boats and other watercraft that happen to be impacted by seiche may be toppled, but this is unlikely. Smaller vessels have a higher risk of being overturned by a large wave. Nevertheless, boats in the direct vicinity of a landslide, may be severely damaged or sunk by falling debris and outwash. This would also be very dangerous for persons on board and would likely result in injuries or even death.

Value of Resources at Risk

Currently, there are 55 structures with an approximate total value of \$4.1 million based on the County Assessor's data. Individual crops, structures, or docks may be damaged, but widespread losses are unlikely. Most of the infrastructure within the Impact Zone is recreational facilities including the National Park Service's Spring Canyon facility, Lincoln Hill launch ramp, Hawk Creek launch ramp, Seven Bays launch ramp and marina, Fort Spokane launch ramp, Detillion launch ramp, and the Porcupine Bay launch ramp. The Keller Ferry facility is also at risk. All these recreational sites are valued in the millions.

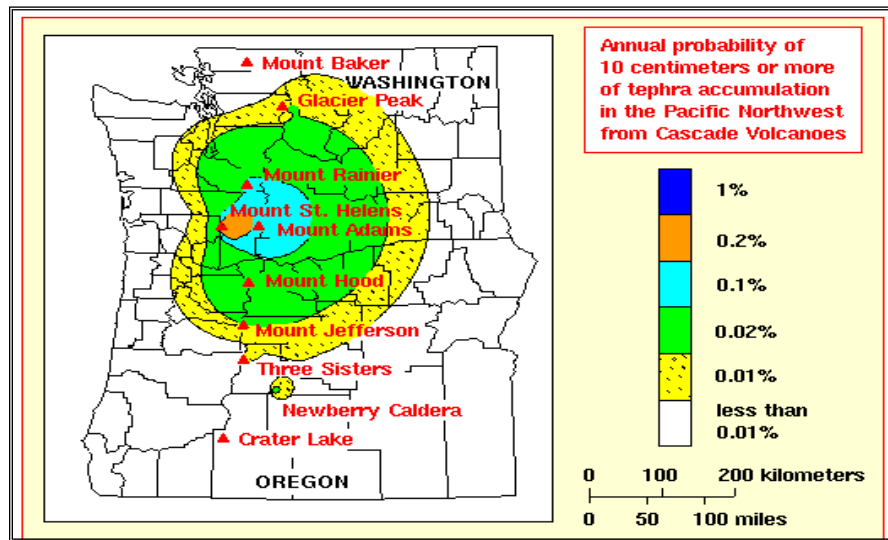
Volcanic Eruption Profile

Lincoln County is not directly at risk of experiencing a volcano; however, there is a high probability that ash and other particulates from an eruption in western Washington or Oregon would be carried to and deposited within the County. The Mount St. Helens eruption in 1980 deposited several inches of ash causing widespread damages to vehicles and other equipment in Lincoln County. The airborne particulates can also cause

respiratory problems for both people and animals. These affects are particularly notable for populations already dealing with respiratory illnesses.

The most serious ash fallout risk in Lincoln County is due to Mount St. Helens, the most prolific producer of tephra (solid material thrown into the air by volcanic eruption) in the Cascades during the past few thousand years. Figure 5.11. provides estimates of the annual probability of tephra fall affecting the region, based on the combined likelihood of tephra-producing eruptions occurring at Cascade volcanoes, the relationship between thickness of a tephra-fall deposit and distance from its source vent, and regional wind patterns. Probability zones extend farther east of the range because winds blow from westerly directions most of the time. The map shows probabilities for a fall of 10 centimeters (about 4 inches) or greater. Even though Mount Adams is a meager tephra producer, the region around Mount Adams has the highest probability of tephra fall of anywhere in the western conterminous United States, owing to its location just downwind of Mount St. Helens.⁸²

Figure 5.21. Annual Probability of 10cm or more of Tephra Accumulation.



Probability of Future Occurrence

The geologic history is fragmented for most of the volcanoes in the Cascade Range, thus, the probability of one of these volcanoes entering a new period of eruptive activity is difficult to estimate. In general, the annual probability that Lincoln County will be significantly affected by a volcanic eruption is very low.

Impacts of Volcanic Eruptions

Lincoln County, like most areas, has sensitive populations, such as elderly residents and children, who may be affected by air quality during ash fall. Ash fall can severely degrade air quality, triggering health problems. In areas with considerable ash fall, people with breathing problems might need additional services from doctors or emergency rooms.

⁸² W.E. Scott, R.M. Iverson, J.W. Vallance, and W. Hildreth, 1995, *Volcano Hazards in the Mount Adams Region, Washington: U.S. Geological Survey Open-File Report 95-492.*

Volcanic eruptions can also disrupt the normal flow of commerce and daily human activity without causing severe physical harm or damage. Ash that is a few inches thick can halt traffic, cause rapid wear of machinery, clog air filters, block drains, creeks, and water intakes, and impact agriculture. Removal and disposal of large volumes of deposited ash can also have significant impacts on government and business.

The interconnectedness of the region's economy can be disturbed after a volcanic eruption. Roads, railroads, and bridges nearest the volcano can be damaged from lahars and mudflows, which will influence intra-state travel and commerce. In addition, the movement of goods via the Columbia River can also be halted due to debris in the river and tephra in the air. The Mount St. Helens event in May 1980 cost the trade and commerce industry an estimated \$50 million in only two days, as ships were unable to navigate the Columbia.

Local accounts of the Mount St. Helens eruption did not indicate that the ash deposition adversely affected crops. In fact, some noted that the addition of volcanic ash increased the water retention properties of the soil.

Clouds of ash often cause electrical storms that start fires and damp ash can short-circuit electrical systems and disrupt radio communication. Volcanic activity can also lead to the closure of recreation areas, along the Columbia River in Lincoln County, as a safety precaution.

Value of Resources at Risk

Lincoln County has no assets at direct risk of being impacted by a volcanic eruption. However, the secondary effects of ash and airborne particulates may have varying degrees of negative effects within the County. Damages to property will likely be limited to vehicles and cleanup costs. Additionally, residents of Lincoln County will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

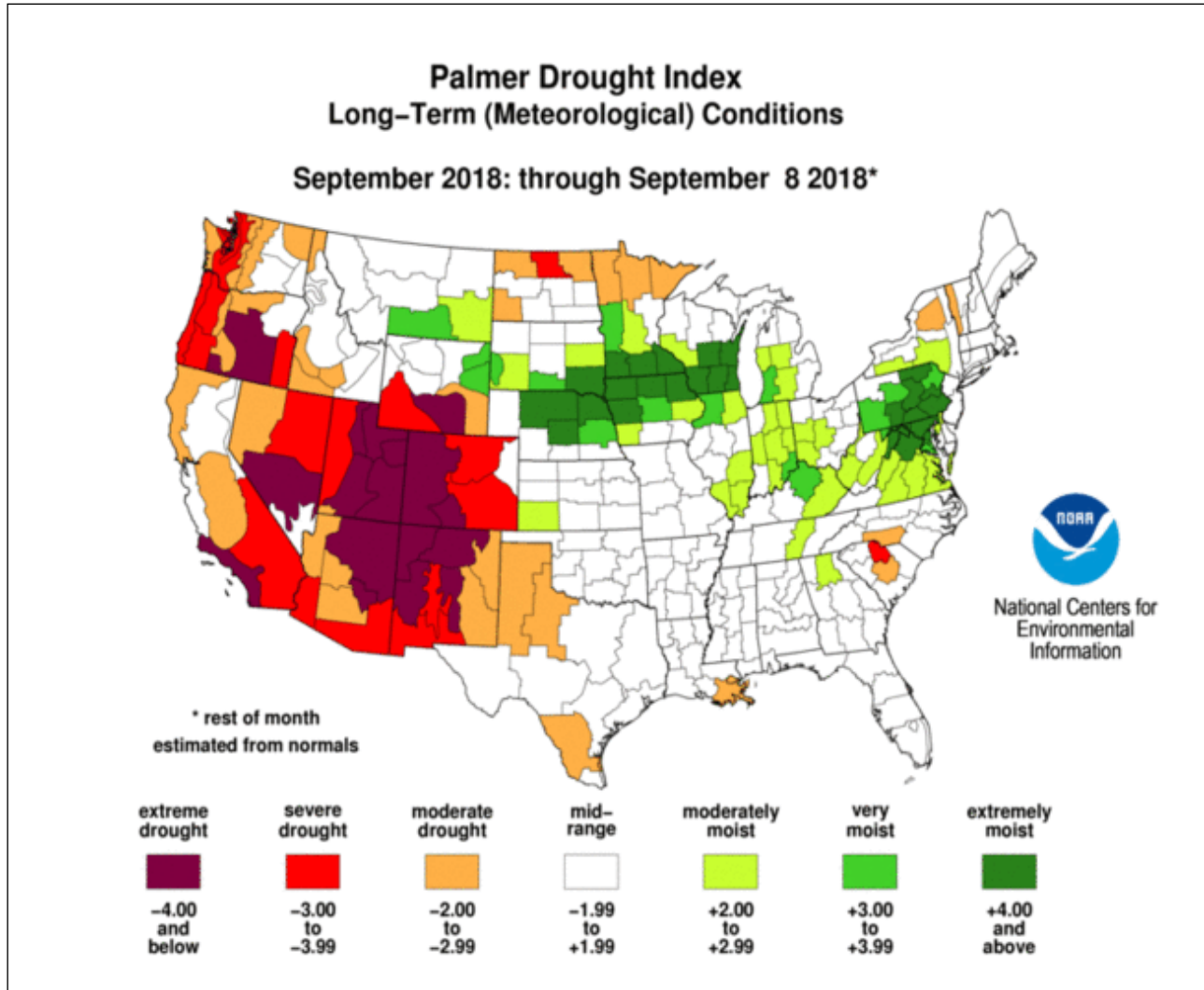
Drought Profile

Drought is a condition of prolonged dryness that is severe enough to reduce soil moisture, water, and snow levels below the minimum necessary for sustaining plant, animal, and economic systems.⁸³ The Washington State Legislature in 1989 gave permanent drought relief authority to the Department of Ecology and enabled them to issue orders declaring drought emergencies. Nearly all areas of the State are vulnerable to drought. In every drought, agriculture is adversely impacted, especially in non-irrigated areas such as the dry land farms and rangelands in Lincoln County. Droughts impact individuals (farm owners, tenants, and farm laborers), the agricultural industry, and other agriculture-related sectors.

The severity of drought is measured by the Palmer Index in a range of 4 (extremely wet) to -4 (extremely dry). The Palmer Index incorporates temperature, precipitation, evaporation and transpiration, runoff and soil moisture when designating the degree of drought.

⁸³ "Washington State Enhanced Hazard Mitigation Plan". Washington Military Department Emergency Management Division, 2013. <https://mil.wa.gov/other-links/enhanced-hazard-mitigation-plan>.

Figure 5.22. Palmer Drought Severity Index for September 2018.⁸⁴



Drought affects water levels for use by industry, agriculture, and individual consumers. Water shortages affect firefighting capabilities through reduced flows and pressures. Drought also affects power production. Much of Washington State’s power is produced by hydro-electric dams. When water levels drop, electric companies cannot produce enough power to meet demand and are forced to buy electricity from other sources

Oftentimes, drought is accompanied by extreme heat. When temperatures reach 90 degrees and above, people are vulnerable to sunstroke, heat cramps, and heat exhaustion. Pets and livestock are also vulnerable to heat-related injuries. Crops can be vulnerable as well. In the past Washington State droughts, wheat has been scorched, apples have sunburned and peeled, and yields were significantly lessened.

⁸⁴ National Integrated Drought Information System. Drought.gov. website: <https://www.drought.gov/drought/data-maps-tools/current-conditions>. Accessed September, 2018.

Drought increases the danger of wildland fires. In Lincoln County, fires in rangeland areas are particularly dangerous due to typically high rates of spread and the scattered nature of structures and infrastructure that could potentially be affected.

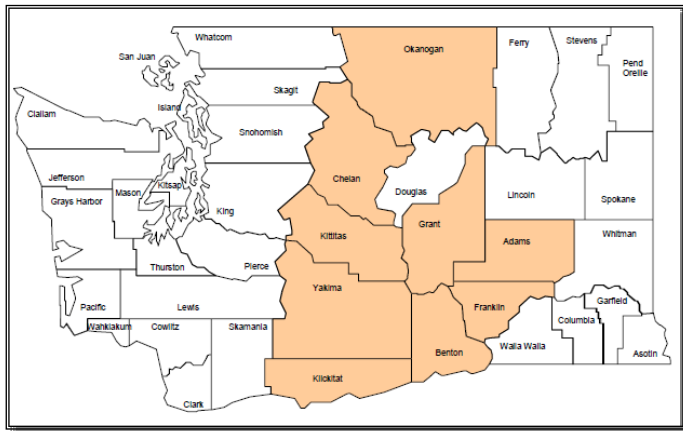
High quality agricultural soils exist in much of Lincoln County. Many areas of the county sustain dry land crops such as wheat that are dependent upon moisture through the winter and spring and dry arid conditions in the summer. According to the 2007 Census of Agriculture, Lincoln County had 798 farms totaling 1,090,178 acres. The market value of these farms was reportedly \$126,216,000 with government payments totaling \$15,371,000.⁸⁵ While Lincoln County does experience droughts, on the whole, they are mild and do not cause long term damage.

Local Event History

2015 Drought – “The 2015 growing season in Washington State was one of the driest on record due to early, rapid snow melt. In addition, temperatures during the 2015 water year (October 1, 2014 – September 30, 2015) were far above average. Due to high temperatures, precipitation at high elevations that would ordinarily result in snow accumulation (sustaining irrigation networks through the summer) fell as rain instead. As a result, summer streamflow throughout the state was much lower than usual. During the last week of August, the height of the 2015 drought, 85% of Washington was in extreme drought status.”⁸⁶

Probability of Future Occurrence

Figure 5.23. Counties Most Vulnerable to Drought



The Washington State Hazard Mitigation Plan does not consider Lincoln County to be one of the counties most vulnerable to drought in Washington. Lincoln County was in a severe drought condition 10-15% of the time between 1895 and 1995, 20-30% of the time between 1985 and 1995, and 30-40% of the time between 1976 and 1977.

It is critical that the people inhabiting each geographic region understand their exposure to the drought hazard: for example, the probability of drought occurrence at various severity levels.

However, the risks associated with drought for any region are products of both the region's exposure to the event and the vulnerability of its society to a drought at that point in time. Vulnerability, unlike the natural event, is determined by varied social factors.

⁸⁵ Washington State Homeland Security Region 9. “Regional Threat/Risk Assessment and Vulnerability Analysis Report”. Spokane, Washington. January 2011.

⁸⁶ McLain, K., Hancock, J., Drennan, M., 2017. 2015 Drought and Agriculture. A study by the Washington Sate Department of Agriculture. AGR PUB 104-495 (N/2/17).

- Population changes
- Population shifts (region to region and rural to urban)
- Demographic characteristics
- Environmental awareness (or lack thereof)
- Level of technology
- Wisdom and applicability of government policies
- Land management practices
- Social behavior

These factors change over time and thus vulnerability is likely to increase or decrease in response to these changes. Subsequent droughts in the same region will have different effects, even if they are identical in intensity, duration, and spatial characteristics, because societal characteristics will have changed. However, much can be done to lessen societal vulnerability to drought through the development of preparedness plans that emphasize risk management and the adoption of appropriate mitigation actions and programs.

Impacts of Drought Events

The impacts of drought are diverse and often ripple through the economy. Thus, impacts are often referred to as either direct or indirect. A loss of yield resulting from drought is a direct or first-order impact of drought. However, the consequences of that impact (for example, loss of income, farm foreclosures, and government relief programs) are secondary or even tertiary impacts.

The impacts of drought in Lincoln County can be classified into one of three principal types: economic, environmental, and social.

Economic Losses - Economic impacts range from direct losses in the broad agricultural and agriculturally related sectors (including forestry and fishing), to losses in recreation, transportation, banking, and energy sectors. Other economic impacts would include added unemployment and loss of revenue to local, state, and federal government.

Environmental Impacts - Environmental losses include damages to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; and soil erosion. These losses are difficult to quantify but growing public awareness and concern for environmental quality has forced public officials to focus greater attention on them.

Impacts on Society - Social impacts mainly involve public safety, health, conflicts between water users, and inequities in the distribution of impacts and disaster relief programs. As with all-natural hazards, the economic impacts of drought are highly variable within and between economic sectors and geographic regions, producing a complex assortment of winners and losers with the occurrence of each disaster.

Value of Resources at Risk

The 2015 and other past drought years in Washington caused only minor damages and crop losses. There were no threats to any critical facilities. Thus, a minor to moderate drought has a low probability of affecting

the County's economy directly due to the availability of irrigation waters. An extreme and prolonged drought could result in limited availability of irrigation water; thus, causing severe crop losses countywide.

In the event of an extended drought cycle, water shortages may lead to crop failures, or at the least, the necessity to plant lower value crops that are less water-dependent. Most of the population is employed either directly by the agriculture industry or to a service industry dependent on agriculture. Crop losses resulting from extended droughts would likely be considered a disaster for Lincoln County. Lower water levels may also affect the County's ability to efficiently transport crops to available markets. Barging of goods on the Columbia River could be reduced due to lower water levels.

Domestic and municipal water shortages are also likely to occur during an extended drought. Efforts to conserve water resources, including public education on conservation techniques, are encouraged by Lincoln County during the summer months.

City of Davenport Annex

Flood Profile

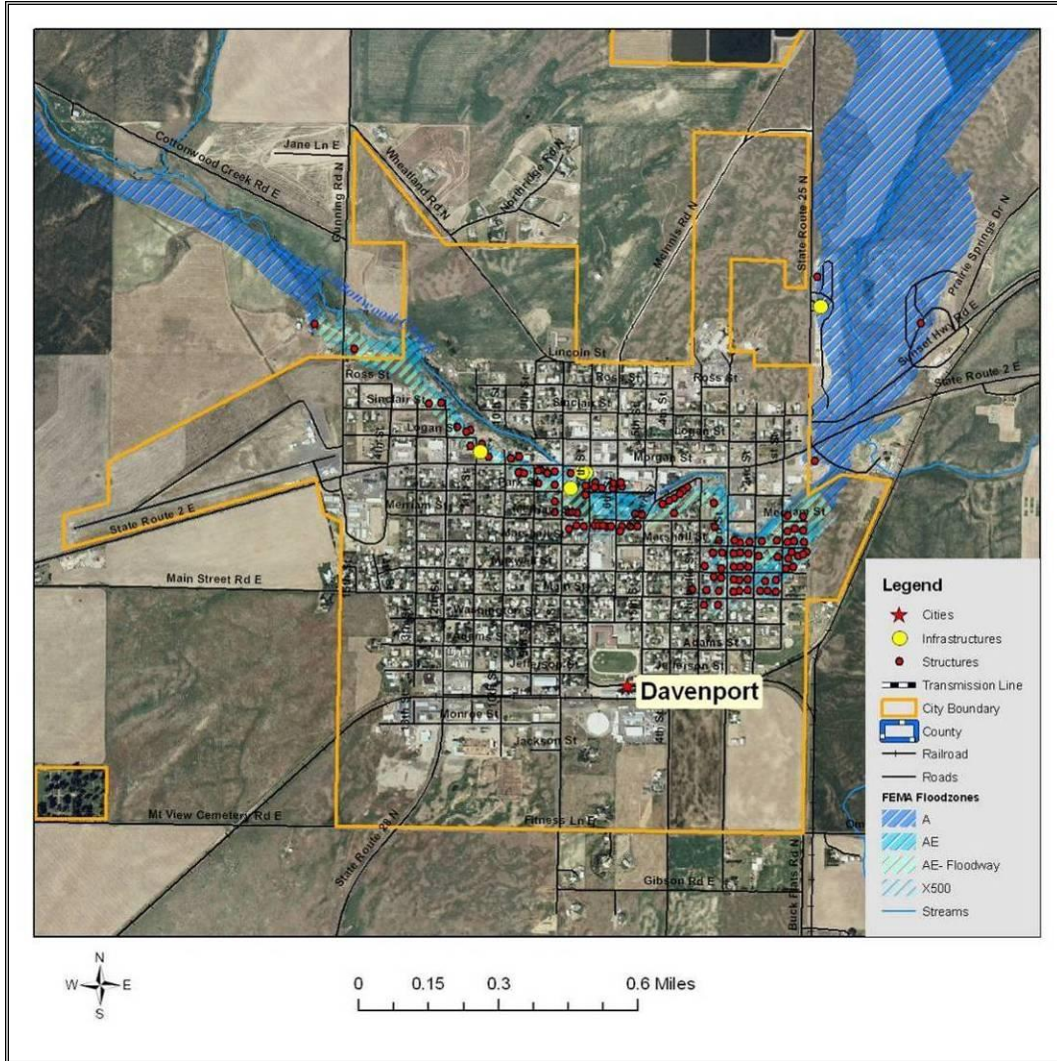
The main channel of Cottonwood Creek, a tributary to Hawk Creek, runs directly through the city of Davenport entering near State Highway 25 on the northeast corner of town and exiting along the western boundary. Within Davenport, flooding is generally limited to large rain-on-snow events such as occurred in 1996-1997 and most recently in 2009-10. Warm rains result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen, and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days. Low velocity flooding occurs in several of the nearby tributaries almost annually during the spring runoff period. Flash floods are also a concern as numerous small tributaries feed Cottonwood Creek. These smaller streams typically have shallow channels with large floodplains draining hundreds of acres. Cottonwood Creek collects much of this runoff before entering the relatively narrow channel through downtown Davenport. Jams can also cause localized flooding as debris or ice get caught at bridge abutments and other obstructions causing the channel to become constricted and floodwaters to back up.

Davenport's municipal water system is supplied by several wells in the area. Flooding as well as several other hazards and numerous potential non-point sources could cause contamination of the water supply or affect the capacity of the system. All the homes and businesses in Davenport are fed by the municipal system; thus, the impact of these events could affect the majority of the population including the hospital and schools.

Rural residences, ranches, farms, and roadways located near smaller waterways may be at significant flood risk. The onset of flooding in the smaller drainages can range from extremely slow to very fast. This variability depends on the cause of flooding and other factors such as rainfall intensity, the areas receiving the rain, temperature, and the condition of the soil. Floods that occur quickly are usually caused by thunderstorms, while floods that occur more slowly are often the result of moderate, but prolonged rainfall, snowmelt, or a combination of both. In the case of intense rainfall immediately above developed areas, the onset of flooding may occur in a matter of minutes.

A high level of sediment is prevalent during periods of intense runoff. This sediment tends to cause a deteriorating condition in streambeds and channels through deposition. Natural obstructions to flood waters include trees, brush, and other vegetation along the stream banks in the floodplain area. Considerable debris has been allowed to accumulate in these channels, plugging culverts and bridges at several locations throughout the county.

Figure 5.24. City of Davenport FEMA Flood Insurance Rate Map.



The city of Davenport does not currently participate in the NFIP. This is due to homeowners and business owners being largely unconcerned or unaware about flood risk and uninformed on the availability of low-cost flood insurance. Also, the typical flood event in Davenport does not result in property damage and is more likely to temporarily disrupt transportation and travel. Encouraging landowners to participate in the NFIP, especially those in flood-prone areas, is an ongoing mitigation action item.

Probability of Future Occurrence

The probability of flood events occurring in Davenport is moderate to high. Low magnitude flood events can be expected several times each year, particularly within the wider floodplain just north of the city limits. However, due to the flat topography and drainage infrastructure, the impacts of these events are slight and will usually amount to minor and temporary traffic issues. Larger magnitude and high impact flood events have occurred but are not likely in any given year. These types of flood events have the highest probability of occurrence in the winter or early spring in Davenport. Minor flash floods are common on the numerous small tributaries feeding Cottonwood Creek near the community but are not likely to have an impact on the Cottonwood Creek channel within the city center.

Impacts of Flood Events

The potential impacts from flooding in Davenport are very similar to the impacts described for Lincoln County as a whole. First responders and other volunteers aiding with emergency flood control or cleanup efforts are potentially at risk of injury due to accidents or possibly exposure to contaminated water. Although unlikely, the city's water supply could be affected by contaminated flood waters entering the groundwater supply.

The major impacts from flooding in Davenport are the restricted use of several streets, commercial, railroad spurs, and residential areas due to overburden of existing drainage facilities. There are numerous bridge and culvert crossings over Cottonwood Creek throughout its extent within the City and the surrounding area.

The availability of food and other supplies is not likely to be impacted or interrupted by a flood event. Furthermore, the delivery of community services such as postal services, health care, law enforcement, and emergency response are also not likely to be impacted by flood events in Davenport. While individual homes and businesses may incur damages because of a flood, the economy of the community will not be impacted by this type of hazard.

Environmental damages resulting from a flood event are also unlikely. Cottonwood Creek occupies a relatively wide floodplain except for a short segment that has been channeled through the community. Scouring and erosion along the banks of the stream along this narrower section is possible, but due to grass and other vegetation, these impacts will most likely be minimal and localized. Contamination of the riparian area by floodwaters containing chemicals or other pollutants is a possibility but is more likely to be realized in the surrounding areas than within the community due to the hydrologic profile of the floodplain.

Value of Resources at Risk

There are approximately 291 parcels and 108 structures within the FEMA-identified floodplains (100- and 500-year) in Davenport, yielding a total structure value of \$8 million. The per structure value is based on a countywide average of \$74,296 and does not reflect the replacement cost of a structure. The average damage to structures was estimated based on the parcel's location as either completely within or out of the flood zone. The estimated value of contents is ½ the value of the improvements equating to an additional \$4 million in potential losses. The damages will most likely not be equally distributed between buildings based on building materials, building location, and flood location. However, these estimates provide a basic approximation.

Critical infrastructure located within the identified floodplain for Davenport includes the fire station, the police station, and the Inland Power and CenturyTel communication towers. Currently, there are no repetitive loss properties in Davenport.

Earthquake

There are no recorded occurrences of earthquakes significantly impacting the city of Davenport; however, some minimal shaking has been felt because of larger earthquakes elsewhere. Davenport does not have any differing issues or levels of risk associated with this hazard than Lincoln County as a whole.

Probability of Future Occurrence

The City has 10% chance of exceeding a 6-7% pga in the next 50 years.⁸⁷

Impacts and Value of Resources At Risk

Unreinforced masonry (URM) structures and unreinforced chimneys of homes will likely be damaged in the event of an earthquake. There are several publicly accessible unreinforced masonry structures in Davenport in addition to the numerous homes and other buildings throughout the City with unreinforced chimneys. Damaged or collapsed chimneys could result in the secondary hazard of fire. Nonstructural damage caused by falling and swinging objects may be considerable after any magnitude earthquake. Damage to some older, more fragile bridges and land failure causing minor slides along roadways may isolate some residents.

In Davenport, nearly all the downtown structures are assumed to be unreinforced masonry including the police and fire station, city Library, city hall, and nearly all original buildings located on Morgan Street (SR2). These structures were built prior to the inclusion of articles for seismic stability in the Uniform Building Codes in 1972. The number and value of unreinforced masonry homes or homes with masonry chimneys in Davenport is unknown but estimated to include at least 100 buildings.

Landslide Profile

The city of Davenport has a very low probability of experiencing damaging landslides. The few slopes in and around the community are generally less than 20%. While small, low angle slumps may occur on eyebrows of the surrounding rolling hills, these will be infrequent and likely the result of water saturation or a major disturbance such as an earthquake or road construction.

Impacts and Value of Resources at Risk

There are no structures or infrastructure directly at risk from landslides within the city of Davenport.

Severe Weather Profile

The city of Davenport does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. The probability of a severe weather event occurring in Davenport on an annual basis is very high. However, the impacts to the community are usually minimal and are the same as those described for Lincoln County as a whole.

Impacts and Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Davenport. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. Additionally, snow rarely accumulates for long periods of time due to regular wind events. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer

⁸⁷ USGS. 2008 United States National Seismic Hazard Maps. U.S. Geological Survey. U.S. Department of Interior. Available online at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>. October 2009.

ones. Snow plowing in within the city limits is accomplished by the city's public works department. Private landowners are responsible for maintaining their own driveways or other private roads. Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Lincoln County schools are occasionally closed during and right after a severe winter storm because of cold temperatures and snow-covered roads.

Thunderstorms are not likely to be severe enough in Davenport to cause significant damages. However, the loss potential from flooding that result from severe thunderstorms could be significant.

Although the financial impacts of hail can be substantial and extended, accurately quantifying these impacts is problematic. Hail typically causes direct losses to structures and other personal property within Davenport. The most significant losses are most clearly seen in the agriculture sectors of the economy. Potential losses to agriculture can be disastrous. Crop damage from hail will also be different depending on the time of year and the type of crop. Most farmers carry insurance on their crops to help mitigate the potential financial loss resulting from a localized hail storm. Homeowners in Davenport rarely incur severe damage to structures (roofs); however, hail damage to vehicles is common. The damage to vehicles is difficult to estimate because the number of vehicles impacted by a specific ice storm is unknown. Additionally, most hail damage records are kept by various insurance agencies.

It is difficult to estimate potential losses in Davenport due to windstorms and tornadoes. Construction throughout the County has been implemented in the presence of high wind events, and therefore, the community is at a higher level of preparedness to high wind events than many other areas experiencing lower average wind speeds.

We have estimated losses based on wind and tornado damage as follows:

- 3% of the buildings damaged causing 50% of value loss (loss could be from downed or damaged trees, damaged outbuildings, damaged fences/poles, damage to siding, damaged landscaping etc.)
- 5% of the buildings received damage to roof (requiring replacement of roof equaling \$3,000)

Damages associated with sensitive receptor irritation have not been estimated. We have also not estimated the potential for a large-scale wildfire event associated with high winds. Based on the data provided by the County, there are 810 total parcels in Davenport with a total value of approximately \$59.3 million. Using the criteria outlined above an estimate of the impact of high winds in Davenport has been made. The potential wind and tornado damage to all buildings is estimated at approximately \$879,024. The estimated damage to roofs is approximately \$121,500.

Power failure often accompanies severe storms. Prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Wildland Fire Profile

The community of Davenport is surrounded by agricultural crops and pasture. Vast areas of deep, rich soil deposits provide for extensive agriculture development. Lincoln County is the second highest wheat and barley producing county in the state. Other crops include grass seed, oats, hay and potatoes as well as extensive areas of fallow land set aside in the CRP. Most of these crops are vulnerable to wildfire at certain times of the year. New development occurs primarily near the community and along major roads. Occasionally farmland is subdivided between family members for new home sites or for development of new farming facilities.

Wildfire potential in the agricultural fields near Davenport is high. Farming and ranching activities have the potential to increase the risk of a human-caused ignition. Large expanses of crops, CRP, rangeland or pasture provide areas of continuous fuels that may threaten homes and farmsteads near Davenport. Under extreme weather conditions, escaped fires in these fuels could threaten individual homes or the community; however, this type of fire is usually quickly controlled. Clearings and fuel breaks disrupt a slow-moving wildfire enabling suppression before a fire can ignite heavier fuels. High winds increase the rate of fire spread and intensity of crop and rangeland fires. It is imperative that homeowners implement fire mitigation measures to protect their structures and families prior to a wildfire event.

Wildfire risk in the agricultural landscape is at its highest during late summer and fall when crops are cured, and daily temperatures are at their highest. A wind-driven fire in agricultural fuels or dry native fuel complexes would produce a rapidly advancing, but variable intensity fire. Fires burning in some types of unharvested fields would be expected to burn more intensely with larger flame lengths due to the greater availability of fuels resulting from the higher productivity of the vegetation. Fields enrolled in the CRP or set aside for wildlife habitat can burn very intensely due to an increased amount of fuel build-up from previous years' growth. Fires in these types of fuels are harder to extinguish completely due to the dense duff layer, often leading to hold over fires that may reemerge later causing additional fire starts.

Residents living in Davenport have access to the municipal water supply system and public fire hydrants. Outside these areas, development relies on individual, co-op, or multiple-home well systems. Creeks, ponds, and developed drafting areas provide water sources for emergency fire suppression in the rural areas to a limited extent. Irrigation systems can provide additional water supply for suppression equipment on a limited basis. Additional water resources distributed and documented throughout the agricultural landscape are needed to provide water for fire suppression.

Above ground, high voltage transmission lines cross the planning area in many directions in corridors cleared of most vegetation, which provides for a defensible space around the power line infrastructure and may provide a control point for fire suppression, if well maintained. Local public electrical utility lines are both

above and below ground traveling through back yards and along roads and highways. Many of these lines are exposed to damage from falling trees and branches. Power and communications may be cut to some of these during a wildfire event.

Lincoln County Fire District #5 protects the community of Davenport. The fire district provides structural fire protection as well as wildland fire protection. Mutual aid agreements between fire districts supplement wildland fire protection when needed. Additional fire protection is provided by the Washington DNR, which provides wildfire protection and suppression on privately owned forestland and state-owned forestland north of Highway 2 in Lincoln County. The DNR does not provide structural fire suppression but does provide wildfire protection on non-forested land that threatens DNR-protected lands. The BLM provides wildfire protection on their ownership within Lincoln County and has mutual aid agreements with the DNR for protection of forested land. BLM also does not provide structural fire suppression.

Probability of Future Occurrence

The probability of a wildland fire threatening Davenport on an annual basis is high. Homes and other structures located in the grasslands or agricultural fields within or surrounding the community have a high wildfire risk. Rangeland or grass fires are often the most dangerous due to high rates of spread. Fires in this fuel type are considered somewhat easier to suppress given the appropriate resources, but they can also be the most destructive. Homes along the perimeter of the community would have the highest risk due to their adjacency to flashy fuels.

Impacts of Wildland Fire Events

The potential impacts from a wildfire in Davenport are very similar to the impacts described for Lincoln County as a whole. All fires pose a significant safety risk to residents and emergency service personnel. Individual structures, property, and livelihoods could be severely damaged or lost because of a fire; however, the community is not likely to suffer severe or long-term economic losses.

A fire in the grasslands surrounding the community may benefit the ecological environment as nutrients are recycled into the soil. Generally, grass and forbs are rejuvenated by a low intensity fire and grow back quickly; however, heavy rains immediately after a fire could cause erosion.

Smoke from a nearby wildland fire may impact sensitive populations within the community due to degraded air quality conditions. Smoke and/or flames will also impact transportation corridors connecting Davenport to other communities; thus, travel and commerce may be interrupted.

Value of Resources at Risk

It is difficult to estimate potential losses in Davenport from wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is unlikely that more than a few structures or other properties within the city limits of Davenport would be lost or damaged by a wildland fire; however, residents in the immediate vicinity may be directly impacted. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard.

Avalanche Profile

The city of Davenport will not be directly impacted by this type of localized event due to the gentle topography and low snow accumulations.

Impacts and Value of Resources at Risk

The city of Davenport will not be impacted and has no assets at risk to avalanches.

Seiche Profile

Although Lincoln County's northern border has a moderate risk of being impact by a seiche on Lake Roosevelt, the city of Davenport will not be directly impacted by this type of localized event.

Impacts and Value of Resources at Risk

The city of Davenport will not be impacted and has no assets at risk to seiches.

Volcanic Eruption Profile

The city of Davenport does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The city of Davenport has no assets at direct risk of being impacted by a volcanic eruption. However, the secondary effects of ash and airborne particulates may have varying degrees of negative effects. Damages to property will likely be limited to vehicles and cleanup costs. Additionally, residents of Davenport will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

Drought Profile

The city of Davenport does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, the city does have its own policies concerning water conservation practices during emergency drought conditions. Additionally, the city may further develop programs to deal with residents and businesses significantly impacted by drought if necessary. Year-round water conservation ideas are regularly being offered to citizens to reduce consumption.

Impacts and Value of Resources at Risk

The city of Davenport has no assets directly at risk to drought; however, the economic impacts of a drought or a wildland fire caused by extended dry periods would have a great impact on the community. Most of the population is employed either directly by the agriculture industry or to a service industry dependent on agriculture. Crop losses resulting from extended droughts would likely be considered a disaster for the community.

City of Sprague Annex

Flood Profile

The city of Sprague is bisected by the main channel of Negro Creek, the feeder stream for Sprague Lake. Additionally, two small unnamed springs flow out of the north and drain into Negro Creek at Sprague. Much of Sprague's downtown area as well as several residential neighborhoods fall within the floodplain of this drainage.

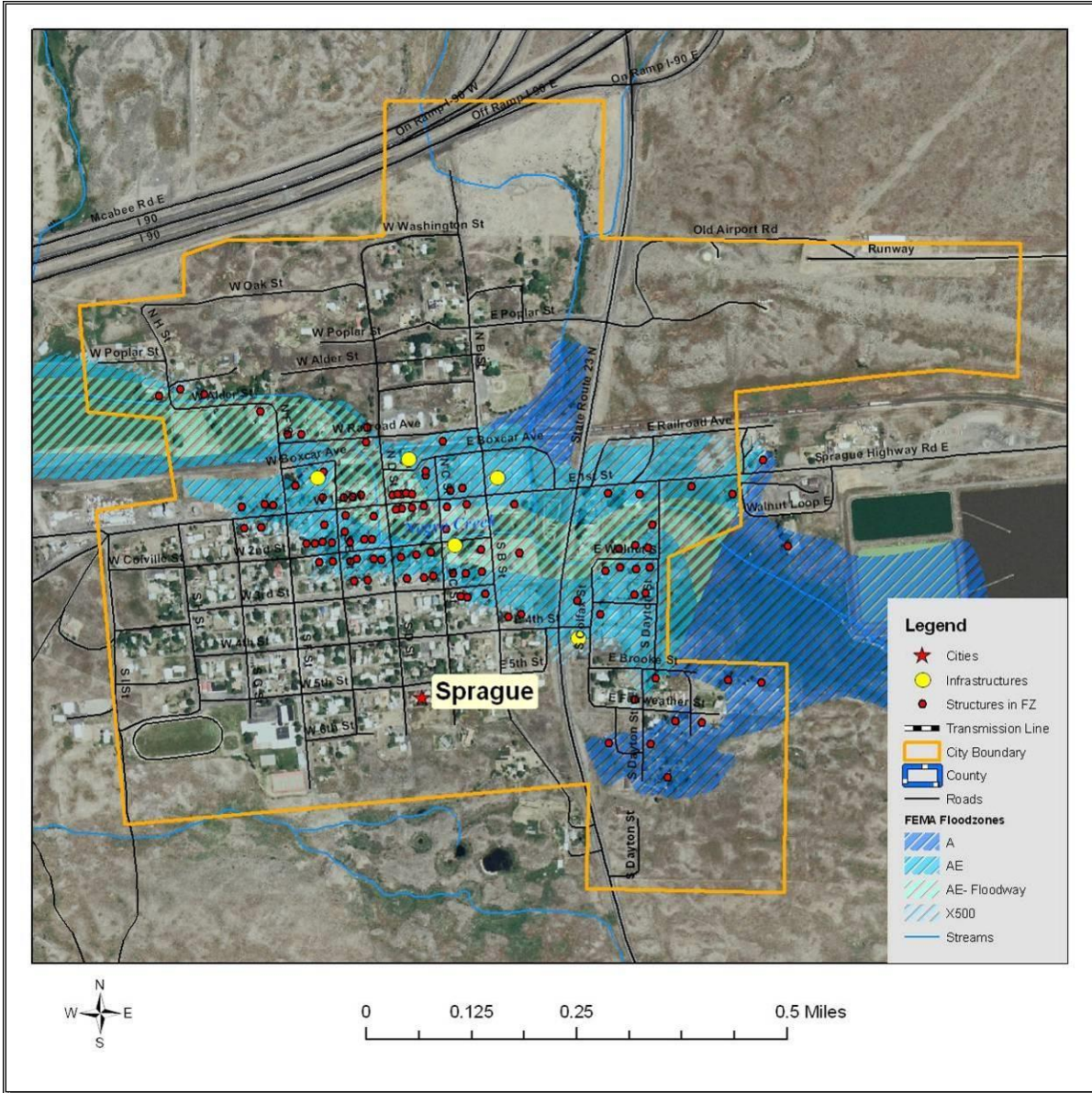
Negro Creek is extremely prone to flash flooding from localized weather events. Negro Creek drains hundreds of acres to northeast before passing through the community. Rain-on-snow events can also have a significant effect on this watershed. Warm rains result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen, and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days. Low velocity flooding occurs in several of the nearby tributaries almost annually during the spring runoff period.

Rural residences, ranches, farms, and roadways located near smaller waterways may be at significant flood risk. The onset of flooding in the smaller drainages can range from extremely slow to very fast. This variability depends on the cause of flooding and other factors such as rainfall intensity, the areas receiving the rain, temperature, and the condition of the soil. Floods that occur quickly are usually caused by thunderstorms, while floods that occur more slowly are often the result of moderate, but prolonged rainfall, snowmelt, or a combination of both. In the case of intense rainfall immediately above developed areas, the onset of flooding may occur in a matter of minutes.

A high level of sediment is prevalent during periods of intense runoff. This sediment tends to cause a deteriorating condition in streambeds and channels through deposition. Natural obstructions to flood waters include trees, brush, and other vegetation along the stream banks in the floodplain area. Considerable debris has been allowed to accumulate in these channels, plugging culverts and bridges at several locations throughout the county.

The city of Sprague participates in the NFIP and as of June 2018, had 12 policies, and more than \$1.4 million in force. Sprague will undergo a Flood Risk Assessment in 2019, through an Army Corps of Engineers Silver Jackets Flood Risk Management Grant. Encouraging landowners to participate in the NFIP, especially those in flood-prone areas, is an ongoing mitigation action item.

Figure 5.25. City of Sprague FEMA Flood Insurance Rate Map.



Probability of Future Occurrence

The probability of flood events occurring in Sprague is high. Low magnitude flood events can be expected several times each year. However, due to the flat topography and drainage infrastructure, the impacts of these events are slight and will usually amount to minor and temporary traffic issues. Larger magnitude and high impact flood events have occurred but are not likely in any given year. These types of flood events have the highest probability of occurrence in the winter or early spring in Sprague because of rain-on-snow events or rapid runoff. Minor flash floods are also common on Negro Creek and several of the small tributaries feeding the main channel near the community.

Impacts of Flood Events

The potential impacts from flooding in Sprague are very similar to the impacts described for Lincoln County as a whole. First responders and other volunteers aiding with emergency flood control or cleanup efforts are potentially at risk of injury due to accidents or possibly exposure to contaminated water. Although unlikely, the city's water supply could be affected by contaminated flood waters entering the groundwater supply.

The major impacts from flooding in Sprague are the restricted use of several streets, commercial, and residential areas. There are numerous bridge and culvert crossings over Negro Creek throughout its extent within the City and the surrounding area.

The availability of food and other supplies is not likely to be impacted or interrupted by a flood event. Furthermore, the delivery of community services such as postal services, health care, law enforcement, and emergency response are also not likely to be impacted by flood events in Sprague except under extreme (100 year plus floods) circumstances. While individual homes and businesses may incur damages because of a flood, the economy of the community will not be impacted by this type of hazard.

Environmental damages resulting from a flood event are also unlikely. Scouring and erosion along the banks of Negro Creek in the Sprague area is possible, but due to grass and other vegetation on the stream banks, these impacts will most likely be minimal and localized. Contamination of the riparian area by floodwaters containing chemicals or other pollutants is also a possibility.

Value of Resources at Risk

The County's parcel layer for Sprague is incomplete, but it is estimated that there are approximately 100 structures within the FEMA-identified floodplains (100- and 500-year) in Sprague, yielding a total structure value of \$7.4 million. The per structure value is based on a countywide average of \$74,296 and does not reflect the replacement cost of a structure. The average damage to structures was estimated based on the parcel's location as either completely within or out of the flood zone. The estimated value of contents is ½ the value of the improvements equating to an additional \$3.7 million in potential losses. The damages will most likely not be equally distributed between buildings based on building materials, building location, and flood location. However, these estimates provide a basic approximation. For comparison, there have been eight NFIP claims made in Sprague since 1978 totaling \$95,695 which is the most in the County of such claims.

Critical infrastructure located within the identified floodplain for Sprague includes the agricultural chemical plant, the city hall/fire station, a gas station, and two grain elevators. Also, a portion of the city's wastewater treatment facility just east of the city limits is within the floodplain. Currently, there are no repetitive loss properties in Sprague.

Earthquake

There are no recorded occurrences of earthquakes significantly impacting the city of Sprague; however, some minimal shaking has been felt because of larger earthquakes elsewhere. Sprague does not have any differing issues or levels of risk associated with this hazard than Lincoln County as a whole.

Probability of Future Occurrence

The City has 10% chance of exceeding a 6-7% pga in the next 50 years.⁸⁸

Impacts and Value of Resources at Risk

Unreinforced masonry (URM) structures and unreinforced chimneys of homes will likely be damaged in the event of an earthquake. There are several publicly accessible unreinforced masonry structures in Sprague in addition to the numerous homes and other buildings throughout the City with unreinforced chimneys. Damaged or collapsed chimneys could result in the secondary hazard of fire. Nonstructural damage caused by falling and swinging objects may be considerable after any magnitude earthquake. Damage to some older, more fragile bridges and land failure causing minor slides along roadways may isolate some residents.

In Sprague, nearly all the downtown structures are assumed to be unreinforced masonry including Kathy's Market, Carrie's Beauty Salon, Rae-Lynn's Oasis, and Sprague City Hall. These structures were built prior to the inclusion of articles for seismic stability in the Uniform Building Codes in 1972. The number and value of unreinforced masonry homes or homes with masonry chimneys in Sprague is unknown but estimated to include at least 30 buildings.

Landslide Profile

The city of Sprague has a very low probability of experiencing damaging landslides. The mild south aspect slope on the north side of town is generally less than 35% and presents little risk. However, because building and road construction have likely weakened the stability of the hillside, it is possible that small slides could occur when the soils are saturated or because of additional construction undermining the toeslope.

While small, low angle slumps may occur on eyebrows of the surrounding rolling hills, these will be infrequent and likely the result of water saturation or a major disturbance such as an earthquake or road construction. It is also probable that small slides will continue to occur on the cut and fill slopes of some roads. This type of slide is generally small with little permanent damage to the road or other infrastructure; however, there is some risk of traffic being delayed temporarily while road crews clear the debris and stabilize the bank.

Impacts and Value of Resources at Risk

There are no structures directly at risk from landslides within the city of Sprague. Small slumps may occur along State Route 23, Oak Street, North D Street, or other secondary roads. In many cases, this will cause temporary sediment delivery into nearby streams and/or plug culverts. These types of events are cleaned up by county or city road departments with little complications. Road slumps are generally reported as regular maintenance; thus, there are few records associated with these events.

Severe Weather Profile

The city of Sprague does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. The probability of a severe weather event occurring in Sprague on an annual basis is very high.

⁸⁸ USGS. 2008 United States National Seismic Hazard Maps. U.S. Geological Survey. U.S. Department of Interior. Available online at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>. October 2009.

However, the impacts to the community are usually minimal and are the same as those described for Lincoln County as a whole.

Impacts and Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Sprague. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. Additionally, snow rarely accumulates for long periods of time due to regular wind events. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer ones. Snow plowing in within the city limits is accomplished by the city's public works department. Private landowners are responsible for maintaining their own driveways or other private roads. Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Lincoln County schools are occasionally closed during and right after a severe winter storm because of cold temperatures and snow-covered roads.

Thunderstorms are not likely to be severe enough in Sprague to cause significant damages. However, the loss potential from flooding that results from severe thunderstorms could be significant.

Although the financial impacts of hail can be substantial and extended, accurately quantifying these impacts is problematic. Hail typically causes direct losses to structures and other personal property within Sprague. The most significant losses are most clearly seen in the agriculture sectors of the economy. Potential losses to agriculture can be disastrous. Crop damage from hail will also be different depending on the time of year and the type of crop. Most farmers carry insurance on their crops to help mitigate the potential financial loss resulting from a localized hail storm. Homeowners in Sprague rarely incur severe damage to structures (roofs); however, hail damage to vehicles is not uncommon. The damage to vehicles is difficult to estimate because the number of vehicles impacted by a specific ice storm is unknown. Additionally, most hail damage records are kept by various insurance agencies.

It is difficult to estimate potential losses in Sprague due to windstorms and tornadoes. Construction throughout the County has been implemented in the presence of high wind events, and therefore, the community is at a higher level of preparedness to high wind events than many other areas experiencing lower average wind speeds.

We have estimated losses based on wind and tornado damage as follows:

- 3% of the buildings damaged causing 50% of value loss (loss could be from downed or damaged trees, damaged outbuildings, damaged fences/poles, damage to siding, damaged landscaping etc.)
- 5% of the buildings received damage to roof (requiring replacement of roof equaling \$3,000)

Damages associated with sensitive receptor irritation have not been estimated. We have also not estimated the potential for a large-scale wildfire event associated with high winds. Based on the data provided by the County, there are 274 total parcels in Sprague with a total value of approximately \$15.4 million. Using the criteria outlined above an estimate of the impact of high winds in Sprague has been made. The potential wind and tornado damage to all buildings is estimated at approximately \$225,363. The estimated damage to roofs is approximately \$41,100.

Power failure often accompanies severe storms. Prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Wildland Fire Profile

Channeled scablands are the dominant landscape feature surrounding Sprague. This unique geological feature was created by ice age floods that swept across eastern Washington and down the Columbia River Plateau periodically during the Pleistocene era. The massive erosion caused by the flood events scoured the landscape down to the underlying basalt creating vast areas of rocky cliffs, river valleys, channel ways and pothole lakes. Typical vegetation found throughout this landscape is grass, mixed shrub, and sagebrush with areas of wetlands, marsh, ponderosa pine islands, cultivated crops and CRP fields. New development is occurring primarily near the community and along major roads.

Sprague has a moderate to high wildfire potential due to a characteristically high occurrence of shrubby fuels mixed with grass and sloping terrain. Large expanses of open rangeland or pasture in the surrounding area provide a continuous fuel bed that could, if ignited, threaten structures and infrastructure under extreme weather conditions. Cattle grazing will often reduce fine, flashy fuels reducing a fire's rate of spread; however, high winds increase the rate of fire spread and intensity of rangeland fires. A wind-driven fire in the dry, native fuel complexes produces a rapidly advancing, very intense fire with larger flame lengths, which enables spotting ahead of the fire front.

Wildfire risk near Sprague is at its highest during summer and fall when daily temperatures are high and relative humidity is low. Fires burning in some types of unharvested fields would be expected to burn more intensely with larger flame lengths due to the greater availability of fuels. Fields enrolled in conservation programs or managed for wildlife habitat, can burn very intensely due to an increased amount of fuel build-up from previous years' growth. Fires in this fuel type are harder to extinguish completely due to the dense duff layer, which often leads to hold-over fires that may reemerge later causing additional fire starts.

Residents living in Sprague have access to the municipal water supply system and public fire hydrants. Outside these areas, development relies on individual, co-op or multiple-home well systems. Creeks, ponds and developed drafting areas provide water sources for emergency fire suppression in the rural areas to a limited extent. Water tanks have been set up at several ranches throughout the area as a supplemental water supply during fire season. Irrigation systems can provide additional water supplies for suppression equipment on a limited basis. Additional water resources distributed and documented throughout the agricultural landscape are needed to provide adequate water for fire suppression.

Public utility lines travel both above and below ground along roads and cross-country to remote facilities. Many irrigation systems and wells rely on above ground power lines for electricity. These power poles pass through areas of dense wildland fuels that could be destroyed or compromised in the event of a wildfire.

Lincoln County Fire District #1 protects the community of Sprague. The fire district provides structural fire protection as well as wildland fire protection. Mutual aid agreements between fire districts supplement the wildland fire protection response when needed. Additional fire protection is provided by the Washington DNR, which provides wildfire protection and suppression on privately-owned forestland and state-owned forestland north of Highway 2 in Lincoln County. The DNR does not provide structural fire suppression, but it does provide wildfire protection on non-forested land that threatens DNR-protected lands. BLM provides wildfire protection on their lands within Lincoln County and has mutual aid agreements with the DNR for protection of forested land. BLM also does not provide structural fire suppression.

Probability of Future Occurrence

The probability of a wildland fire threatening Sprague on an annual basis is high. Homes and other structures located in the scablands or agricultural fields within or surrounding the community have a high wildfire risk. Rangeland or grass fires are often the most dangerous due to high rates of spread. Fires in this fuel type are considered somewhat easier to suppress given the appropriate resources, but they can also be the most destructive. Homes along the perimeter of the community would have the highest risk due to their adjacency to flashy fuels.

Impacts of Wildland Fire Events

The potential impacts from a wildfire in Sprague are very similar to the impacts described for Lincoln County as a whole. All fires pose a significant safety risk to residents and emergency service personnel. Individual structures, property, and livelihoods could be severely damaged or lost because of a fire; however, the community is not likely to suffer severe or long-term economic losses.

A fire in the grasslands surrounding the community may benefit the ecological environment as nutrients are recycled into the soil. Generally, grass and forbs are rejuvenated by a low intensity fire and grow back quickly; however, heavy rains immediately after a fire could cause erosion.

Smoke from a nearby wildland fire may impact sensitive populations within the community due to degraded air quality conditions. Smoke and/or flames will also impact transportation corridors connecting Sprague to other communities; thus, travel and commerce may be interrupted.

Value of Resources at Risk

It is difficult to estimate potential losses in Sprague from wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is unlikely that more than a few structures or other properties within the city limits of Sprague would be lost or damaged by a wildland fire; however, residents in the immediate vicinity may be directly impacted. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard.

Avalanche Profile

The city of Sprague will not be directly impacted by this type of localized event due to the gentle topography and low snow accumulations.

Impacts and Value of Resources at Risk

The city of Sprague will not be impacted and has no assets at risk to avalanches.

Seiche Profile

Although Lincoln County's northern border has a moderate risk of being impact by a seiche on Lake Roosevelt, the city of Sprague will not be directly impacted by this type of localized event.

Impacts and Value of Resources at Risk

The city of Sprague will not be impacted and has no assets at risk to seiches.

Volcanic Eruption Profile

The city of Sprague does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The city of Sprague has no assets at direct risk of being impacted by a volcanic eruption. However, the secondary effects of ash and airborne particulates may have varying degrees of negative effects. Damages to property will likely be limited to vehicles and cleanup costs. Additionally, residents of Sprague will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

Drought Profile

The city of Sprague does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, the city does have its own policies concerning water conservation practices during the dry months. Additionally, the city may develop programs to deal with residents and businesses significantly impacted by drought if necessary.

Impacts and Value of Resources at Risk

The city of Sprague has no assets directly at risk to drought; however, the economic impacts of a drought or a wildland fire caused by extended dry periods would have a great impact on the community. Most of the

population is employed either directly by the agriculture industry or to a service industry dependent on agriculture. Crop losses resulting from extended droughts would likely be considered a disaster for the community.

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Town of Almira Annex

Flood Profile

The town of Almira is affected by the floodplain of several small feeder tributaries of Wilson Creek. Water flowing out of Corbett and Childers Draw to the northeast passes through the town just east of the town center. Additionally, a larger unnamed tributary flows through a portion of the downtown area. This stream enters the community near the railroad tracks in the northwest corner and exits along the southern town boundary crossing U.S. Highway 2, Main Street, and several other secondary roads. Two additional small springs flow into this collector stream at Almira; one from the north and the other from the west. All these tributaries create the headwaters of the Wilson Creek drainage and are relatively small at Almira. During the summer months, particularly in dry years, these contributing waterways are likely dry.

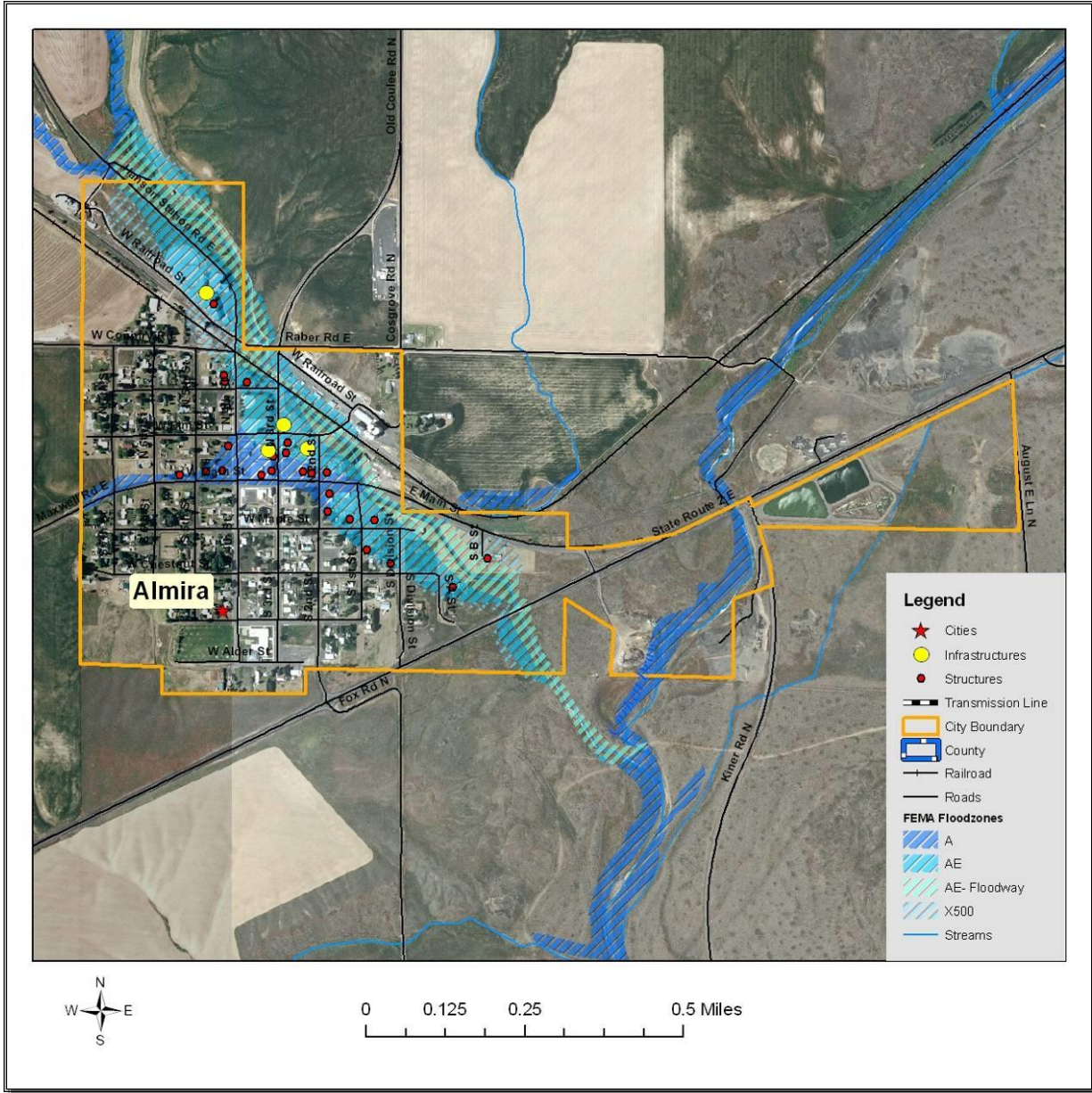
All these waterways are extremely prone to flash flooding from localized weather events due to typically shallow channels and wide floodplains. Rain-on-snow events can also have a significant effect on this watershed. Warm rains result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days. Low velocity flooding occurs in several of the nearby tributaries almost annually during the spring runoff period.

Rural residences, ranches, farms, and roadways located near smaller waterways may be at significant flood risk. The onset of flooding in the smaller drainages can range from extremely slow to very fast. This variability depends on the cause of flooding and other factors such as rainfall intensity, the areas receiving the rain, temperature, and the condition of the soil. Floods that occur quickly are usually caused by thunderstorms, while floods that occur more slowly are often the result of moderate, but prolonged rainfall, snowmelt, or a combination of both. In the case of intense rainfall immediately above developed areas, the onset of flooding may occur in a matter of minutes.

A high level of sediment is prevalent during periods of intense runoff. This sediment tends to cause a deteriorating condition in streambeds and channels through deposition. Natural obstructions to flood waters include trees, brush, and other vegetation along the stream banks in the floodplain area. Considerable debris has been allowed to accumulate in these channels, plugging culverts and bridges at several locations throughout the county.

The town of Almira currently does not have any participation in the NFIP. This is mostly due to the non-serious nature of typical flood events in Almira. Homes and other structures are present in flood zones and floodways, but flood events rarely result in damages. Encouraging landowners to participate in the NFIP, especially those in flood-prone areas, is an ongoing mitigation action item.

Figure 5.26. Town of Almira FEMA Flood Insurance Rate Map.



Probability of Future Occurrence

The probability of flood events occurring in Almira is relatively high. Low magnitude flood events can be expected several times each year. Minor flash flooding is a common occurrence, particularly in the channels coming from Corbett and Childers Draw; however, these events rarely cause damages. Due to the flat topography and drainage infrastructure, the impacts of these events are slight and will usually amount to minor and temporary traffic issues caused by plugged culverts. Larger magnitude and high impact flood events have occurred but are not likely in any given year. These types of flood events have the highest probability of occurrence in the winter or early spring in Almira because of rain-on-snow events or rapid runoff.

Impacts of Flood Events

The potential impacts from flooding in Almira are very similar to the impacts described for Lincoln County as a whole. First responders and other volunteers aiding with emergency flood control or cleanup efforts are potentially at risk of injury due to accidents or possibly exposure to contaminated water. Although unlikely, the town's water supply could be affected by contaminated flood waters entering the groundwater supply.

The major impacts from flooding in Almira are the restricted use of several streets, commercial, and residential areas. There are numerous bridge and culvert crossings both within the Town and in the surrounding area.

The availability of food and other supplies is not likely to be impacted or interrupted by a flood event. Furthermore, the delivery of community services such as postal services, health care, law enforcement, and emergency response are also not likely to be impacted by flood events in Almira. While individual homes and businesses may incur damages because of a flood, the economy of the community will not be impacted by this type of hazard.

Environmental damages resulting from a flood event are also unlikely. Erosion along the stream banks and deposition of sediments in the Almira area is possible, but due to grass and other vegetation on the stream banks, these impacts will most likely be minimal and localized. Contamination of the riparian area by floodwaters containing chemicals or other pollutants is also a possibility.

Value of Resources at Risk

There are approximately 305 parcels and 28 structures within the FEMA-identified floodplains (100- and 500-year) in Almira, yielding a total structure value of \$2.1 million. The per structure value is based on a countywide average of \$74,296 and does not reflect the replacement cost of a structure. The average damage to structures was estimated based on the parcel's location as either completely within or out of the flood zone. The estimated value of contents is ½ the value of the improvements equating to an additional \$1 million in potential losses. The damages will most likely not be equally distributed between buildings based on building materials, building location, and flood location. However, these estimates provide a basic approximation. For comparison, there have been two NFIP claims made in Almira since 1978 totaling \$3,338.

Critical infrastructure located within the identified floodplain for Almira includes the fire station, the post office, town hall, and a grain elevator. Currently, there are no repetitive loss properties in Almira.

Earthquake

There are no recorded occurrences of earthquakes significantly impacting the town of Almira; however, some minimal shaking has been felt because of larger earthquakes elsewhere. Almira does not have any differing issues or levels of risk associated with this hazard than Lincoln County as a whole.

Probability of Future Occurrence

The Town has 10% chance of exceeding a 7-8% pga in the next 50 years.⁸⁹

Impacts and Value of Resources At Risk

Unreinforced masonry (URM) structures and unreinforced chimneys of homes will likely be damaged in the event of an earthquake. There are several publicly accessible unreinforced masonry structures in Almira in addition to the numerous homes and other buildings throughout the Town with unreinforced chimneys. Damaged or collapsed chimneys could result in the secondary hazard of fire. Nonstructural damage caused by falling and swinging objects may be considerable after any magnitude earthquake. Damage to some older, more fragile bridges and land failure causing minor slides along roadways may isolate some residents.

In Almira, nearly all the downtown structures are assumed to be unreinforced masonry. These structures were built prior to the inclusion of articles for seismic stability in the Uniform Building Codes in 1972. The number and value of unreinforced masonry homes or homes with masonry chimneys in Almira is unknown but estimated to include at least 20-40 buildings.

Landslide Profile

The town of Almira has a very low probability of experiencing damaging landslides. Slopes in and around the community are generally less than 25%. While small, low angle slumps may occur on eyebrows of the surrounding rolling hills, these will be infrequent and likely the result of water saturation or a major disturbance such as an earthquake or road construction. It is also probable that small slides will continue to occur on the cut and fill slopes of some roads. This type of slide is generally small with little permanent damage to the road or other infrastructure; however, there is some risk of traffic being delayed temporarily while road crews clear the debris and stabilize the bank.

Impacts and Value of Resources at Risk

There are no structures directly at risk from landslides within the town of Almira. Small slumps may occur along U.S. Highway 2 or other secondary roads. In many cases, this will cause temporary sediment delivery into nearby streams and plugged culverts. These types of events are cleaned up by county or town road departments with little complications. Road slumps are generally reported as regular maintenance; thus, there are few records associated with these events.

Severe Weather Profile

The town of Almira does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. The probability of a severe weather event occurring in Almira on an annual basis is very high. However, the impacts to the community are usually minimal and are the same as those described for Lincoln County as a whole.

⁸⁹ USGS. 2008 United States National Seismic Hazard Maps. U.S. Geological Survey. U.S. Department of Interior. Available online at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>. October 2009.

Impacts and Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Almira. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. Additionally, snow rarely accumulates for long periods of time due to regular wind events. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer ones. Snow plowing in within the town limits is accomplished by the town's public works department. Private landowners are responsible for maintaining their own driveways or other private roads. Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Lincoln County schools are occasionally closed during and right after a severe winter storm because of cold temperatures and snow-covered roads.

Thunderstorms are not likely to be severe enough in Almira to cause significant damages. However, the loss potential from flooding that results from severe thunderstorms could be significant.

Although the financial impacts of hail can be substantial and extended, accurately quantifying these impacts is problematic. Hail typically causes direct losses to structures and other personal property within Almira. The most significant losses are most clearly seen in the agriculture sectors of the economy. Potential losses to agriculture can be disastrous. Crop damage from hail will also be different depending on the time of year and the type of crop. Most farmers carry insurance on their crops to help mitigate the potential financial loss resulting from a localized hail storm. Homeowners in Almira rarely incur severe damage to structures (roofs); however, hail damage to vehicles is not uncommon. The damage to vehicles is difficult to estimate because the number of vehicles impacted by a specific ice storm is unknown. Additionally, most hail damage records are kept by various insurance agencies.

It is difficult to estimate potential losses in Almira due to windstorms and tornadoes. Construction throughout the County has been implemented in the presence of high wind events, and therefore, the community is at a higher level of preparedness to high wind events than many other areas experiencing lower average wind speeds.

We have estimated losses based on wind and tornado damage as follows:

- 3% of the buildings damaged causing 50% of value loss (loss could be from downed or damaged trees, damaged outbuildings, damaged fences/poles, damage to siding, damaged landscaping etc.)
- 5% of the buildings received damage to roof (requiring replacement of roof equaling \$3,000)

Damages associated with sensitive receptor irritation have not been estimated. We have also not estimated the potential for a large-scale wildfire event associated with high winds. Based on the data provided by the County, there are 187 total parcels in Almira with a total value of approximately \$10.2 million. Using the criteria outlined above an estimate of the impact of high winds in Almira has been made. The potential wind and tornado damage to all buildings is estimated at approximately \$152,272. The estimated damage to roofs is approximately \$28,050.

Power failure often accompanies severe storms. More rural parts of the County like Almira are sometimes better prepared to deal with power outages for a few days due to the frequent occurrence of such events; however, prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Wildland Fire Profile

Almira is surrounded by an agricultural landscape. Vast areas of deep, rich soil deposits provide for extensive agriculture development. Lincoln County is the second highest wheat and barley producing county in the state. Other crops include grass seed, oats, hay and potatoes as well as extensive areas of fallow land set aside in the CRP. Most of these crops are vulnerable to wildfire at certain times of the year. New development occurs primarily near the community and along major roads. Occasionally farmland is subdivided between family members for new home sites or for development of new farming facilities.

Wildfire potential in Almira is moderate in the rural farmland and moderate to high in the shrubby draws and waterways, pastures, and scattered patches of scabland. Farming and ranching activities have the potential to increase the risk of a human-caused ignition. Large expanses of crops, CRP, rangeland or pasture provide areas of continuous fuels that may threaten homes and farmsteads. Under extreme weather conditions, escaped fires in these fuels could threaten individual homes or the community; however, this type of fire is usually quickly controlled. Clearings and fuel breaks disrupt a slow-moving wildfire enabling suppression before a fire can ignite heavier fuels. High winds increase the rate of fire spread and intensity of crop and rangeland fires. It is imperative that homeowners implement fire mitigation measures to protect their structures and families prior to a wildfire event.

Wildfire risk in the agricultural landscape is at its highest during late summer and fall when crops are cured, and daily temperatures are at their highest. A wind-driven fire in agricultural fuels or dry native fuel complexes would produce a rapidly advancing, but variable intensity fire. Fires burning in some types of unharvested fields would be expected to burn more intensely with larger flame lengths due to the greater availability of fuels resulting from the higher productivity of the vegetation. Fields enrolled in the CRP or set aside for wildlife habitat can burn very intensely due to an increased amount of fuel build-up from previous years' growth. Fires in these types of fuels are harder to extinguish completely due to the dense duff layer, often leading to hold over fires that may reemerge later causing additional fire starts.

Residents living in Almira have access to the municipal water supply system and public fire hydrants. Outside these areas, development relies on individual, co-op, or multiple-home well systems. Creeks, ponds, and developed drafting areas provide water sources for emergency fire suppression in the rural areas to a limited extent. Irrigation systems can provide additional water supply for suppression equipment on a limited basis. Additional water resources distributed and documented throughout the agricultural landscape are needed to provide water for fire suppression.

Above ground, high voltage transmission lines cross the planning area in many directions in corridors cleared of most vegetation, which provides for a defensible space around the power line infrastructure and may provide a control point for fire suppression, if well maintained. Local public electrical utility lines are both above and below ground traveling through back yards and along roads and highways. Many of these lines are exposed to damage from falling trees and branches. Power and communications may be cut to some of these during a wildfire event.

Lincoln County Fire District #8 protects the community of Almira. The fire district provides structural fire protection as well as wildland fire protection. Mutual aid agreements between fire districts supplement wildland fire protection when needed. Additional fire protection is provided by the Washington DNR, which provides wildfire protection and suppression on privately owned forestland and state-owned forestland north of Highway 2 in Lincoln County. The DNR does not provide structural fire suppression but does provide wildfire protection on non-forested land that threatens DNR-protected lands. The BLM provides wildfire protection on their ownership within Lincoln County and has mutual aid agreements with the DNR for protection of forested land. BLM also does not provide structural fire suppression.

Probability of Future Occurrence

The probability of a wildland fire threatening Almira on an annual basis is high. Homes and other structures located in the grasslands or agricultural fields within or surrounding the community have a high wildfire risk. Rangeland or grass fires are often the most dangerous due to high rates of spread. Fires in this fuel type are considered somewhat easier to suppress given the appropriate resources, but they can also be the most destructive. Homes along the perimeter of the community would have the highest risk due to their adjacency to flashy fuels.

Impacts of Wildland Fire Events

The potential impacts from a wildfire in Almira are very similar to the impacts described for Lincoln County as a whole. All fires pose a significant safety risk to residents and emergency service personnel. Individual structures, property, and livelihoods could be severely damaged or lost because of a fire; however, the community is not likely to suffer severe or long-term economic losses.

A fire in the grasslands surrounding the community may benefit the ecological environment as nutrients are recycled into the soil. Generally, grass and forbs are rejuvenated by a low intensity fire and grow back quickly; however, heavy rains immediately after a fire could cause erosion.

Smoke from a nearby wildland fire may impact sensitive populations within the community due to degraded air quality conditions. Smoke and/or flames will also impact transportation corridors connecting Almira to other communities; thus, travel and commerce may be interrupted.

Value of Resources at Risk

It is difficult to estimate potential losses in Almira from wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is unlikely that more than a few structures or other properties within the city limits of Almira would be lost or damaged by a wildland fire; however, residents in the immediate vicinity may be directly impacted. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard.

Avalanche Profile

The town of Almira will not be directly impacted by this type of localized event due to the gentle topography and low snow accumulations.

Impacts and Value of Resources at Risk

The town of Almira will not be impacted and has no assets at risk to avalanches.

Seiche Profile

Although Lincoln County's northern border has a moderate risk of being impacted by a seiche on Lake Roosevelt, the town of Almira will not be directly impacted by this type of localized event.

Impacts and Value of Resources at Risk

The town of Almira will not be impacted and has no assets at risk to seiches.

Volcanic Eruption Profile

The town of Almira does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The town of Almira has no assets at direct risk of being impacted by a volcanic eruption. However, the secondary effects of ash and airborne particulates may have varying degrees of negative effects. Damages to property will likely be limited to vehicles and cleanup costs. Additionally, residents of Almira will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

Drought Profile

The town of Almira does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, the town does have its own policies concerning water conservation practices during the dry months. Additionally, the town may develop programs to deal with residents and businesses significantly impacted by drought if necessary.

Impacts and Value of Resources at Risk

The town of Almira has no assets directly at risk to drought; however, the economic impacts of a drought or a wildland fire caused by extended dry periods would have a great impact on the community. Most of the

population is employed either directly by the agriculture industry or to a service industry dependent on agriculture. Crop losses resulting from extended droughts would likely be considered a disaster for the community.

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Town of Creston Annex

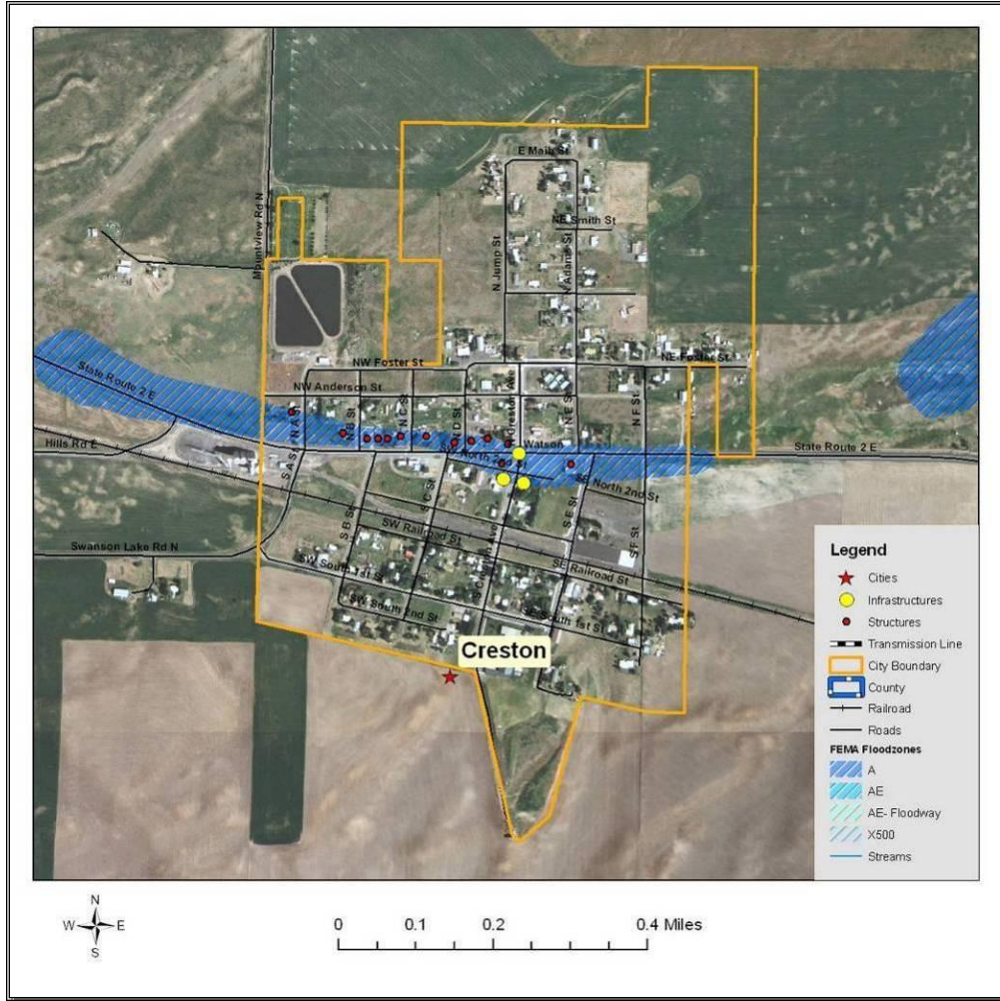
Flood Profile

The town of Creston is affected by a small floodplain caused by a high-water table. During wet years, water collects in this area and becomes a tributary to Sinking Creek to the south. Within the community, the floodplain primarily affects U.S. Highway 2 and SW North 2nd Street and crosses North D, North C, North B, and North A Streets. Most of this area is residential; however, a few commercial and public buildings could also be impacted.

Creston is most at risk to rain-on-snow and rapid spring runoff events that causes water to collect in this area. Warm rains result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days. Low velocity flooding occurs in several of the nearby tributaries almost annually during the spring runoff period.

Creston does have a floodplain ordinance and a floodplain administrator. However, the town does not have any participation in NFIP. This is chiefly because only a small part of Creston is affected by flood hazards and significant flood events are not very common in Creston. Encouraging landowners to participate in the NFIP, especially those in flood-prone areas, is an ongoing mitigation action item.

Figure 5.27. Town of Creston FEMA Flood Insurance Rate Map.



Probability of Future Occurrences

The probability of flood events occurring in Creston is low to moderate. Creston is only at risk to flooding during extremely wet months when the water table is high. Prolonged rain and soil saturation may lead to localized pooling and flooding in Creston. Low magnitude flood events can be expected several times each year, particularly in the spring. Flash floods are not likely to occur in this area. Larger magnitude and high impact flood events have occurred but are not likely in any given year.

Impacts of Flood Events

The potential impacts from flooding in Creston are very similar to the impacts described for Lincoln County as a whole. First responders and other volunteers aiding with emergency flood control or cleanup efforts are potentially at risk of injury due to accidents or possibly exposure to contaminated water. Creston’s risk of the town’s water supply becoming contaminated by flood waters may be higher than in other areas, due to the high-water table. Depressions and low spots are likely to have standing water during prolonged rain events and during the spring due to the high-water table; thus, contaminants in the soil or on vegetation in these areas could impact the water supply.

The availability of food and other supplies is not likely to be impacted or interrupted by a flood event. Furthermore, the delivery of community services such as postal services, health care, law enforcement, and emergency response are also not likely to be impacted by flood events in Creston. While individual homes and businesses may incur damages because of a flood, the economy of the community will not be impacted by this type of hazard.

Environmental damages resulting from a flood event are not likely to occur in Creston.

Value of Resources at Risk

The County's parcel layer for Creston is incomplete, but it is estimated that there are approximately 15 structures within the FEMA-identified floodplains (100- and 500-year) in Creston, yielding a total structure value of \$1.1 million. The per structure value is based on a countywide average of \$74,296 and does not reflect the replacement cost of a structure. The average damage to structures was estimated based on the parcel's location as either completely within or out of the flood zone. The estimated value of contents is ½ the value of the improvements equating to an additional \$557,217 in potential losses. The damages will most likely not be equally distributed between buildings based on building materials, building location, and flood location. However, these estimates provide a basic approximation.

Critical infrastructure located within the identified floodplain for Creston includes the post office and town hall. Currently, there are no repetitive loss properties in Creston.

Earthquake

There are no recorded occurrences of earthquakes significantly impacting the town of Creston; however, some minimal shaking has been felt because of larger earthquakes elsewhere. Creston does not have any differing issues or levels of risk associated with this hazard than Lincoln County as a whole.

Probability of Future Occurrence

The Town has 10% chance of exceeding a 6-7% pga in the next 50 years.⁹⁰

Impacts and Value of Resources at Risk

Unreinforced masonry (URM) structures and unreinforced chimneys of homes will likely be damaged in the event of an earthquake. There are several publicly accessible unreinforced masonry structures in Creston in addition to the numerous homes and other buildings throughout the Town with unreinforced chimneys. Damaged or collapsed chimneys could result in the secondary hazard of fire. Nonstructural damage caused by falling and swinging objects may be considerable after any magnitude earthquake. Damage to some older, more fragile bridges and land failure causing minor slides along roadways may isolate some residents.

In Creston, nearly all the downtown structures are assumed to be unreinforced masonry. These structures were built prior to the inclusion of articles for seismic stability in the Uniform Building Codes in 1972. The

⁹⁰ USGS. 2008 United States National Seismic Hazard Maps. U.S. Geological Survey. U.S. Department of Interior. Available online at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>. October 2009.

number and value of unreinforced masonry homes or homes with masonry chimneys in Creston is unknown but estimated to include at least 20-40 buildings.

Landslide Profile

The town of Creston has a very low probability of experiencing damaging landslides. Slopes in and around the community are generally less than 35%. While small, low angle slumps may occur on eyebrows of the hills south of town, these will be infrequent and likely the result of water saturation or a major disturbance such as an earthquake or road construction.

Impacts and Value of Resources at Risk

There are no structures or infrastructure directly at risk from landslides within the town of Creston.

Severe Weather Profile

The town of Creston does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. The probability of a severe weather event occurring in Creston on an annual basis is very high. However, the impacts to the community are usually minimal and are the same as those described for Lincoln County as a whole.

Local Event History

January 2009 Ice Storm – Creston experienced an episode of freezing fog lasting for 10 days. A total of 32 trees within the town limits had up to 2 inches of ice buildup resulting in breakage, cracking, and bending limbs that were determined to be an immediate threat to public health and safety.

Impacts and Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Creston. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. Additionally, snow rarely accumulates for long periods of time due to regular wind events. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer ones. Snow plowing in within the town limits is accomplished by the town's public works department. Private landowners are responsible for maintaining their own driveways or other private roads. Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Lincoln County schools are occasionally closed during and right after a severe winter storm because of cold temperatures and snow-covered roads.

Thunderstorms are not likely to be severe enough in Creston to cause significant damages. However, the loss potential from flooding that results from severe thunderstorms could be significant.

Although the financial impacts of hail can be substantial and extended, accurately quantifying these impacts is problematic. Hail typically causes direct losses to structures and other personal property within Creston. The most significant losses are most clearly seen in the agriculture sectors of the economy. Potential losses to agriculture can be disastrous. Crop damage from hail will also be different depending on the time of year and the type of crop. Most farmers carry insurance on their crops to help mitigate the potential financial loss resulting from a localized hail storm. Homeowners in Creston rarely incur severe damage to structures (roofs); however, hail damage to vehicles is not uncommon. The damage to vehicles is difficult to estimate because the number of vehicles impacted by a specific ice storm is unknown. Additionally, most hail damage records are kept by various insurance agencies.

It is difficult to estimate potential losses in Creston due to windstorms and tornadoes. Construction throughout the County has been implemented in the presence of high wind events, and therefore, the community is at a higher level of preparedness to high wind events than many other areas experiencing lower average wind speeds.

We have estimated losses based on wind and tornado damage as follows:

- 3% of the buildings damaged causing 50% of value loss (loss could be from downed or damaged trees, damaged outbuildings, damaged fences/poles, damage to siding, damaged landscaping etc.)
- 5% of the buildings received damage to roof (requiring replacement of roof equaling \$3,000)

Damages associated with sensitive receptor irritation have not been estimated. We have also not estimated the potential for a large-scale wildfire event associated with high winds. Based on the data provided by the County, there are 134 total parcels in Creston with a total value of approximately \$6.7 million. Using the criteria outlined above an estimate of the impact of high winds in Creston has been made. The potential wind and tornado damage to all buildings is estimated at approximately \$100,311. The estimated damage to roofs is approximately \$20,100.

Power failure often accompanies severe storms. More rural parts of the County like Creston are sometimes better prepared to deal with power outages for a few days due to the frequent occurrence of such events; however, prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Wildland Fire Profile

Creston is surrounded by an agricultural landscape. Vast areas of deep, rich soil deposits provide for extensive agriculture development. Lincoln County is the second highest wheat and barley producing county in the state. Other crops include grass seed, oats, hay and potatoes as well as extensive areas of fallow land set

aside in the CRP. Most of these crops are vulnerable to wildfire at certain times of the year. New development occurs primarily near the community and along major roads. Occasionally farmland is subdivided between family members for new home sites or for development of new farming facilities.

Wildfire potential in Creston is moderate in the rural farmland. Farming and ranching activities have the potential to increase the risk of a human-caused ignition. Large expanses of crops, CRP, rangeland or pasture provide areas of continuous fuels that may threaten homes and farmsteads. Under extreme weather conditions, escaped fires in these fuels could threaten individual homes or a town site; however, this type of fire is usually quickly controlled. Clearings and fuel breaks disrupt a slow-moving wildfire enabling suppression before a fire can ignite heavier fuels. High winds increase the rate of fire spread and intensity of crop and rangeland fires. It is imperative that homeowners implement fire mitigation measures to protect their structures and families prior to a wildfire event.

Wildfire risk in the agricultural landscape is at its highest during late summer and fall when crops are cured, and daily temperatures are at their highest. A wind-driven fire in agricultural fuels or dry native fuel complexes would produce a rapidly advancing, but variable intensity fire. Fires burning in some types of unharvested fields would be expected to burn more intensely with larger flame lengths due to the greater availability of fuels resulting from the higher productivity of the vegetation. Fields enrolled in the CRP or set aside for wildlife habitat can burn very intensely due to an increased amount of fuel build-up from previous years' growth. Fires in these types of fuels are harder to extinguish completely due to the dense duff layer, often leading to hold over fires that may reemerge later causing additional fire starts.

Residents living in Creston have access to the municipal water supply system and public fire hydrants. Outside these areas, development relies on individual, co-op, or multiple-home well systems. Creeks, ponds, and developed drafting areas provide water sources for emergency fire suppression in the rural areas to a limited extent. Irrigation systems can provide additional water supply for suppression equipment on a limited basis. Additional water resources distributed and documented throughout the agricultural landscape are needed to provide water for fire suppression.

Above ground, high voltage transmission lines cross the planning area in many directions in corridors cleared of most vegetation, which provides for a defensible space around the power line infrastructure and may provide a control point for fire suppression, if well maintained. Local public electrical utility lines are both above and below ground traveling through back yards and along roads and highways. Many of these lines are exposed to damage from falling trees and branches. Power and communications may be cut to some of these during a wildfire event.

Lincoln County Fire District #7 protects the community of Creston. The fire district provides structural fire protection as well as wildland fire protection. Mutual aid agreements between fire districts supplement wildland fire protection when needed. Additional fire protection is provided by the Washington DNR, which provides wildfire protection and suppression on privately owned forestland and state-owned forestland north of Highway 2 in Lincoln County. The DNR does not provide structural fire suppression but does provide wildfire protection on non-forested land that threatens DNR-protected lands. The BLM provides wildfire protection on their ownership within Lincoln County and has mutual aid agreements with the DNR for protection of forested land. BLM also does not provide structural fire suppression.

Probability of Future Occurrence

The probability of a wildland fire threatening Creston on an annual basis is high. Homes and other structures located in the grasslands or agricultural fields within or surrounding the community have a high wildfire risk. Rangeland or grass fires are often the most dangerous due to high rates of spread. Fires in this fuel type are considered somewhat easier to suppress given the appropriate resources, but they can also be the most destructive. Homes along the perimeter of the community would have the highest risk due to their adjacency to flashy fuels.

Impacts of Wildland Fire Events

The potential impacts from a wildfire in Creston are very similar to the impacts described for Lincoln County as a whole. All fires pose a significant safety risk to residents and emergency service personnel. Individual structures, property, and livelihoods could be severely damaged or lost because of a fire; however, the community is not likely to suffer severe or long-term economic losses.

A fire in the grasslands surrounding the community may benefit the ecological environment as nutrients are recycled into the soil. Generally, grass and forbs are rejuvenated by a low intensity fire and grow back quickly; however, heavy rains immediately after a fire could cause erosion.

Smoke from a nearby wildland fire may impact sensitive populations within the community due to degraded air quality conditions. Smoke and/or flames will also impact transportation corridors connecting Creston to other communities; thus, travel and commerce may be interrupted.

Value of Resources at Risk

It is difficult to estimate potential losses in Creston from wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is unlikely that more than a few structures or other properties within the city limits of Creston would be lost or damaged by a wildland fire; however, residents in the immediate vicinity may be directly impacted. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard.

Avalanche Profile

The town of Creston will not be directly impacted by this type of localized event due to the gentle topography and low snow accumulations.

Impacts and Value of Resources at Risk

The town of Creston will not be impacted and has no assets at risk to avalanches.

Seiche Profile

Although Lincoln County's northern border has a moderate risk of being impact by a seiche on Lake Roosevelt, the town of Creston will not be directly impacted by this type of localized event.

Impacts and Value of Resources at Risk

The town of Creston will not be impact and has no assets at risk to seiches.

Volcanic Eruption Profile

The town of Creston does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The town of Creston has no assets at direct risk of being impacted by a volcanic eruption. However, the secondary effects of ash and airborne particulates may have varying degrees of negative effects. Damages to property will likely be limited to vehicles and cleanup costs. Additionally, residents of Creston will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

Drought Profile

The town of Creston does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, the town does have its own policies concerning water conservation practices during the dry months. Additionally, the town may develop programs to deal with residents and businesses significantly impacted by drought if necessary.

Impacts and Value of Resources at Risk

The town of Creston has no assets directly at risk to drought; however, the economic impacts of a drought or a wildland fire caused by extended dry periods would have a great impact on the community. Most of the population is employed either directly by the agriculture industry or to a service industry dependent on agriculture. Crop losses resulting from extended droughts would likely be considered a disaster for the community.

Town of Harrington Annex

Flood Profile

The town of Harrington is affected by the floodplain from two tributaries of Coal Creek, which eventually flows into Sylvan Lake to the southwest. The primary collector stream flows in a southerly direction along the western edge of town paralleling State Highway 28. A smaller tributary enters the community along its eastern boundary and forms a confluence near the culmination of North 4th Street.

All these waterways are extremely prone to flash flooding from localized weather events due to typically shallow channels and wide floodplains. Rain-on-snow events can also have a significant effect on this watershed. Warm rains result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days. Low velocity flooding occurs in several of the nearby tributaries almost annually during the spring runoff period.

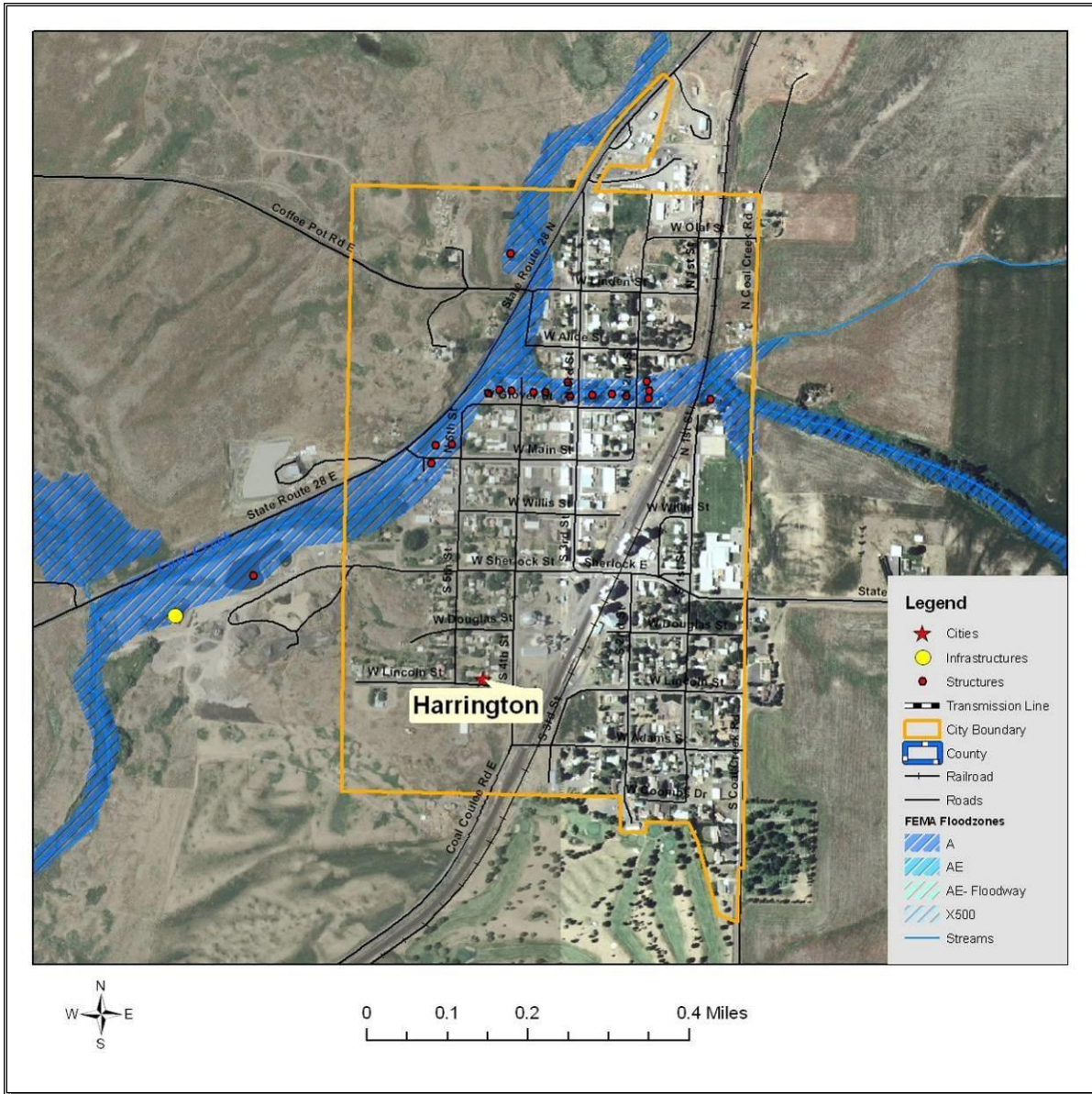
A flood drainage channel runs from the eastern city limits westward through town and drains into the Coal Creek tributary near State Route 28. The Main Street Bridge is a 6 foot by 25-foot culvert that was designed to handle a large flood event. Additionally, there are two large culverts on State Route 28 that provide for passage of peak flows.

Rural residences, ranches, farms, and roadways located near smaller waterways may be at significant flood risk. The onset of flooding in the smaller drainages can range from extremely slow to very fast. This variability depends on the cause of flooding and other factors such as rainfall intensity, the areas receiving the rain, temperature, and the condition of the soil. Floods that occur quickly are usually caused by thunderstorms, while floods that occur more slowly are often the result of moderate, but prolonged rainfall, snowmelt, or a combination of both. In the case of intense rainfall immediately above developed areas, the onset of flooding may occur in a matter of minutes.

An elevated level of sediment is prevalent during periods of intense runoff. This sediment tends to cause a deteriorating condition in streambeds and channels through deposition. Natural obstructions to flood waters include trees, brush, and other vegetation along the stream banks in the floodplain area. Debris has accumulated in these channels and is periodically removed to prevent plugged culverts and bridges at several locations.

Harrington currently (as of June 14, 2018) participates in the NFIP with two policies in force, totaling \$490,000 of insurance in force. Encouraging landowners to participate in the NFIP, especially those in flood-prone areas, is an ongoing mitigation action item.

Figure 5.28. Town of Harrington FEMA Flood Insurance Rate Map*.



**The 1988 edition of the FIRM shown here is not the current floodplain map used in Harrington. With FEMA’s written permission, the city uses the 1985 version of the FIRM. The “Value of Resources at Risk” section is based on the 1985 FIRM.*

Probability of Future Occurrence

The probability of flood events occurring in Harrington is relatively high. Low magnitude flood events can be expected several times each year. Minor flash flooding is a common occurrence, particularly in the small channel entering the community from the east; however, these events rarely cause damages. Due to the flat topography and drainage infrastructure, the impacts of these events are slight and will usually amount to minor and temporary traffic issues. Larger magnitude and high impact flood events have occurred but are not likely in any given year. Flood issues in previous years have been mitigated by the construction of a flood channel and larger culverts in potentially high velocity areas. These types of flood events have the highest

probability of occurrence in the winter or early spring in Harrington because of rain-on-snow events or rapid runoff.

Impacts of Flood Events

The potential impacts from flooding in Almira are very similar to the impacts described for Lincoln County as a whole. First responders and other volunteers aiding with emergency flood control measures or cleanup efforts are potentially at risk of injury due to accidents or possibly exposure to contaminated water. Although unlikely, the town's water supply could be affected by contaminated flood waters entering the groundwater supply.

The major impacts from flooding in Harrington are the restricted use of several streets including State Highways 23 and 28, commercial areas along State Highway 23, and several residential areas that are above the corrected Flood Zone A designation. There are numerous bridge and culvert crossings both within the Town and in the surrounding area. Traffic delays on any of the State highways because of flooding could cause issues for inter and intra-county traffic; however, in most cases, alternative routes are available.

The availability of food and other supplies is not likely to be impacted or interrupted by a flood event. Furthermore, the delivery of community services such as postal services, health care, law enforcement, and emergency response are also not likely to be impacted by flood events in Harrington except in extreme circumstances such as a 100-year plus flood event. While individual homes and businesses may incur damages because of a flood, the economy of the community will not be impacted by this type of hazard.

Environmental damages resulting from a flood event are also unlikely. Erosion along the stream banks and deposition of sediments in the Harrington area is possible, but due to grass and other vegetation on the stream banks, these impacts will most likely be minimal and localized. Contamination of the riparian area by floodwaters containing chemicals or other pollutants is also a possibility.

Value of Resources at Risk

There are approximately 10 parcels and 2 structures within the corrected FEMA-identified floodplains (100- and 500-year) in Harrington, yielding a total structure value of \$100,000. The per structure value is based on a countywide average of \$74,296 and does not reflect the replacement cost of a structure. The estimated value of contents is ½ the value of the improvements equating to an additional \$50,000 in potential losses. The damages will most likely not be equally distributed between buildings based on building materials, building location, and flood location. However, these estimates provide a basic approximation. In most cases, minor sandbagging could prevent damages.

The sewer lagoons are the only critical infrastructure within the floodplain in Harrington and these are protected by a flood drainage channel. Currently, there are no repetitive loss properties in Harrington.

Earthquake

There are no recorded occurrences of earthquakes significantly impacting the town of Harrington; however, some minimal shaking has been felt because of larger earthquakes elsewhere. Harrington does not have any differing issues or levels of risk associated with this hazard than Lincoln County as a whole.

Probability of Future Occurrence

The Town has 10% chance of exceeding a 6-7% pga in the next 50 years.⁹¹

Impacts and Value of Resources At Risk

Unreinforced masonry (URM) structures and unreinforced chimneys of homes will likely be damaged in the event of an earthquake. There are several publicly accessible unreinforced masonry structures in Harrington in addition to the 35-40 homes and other buildings throughout the Town with unreinforced chimneys. Damaged or collapsed chimneys could result in the secondary hazard of fire. Nonstructural damage caused by falling and swinging objects may be considerable after any magnitude earthquake. Damage to some older, more fragile bridges and land failure causing minor slides along roadways may isolate some residents.

In Harrington, nearly all the 25 downtown structures are assumed to be unreinforced masonry including the Opera Hall and City Hall. These structures were built prior to the inclusion of articles for seismic stability in the Uniform Building Codes in 1972. The value of structures in the downtown district is unknown. There are approximately 18 unreinforced masonry homes and 35-40 homes with masonry chimneys in Harrington. The value of URM homes is estimated at \$1.3 million using an average improvement value of \$74,296.

Landslide Profile

The town of Harrington has a very low probability of experiencing damaging landslides. Slopes in and around the community are generally less than 30%. While small, low angle slumps may occur on eyebrows of surrounding rolling hills, particularly those to the west of town, these will be infrequent and likely the result of water saturation or freeze/thaw cycles. It is probable that small slides will continue to occur on the cut and fill slopes of some roads. This type of slide is generally small with little permanent damage to the road or other infrastructure; however, there is some risk of traffic being delayed temporarily while road crews clear the debris and stabilize the bank.

Impacts and Value of Resources at Risk

There are no structures directly at risk from landslides within the town of Harrington. Small slumps may occur along State Route 28 or other secondary roads. In many cases, this will cause temporary sediment delivery into nearby streams and plug culverts. These types of events are cleaned up by county or town road departments with little complications. Road slumps are generally reported as regular maintenance; thus, there are few records associated with these events.

Severe Weather Profile

The town of Harrington does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. The probability of a severe weather event occurring in Harrington on an annual basis is very high. However, the impacts to the community are usually minimal and are the same as those described for Lincoln County as a whole.

⁹¹ USGS. 2008 United States National Seismic Hazard Maps. U.S. Geological Survey. U.S. Department of Interior. Available online at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>. October 2009.

Impacts and Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Harrington. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. Additionally, snow rarely accumulates for long periods of time due to regular wind events. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer ones. Snow plowing in within the town limits is accomplished by the town's public works department. Private landowners are responsible for maintaining their own driveways or other private roads. Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Lincoln County schools are occasionally closed during and right after a severe winter storm because of cold temperatures and snow-covered roads.

Thunderstorms are not likely to be severe enough in Harrington to cause significant damages. However, the loss potential from flooding that results from severe thunderstorms could be significant.

Although the financial impacts of hail can be substantial and extended, accurately quantifying these impacts is problematic. Hail typically causes direct losses to structures and other personal property within Harrington. The most significant losses are most clearly seen in the agriculture sectors of the economy. Potential losses to agriculture can be disastrous. Crop damage from hail will also be different depending on the time of year and the type of crop. Most farmers carry insurance on their crops to help mitigate the potential financial loss resulting from a localized hail storm. Homeowners in Harrington rarely incur severe damage to structures (roofs); however, hail damage to vehicles is not uncommon. The damage to vehicles is difficult to estimate because the number of vehicles impacted by a specific ice storm is unknown. Additionally, most hail damage records are kept by various insurance agencies.

It is difficult to estimate potential losses in Harrington due to windstorms and tornadoes. Construction throughout the County has been implemented in the presence of high wind events, and therefore, the community is at a higher level of preparedness to high wind events than many other areas experiencing lower average wind speeds.

We have estimated losses based on wind and tornado damage as follows:

- 3% of the buildings damaged causing 50% of value loss (loss could be from downed or damaged trees, damaged outbuildings, damaged fences/poles, damage to siding, damaged landscaping etc.)
- 5% of the buildings received damage to roof (requiring replacement of roof equaling \$3,000)

Damages associated with sensitive receptor irritation have not been estimated. We have also not estimated the potential for a large-scale wildfire event associated with high winds. Based on the data provided by the County, there are 250 total parcels in Harrington with a total value of approximately \$13.8 million. Using the criteria outlined above an estimate of the impact of high winds in Harrington has been made. The potential wind and tornado damage to all buildings is estimated at approximately \$206,991. The estimated damage to roofs is approximately \$37,500.

Power failure often accompanies severe storms. More rural parts of the County like Harrington are sometimes better prepared to deal with power outages for a few days due to the frequent occurrence of such events; however, prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Wildland Fire Profile

Harrington is surrounded by an agricultural landscape. Vast areas of deep, rich soil deposits provide for extensive agriculture development. Lincoln County is the second highest wheat and barley producing county in the state. Other crops include grass seed, oats, hay and potatoes as well as extensive areas of fallow land set aside in the CRP. Most of these crops are vulnerable to wildfire at certain times of the year. New development occurs primarily near the community and along major roads. Occasionally farmland is subdivided between family members for new home sites or for development of new farming facilities.

Wildfire potential in the agricultural landscape is moderate in the rural farmland. Farming and ranching activities have the potential to increase the risk of a human-caused ignition. Large expanses of crops, CRP, rangeland or pasture provide areas of continuous fuels that may threaten homes and farmsteads. Under extreme weather conditions, escaped fires in these fuels could threaten individual homes or a town site; however, this type of fire is usually quickly controlled. Clearings and fuel breaks disrupt a slow-moving wildfire enabling suppression before a fire can ignite heavier fuels. High winds increase the rate of fire spread and intensity of crop and rangeland fires. It is imperative that homeowners implement fire mitigation measures to protect their structures and families prior to a wildfire event in these areas.

Wildfire risk in the agricultural landscape is at its highest during late summer and fall when crops are cured and daily temperatures are at their highest. A wind-driven fire in agricultural fuels or dry native fuel complexes would produce a rapidly advancing, but variable intensity fire. Fires burning in some types of unharvested fields would be expected to burn more intensely with larger flame lengths due to the greater availability of fuels resulting from the higher productivity of the vegetation. Fields enrolled in the CRP or set aside for wildlife habitat can burn very intensely due to an increased amount of fuel build-up from previous years' growth. Fires in these types of fuels are harder to extinguish completely due to the dense duff layer, often leading to hold over fires that may reemerge later causing additional fire starts.

Residents living in Harrington have access to the municipal water supply system and public fire hydrants. Outside these areas, development relies on individual, co-op, or multiple-home well systems. Creeks, ponds,

and developed drafting areas provide water sources for emergency fire suppression in the rural areas to a limited extent. Irrigation systems can provide additional water supply for suppression equipment on a limited basis. Additional water resources distributed and documented throughout the agricultural landscape are needed to provide water for fire suppression.

Above ground, high voltage transmission lines cross the planning area in many directions in corridors cleared of most vegetation, which provides for a defensible space around the power line infrastructure and may provide a control point for fire suppression, if well maintained. Local public electrical utility lines are both above and below ground traveling through back yards and along roads and highways. Many of these lines are exposed to damage from falling trees and branches. Power and communications may be cut to some of these during a wildfire event.

Lincoln County Fire District #6 protects the community of Harrington. The fire district provides structural fire protection as well as wildland fire protection. Mutual aid agreements between fire districts supplement wildland fire protection when needed. Additional fire protection is provided by the Washington DNR, which provides wildfire protection and suppression on privately owned forestland and state-owned forestland north of Highway 2 in Lincoln County. The DNR does not provide structural fire suppression but does provide wildfire protection on non-forested land that threatens DNR-protected lands. The BLM provides wildfire protection on their ownership within Lincoln County and has mutual aid agreements with the DNR for protection of forested land. BLM also does not provide structural fire suppression.

Probability of Future Occurrence

The probability of a wildland fire threatening Harrington on an annual basis is high. Homes and other structures located in the grasslands or agricultural fields within or surrounding the community have a high wildfire risk. Rangeland or grass fires are often the most dangerous due to high rates of spread. Fires in this fuel type are considered somewhat easier to suppress given the appropriate resources, but they can also be the most destructive. Homes along the perimeter of the community would have the highest risk due to their adjacency to flashy fuels.

Impacts of Wildland Fire Events

The potential impacts from a wildfire in Harrington are very similar to the impacts described for Lincoln County as a whole. All fires pose a significant safety risk to residents and emergency service personnel. Individual structures, property, and livelihoods could be severely damaged or lost because of a fire; however, the community is not likely to suffer severe or long-term economic losses.

A fire in the grasslands surrounding the community may benefit the ecological environment as nutrients are recycled into the soil. Generally, grass and forbs are rejuvenated by a low intensity fire and grow back quickly; however, heavy rains immediately after a fire could cause erosion.

Smoke from a nearby wildland fire may impact sensitive populations within the community due to degraded air quality conditions. Smoke and/or flames will also impact transportation corridors connecting Davenport to other communities; thus, travel and commerce may be interrupted.

Value of Resources at Risk

It is difficult to estimate potential losses in Harrington from wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is unlikely that more than a few structures or other properties within the city limits of Harrington would be lost or damaged by a wildland fire; however, residents in the immediate vicinity may be directly impacted. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard.

Avalanche Profile

The town of Harrington will not be directly impacted by this type of localized event due to the gentle topography and low snow accumulations.

Impacts and Value of Resources at Risk

The town of Harrington will not be impacted and has no assets at risk to avalanches.

Seiche Profile

Although Lincoln County's northern border has a moderate risk of being impact by a seiche on Lake Roosevelt, the town of Harrington will not be directly impacted by this type of localized event.

Impacts and Value of Resources at Risk

The town of Harrington will not be impacted and has no assets at risk to seiches.

Volcanic Eruption Profile

The town of Harrington does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The town of Harrington has no assets at direct risk of being impacted by a volcanic eruption. However, the secondary effects of ash and airborne particulates may have varying degrees of negative effects. Damages to property will likely be limited to vehicles and cleanup costs. Additionally, residents of Harrington will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

Drought Profile

The town of Harrington does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, the town does have its own policies concerning water conservation practices during the dry months. Additionally, the town may develop programs to deal with residents and businesses significantly impacted by drought if necessary.

Impacts and Value of Resources at Risk

The town of Harrington has no assets directly at risk to drought; however, the economic impacts of a drought or a wildland fire caused by extended dry periods would have a great impact on the community. Most of the

population is employed either directly by the agriculture industry or to a service industry dependent on agriculture. Crop losses resulting from extended droughts would likely be considered a disaster for the community.

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Town of Odessa Annex

Flood Profile

Most of the western half of Odessa is affected by the floodplain of Crab Creek. This collector stream flows into the community at its eastern border near State Highway 28, passes through the downtown area, and exits near the railroad tracks on the western edge of town. Duck Creek increases the floodplain area as it drains into Crab Creek near the corner of East Marjorie Avenue and South 3rd Street.

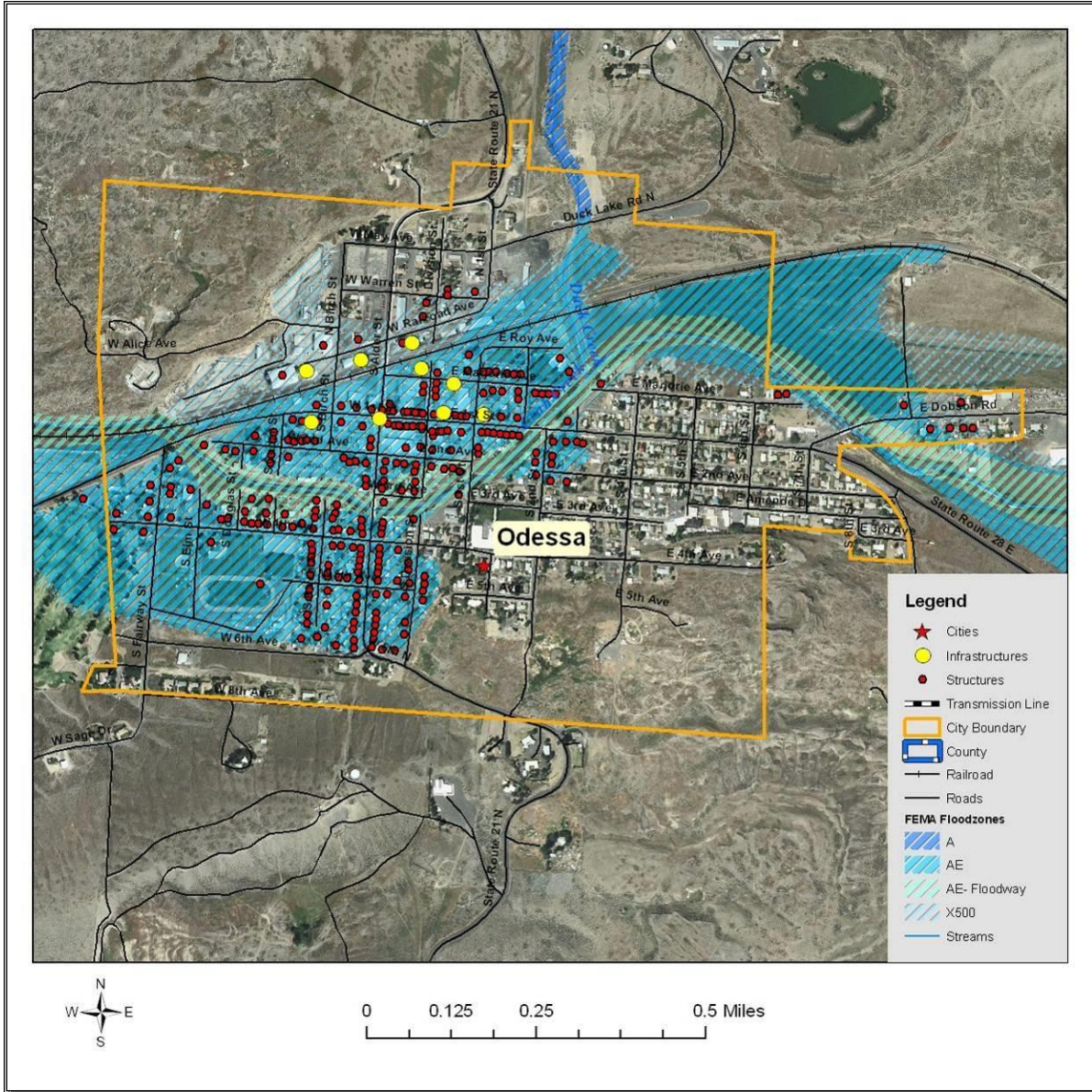
Duck Creek and Crab Creek are prone to flash flooding from localized weather events due to typically shallow channels and wide floodplains as well as less water permeable soils. Additionally, both watersheds drain thousands of acres in Lincoln County. Rain-on-snow events and rapid spring runoff can also have a significant effect on this watershed. Warm rains result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days. Low velocity flooding occurs in several of the nearby tributaries almost annually during the spring runoff period.

Rural residences, ranches, farms, and roadways located near smaller waterways may be at significant flood risk. The onset of flooding in the smaller drainages can range from extremely slow to very fast. This variability depends on the cause of flooding and other factors such as rainfall intensity, the areas receiving the rain, temperature, and the condition of the soil. Floods that occur quickly are usually caused by thunderstorms, while floods that occur more slowly are often the result of moderate, but prolonged rainfall, snowmelt, or a combination of both. In the case of intense rainfall immediately above developed areas, the onset of flooding may occur in a matter of minutes.

A high level of sediment is prevalent during periods of intense runoff. This sediment tends to cause a deteriorating condition in streambeds and channels through deposition. Natural obstructions to flood waters include trees, brush, and other vegetation along the stream banks in the floodplain area. Considerable debris has been allowed to accumulate in these channels, plugging culverts and bridges at several locations throughout the county.

Odessa currently (as of June 14, 2018) has considerable participation in the NFIP. There are 33 policies reported, totaling more than \$3.5 million of insurance in force. Encouraging landowners to participate in the NFIP, especially those in flood-prone areas, is an ongoing mitigation action item.

Figure 5.29. Town of Odessa FEMA Flood Insurance Rate Map.



Probability of Future Occurrence

The probability of flood events occurring in Odessa is high. Low magnitude flood events can be expected within the Crab Creek watershed, including Odessa, several times each year. Due to the flat topography and drainage infrastructure within the community, much of the impacts of these events have been mitigated. Nevertheless, floodwaters occasionally cause minor and temporary traffic issues because of plugged culverts or obstructions in the stream channel. Larger magnitude and high impact flood events have also occurred but are not likely in any given year. These types of flood events have the highest probability of occurrence in the winter or early spring in Odessa. Minor flash floods are common on Duck Creek and the numerous small tributaries feeding Crab Creek near the community and may result in high water events on the Crab Creek channel within the city limits. Flash flooding resulting from rain-on-snow events are more likely to cause flooding on Crab Creek than summer thunderstorms.

Impacts of Flood Events

The potential impacts from flooding in Odessa are very similar to the impacts described for Lincoln County as a whole. First responders and other volunteers aiding with emergency flood control or cleanup efforts are potentially at risk of injury due to accidents or possibly exposure to contaminated water. Although unlikely, the town's water supply could be affected by contaminated flood waters entering the groundwater supply.

The major impacts from flooding in Odessa are the restricted use of several streets, particularly State Highway 28. This route crosses Crab Creek in two places; one on each side of downtown Odessa. Restriction of the channel due to debris or ice jamming at these crossings could lead to water backing up and substantial flooding within the community. A significant number of commercial (most of the business district), industrial (rail yard and grain elevators), and residential properties would also be heavily impacted. The town of Odessa maintains a cache of sand, sandbags, and other equipment available during a flood event.

The availability of food and other supplies is not likely to be impacted or interrupted by a flood event. Furthermore, the delivery of community services such as postal services, health care, law enforcement, and emergency response are also not likely to be impacted by flood events in Odessa. While individual homes and businesses may incur damages, the economy of the community will not be impacted by most flood events. A 100-year plus flood event that damages the local grain elevators or rail yard may lead to temporary economic hardships within the community. Large flood events of this magnitude have a higher probability of occurrence during the winter or spring when the elevators are more likely to be empty, thus lessening the potential economic impact.

Environmental damages resulting from a flood event are unlikely in Odessa. Crab Creek occupies a relatively wide floodplain except for a short segment that has been channeled through the community. Scouring and erosion along the banks of the stream along this narrower section is possible, but due to grass and other vegetation, these impacts will most likely be minimal and localized. Contamination of the riparian area by floodwaters containing chemicals or other pollutants is a possibility but is more likely to be realized in the surrounding areas than within the community due to the hydrologic profile of the floodplain.

Value of Resources at Risk

There are approximately 698 parcels and 267 structures within the FEMA-identified floodplains (100- and 500-year) in Odessa, yielding a total structure value of \$19.8 million. The per structure value is based on a countywide average of \$74,296 and does not reflect the replacement cost of a structure. The average damage to structures was estimated based on the parcel's location as either completely within or out of the flood zone. The estimated value of contents is ½ the value of the improvements equating to an additional \$9.9 million in potential losses. The damages will most likely not be equally distributed between buildings based on building materials, building location, and flood location. However, these estimates provide a basic approximation. For comparison, there has been one NFIP claim made in Odessa since 1978 totaling \$0.

Critical infrastructure located within the identified floodplain for Odessa includes the fire station, police station, three grain elevators, the post office, the town hall/library, and central control for Centurylink. Currently, there are no repetitive loss properties in Odessa.

Earthquake

There are no recorded occurrences of earthquakes significantly impacting the town of Odessa; however, some minimal shaking has been felt because of larger earthquakes elsewhere. Odessa does not have any differing issues or levels of risk associated with this hazard than Lincoln County as a whole.

Probability of Future Occurrence

The Town has 10% chance of exceeding a 7-8% pga in the next 50 years.⁹²

Impacts and Value of Resources At Risk

Unreinforced masonry (URM) structures and unreinforced chimneys of homes will likely be damaged in the event of an earthquake. There are several publicly accessible unreinforced masonry structures in Odessa in addition to the numerous homes and other buildings throughout the Town with unreinforced chimneys. Damaged or collapsed chimneys could result in the secondary hazard of fire. Nonstructural damage caused by falling and swinging objects may be considerable after any magnitude earthquake. Damage to some older, more fragile bridges and land failure causing minor slides along roadways may isolate some residents.

In Odessa, nearly all the downtown structures are assumed to be unreinforced masonry including two churches, a hospital/nursing home, and the Odessa schools complex. These structures were built prior to the inclusion of articles for seismic stability in the Uniform Building Codes in 1972. The number and value of unreinforced masonry homes or homes with masonry chimneys in Odessa is unknown but estimated to include at least 50 brick construction homes and approximately 385 residences with masonry chimneys.

Landslide Profile

The town of Odessa has a very low probability of experiencing damaging landslides. Due to the geologic history of the area, there is very little topsoil or unstable slopes. Slopes in and around the community are generally less than 35%. While small, low angle slumps may occur on eyebrows of the surrounding hills, these will be infrequent and likely the result of rocks coming loose due to the freeze/thaw cycle or a major disturbance such as an earthquake or road construction.

Impacts and Value of Resources at Risk

There are no structures directly at risk from landslides within the town of Odessa. Small slumps may occur along State Route 21, Duck Lake Road, or other secondary roads. In many cases, this will cause temporary sediment delivery into nearby streams and plugged culverts. These types of events are cleaned up by county or town road departments with little complications. Road slumps are generally reported as regular maintenance; thus, there are few records associated with these events.

⁹² USGS. 2008 United States National Seismic Hazard Maps. U.S. Geological Survey. U.S. Department of Interior. Available online at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>. October 2009.

Severe Weather Profile

The town of Odessa does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. The probability of a severe weather event occurring in Odessa on an annual basis is very high. However, the impacts to the community are usually minimal and are the same as those described for Lincoln County as a whole.

Impacts and Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Odessa. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. Additionally, snow rarely accumulates for long periods of time due to regular wind events. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer ones. Odessa's public works department and the Washington Department of Transportation are both responsible for snow removal services within town limits. Private landowners are responsible for maintaining their own driveways or other private roads. Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Lincoln County schools are occasionally closed during and right after a severe winter storm because of cold temperatures and snow-covered roads.

Thunderstorms are not likely to be severe enough in Odessa to cause significant damages. However, the loss potential from flooding that results from severe thunderstorms could be significant.

Although the financial impacts of hail can be substantial and extended, accurately quantifying these impacts is problematic. Hail typically causes direct losses to structures and other personal property within Odessa. The most significant losses are most clearly seen in the agriculture sectors of the economy. Potential losses to agriculture can be disastrous. Crop damage from hail will also be different depending on the time of year and the type of crop. Most farmers carry insurance on their crops to help mitigate the potential financial loss resulting from a localized hail storm. Homeowners in Odessa rarely incur severe damage to structures (roofs); however, hail damage to vehicles is not uncommon. The damage to vehicles is difficult to estimate because the number of vehicles impacted by a specific ice storm is unknown. Additionally, most hail damage records are kept by various insurance agencies.

It is difficult to estimate potential losses in Odessa due to windstorms and tornadoes. Construction throughout the County has been implemented in the presence of high wind events, and therefore, the community is at a higher level of preparedness to high wind events than many other areas experiencing lower average wind speeds.

We have estimated losses based on wind and tornado damage as follows:

- 3% of the buildings damaged causing 50% of value loss (loss could be from downed or damaged trees, damaged outbuildings, damaged fences/poles, damage to siding, damaged landscaping etc.)
- 5% of the buildings received damage to roof (requiring replacement of roof equaling \$3,000)

Damages associated with sensitive receptor irritation have not been estimated. We have also not estimated the potential for a large-scale wildfire event associated with high winds. Based on the data provided by the County, there are 530 total parcels in Odessa with a total value of approximately \$31.8 million. Using the criteria outlined above an estimate of the impact of high winds in Odessa has been made. The potential wind and tornado damage to all buildings is estimated at approximately \$477,005. The estimated damage to roofs is approximately \$79,500.

Power failure often accompanies severe storms. Prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Wildland Fire Profile

Odessa is surrounded by channeled scablands This unique geological feature was created by ice age floods that swept across eastern Washington and down the Columbia River Plateau periodically during the Pleistocene era. The massive erosion caused by the flood events scoured the landscape down to the underlying basalt creating vast areas of rocky cliffs, river valleys, channel ways and pothole lakes. Typical vegetation found throughout this landscape is grass, mixed shrub with areas of wetlands, marsh, ponderosa pine islands, cultivated crops and CRP fields. New development is occurring primarily near the community and along major roads.

The channeled scablands landscape has a moderate to high wildfire potential due to a characteristically high occurrence of shrubby fuels mixed with grass, sloping terrain and somewhat limited access. Large expanses of open rangeland or pasture provide a continuous fuel bed that could, if ignited, threaten structures and infrastructure under extreme weather conditions. Cattle grazing will often reduce fine, flashy fuels reducing a fire's rate of spread; however, high winds increase the rate of fire spread and intensity of rangeland fires. A wind-driven fire in dry, native fuel complexes on variable terrain produces a rapidly advancing, very intense fire, which often enables spotting ahead of the fire front.

Wildfire risk near Odessa is at its highest during summer and fall when daily temperatures are high and relative humidity is low. Fires burning in some types of unharvested fields would be expected to burn more intensely with larger flame lengths due to the greater availability of fuels. Fields enrolled in conservation programs or managed for wildlife habitat, can burn very intensely due to an increased amount of fuel build-up from previous years' growth. Fires in this fuel type are harder to extinguish completely due to the dense duff layer, which often leads to hold-over fires that may reemerge later causing additional fire starts.

Residents living in Odessa have access to the municipal water supply system and public fire hydrants. Outside these areas, development relies on individual, co-op or multiple-home well systems. Creeks, ponds and developed drafting areas provide water sources for emergency fire suppression in the rural areas to a limited extent. Water tanks have been set up at several ranches throughout the area as a supplemental water supply during fire season. Irrigation systems can provide additional water supplies for suppression equipment on a limited basis. Additional water resources distributed and documented throughout the agricultural landscape are needed to provide adequate water for fire suppression.

Public utility lines travel both above and below ground along roads and cross-country to remote facilities. Many irrigation systems and wells rely on above ground power lines for electricity. These power poles pass through areas of dense wildland fuels that could be destroyed or compromised in the event of a wildfire.

Lincoln County Fire District #3 protects the community of Odessa. The fire district provides structural fire protection as well as wildland fire protection. Mutual aid agreements between fire districts supplement the wildland fire protection response when needed. Additional fire protection is provided by the Washington DNR, which provides wildfire protection and suppression on privately-owned forestland and state-owned forestland north of Highway 2 in Lincoln County. The DNR does not provide structural fire suppression, but it does provide wildfire protection on non-forested land that threatens DNR-protected lands. BLM provides wildfire protection on their lands within Lincoln County and has mutual aid agreements with the DNR for protection of forested land. BLM also does not provide structural fire suppression.

Probability of Future Occurrence

The probability of a wildland fire threatening Odessa on an annual basis is high. Homes and other structures located in the range and grasslands or agricultural fields within or surrounding the community have a high wildfire risk. Rangeland or grass fires are often the most dangerous due to high rates of spread. Fires in this fuel type are considered somewhat easier to suppress given the appropriate resources, but they can also be the most destructive. Homes along the perimeter of the community would have the highest risk due to their adjacency to flashy fuels.

Impacts of Wildland Fire Events

The potential impacts from a wildfire in Odessa are very similar to the impacts described for Lincoln County as a whole. All fires pose a significant safety risk to residents and emergency service personnel. Individual structures, property, and livelihoods could be severely damaged or lost because of a fire; however, the community is not likely to suffer severe or long-term economic losses.

A fire in the grasslands surrounding the community may benefit the ecological environment as nutrients are recycled into the soil. Generally, grass and forbs are rejuvenated by a low intensity fire and grow back quickly; however, heavy rains immediately after a fire could cause erosion.

Smoke from a nearby wildland fire may impact sensitive populations within the community due to degraded air quality conditions. Smoke and/or flames will also impact transportation corridors connecting Davenport to other communities; thus, travel and commerce may be interrupted.

Value of Resources at Risk

It is difficult to estimate potential losses in Odessa from wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is unlikely that more than a few structures or other properties within the city limits of Odessa would be lost or damaged by a wildland fire; however, residents in the immediate vicinity may be directly impacted. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard.

Avalanche Profile

The town of Odessa will not be directly impacted by this type of localized event due to the gentle topography and low snow accumulations.

Impacts and Value of Resources at Risk

The town of Odessa will not be impacted and has no assets at risk to avalanches.

Seiche Profile

Although Lincoln County's northern border has a moderate risk of being impacted by a seiche on Lake Roosevelt, the town of Odessa will not be directly impacted by this type of localized event.

Impacts and Value of Resources at Risk

The town of Odessa will not be impacted and has no assets at risk to seiches.

Volcanic Eruption Profile

The town of Odessa does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The town of Odessa has no assets at direct risk of being impacted by a volcanic eruption. However, the secondary effects of ash and airborne particulates may have varying degrees of negative effects. Damages to property will likely be limited to vehicles and cleanup costs. Additionally, residents of Odessa will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

Drought Profile

The town of Odessa does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, the town does have its own policies concerning water conservation practices during the dry months. Additionally, the town may develop programs to deal with residents and businesses significantly impacted by drought if necessary.

Impacts and Value of Resources at Risk

The town of Odessa has no assets directly at risk to drought; however, the economic impacts of a drought or a wildland fire caused by extended dry periods would have a great impact on the community. Most of the

population is employed either directly by the agriculture industry or to a service industry dependent on agriculture. Crop losses resulting from extended droughts would likely be considered a disaster for the community.

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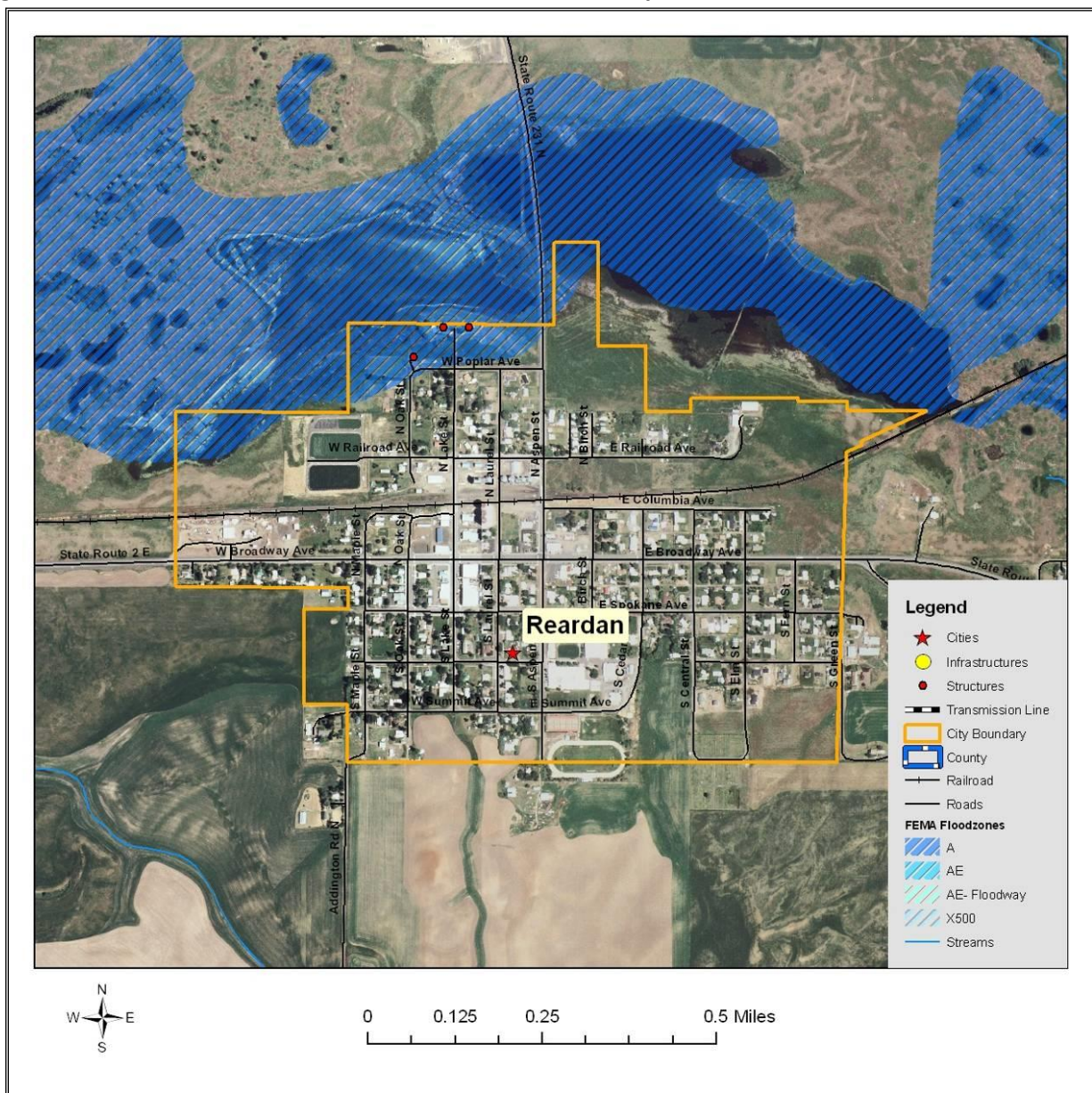
Town of Reardan Annex

Flood Profile

Two large and numerous small potholes-type lakes north of Reardan create a large floodplain that could have a limited impact on a few residential properties in the community. This area is most affected by rain-on-snow and heavy spring runoff events as water would tend to accumulate in this area. Low velocity flooding occurs in several of the nearby tributaries almost annually during the spring runoff period.

As of June 14, 2018, Reardan does not have any participation in the NFIP. This is because most of the town has such a low probability of flooding. Encouraging landowners to participate in the NFIP, especially those in flood-prone areas, is an ongoing mitigation action item.

Figure 5.30. Town of Reardan FEMA Flood Insurance Rate Map.



Probability of Future Occurrences

The probability of flood events occurring in Reardan is low. A small section of Reardan is at risk to flooding only during extremely wet months when the water table is high. Prolonged rain and soil saturation may lead to localized pooling and rejuvenation of wetland areas north of town. Low magnitude flood events can be expected several times each year, particularly in the spring. Flash floods are not expected to occur in this area.

Impacts of Flood Events

The potential impacts from flooding in Reardan are very similar to the impacts described for Lincoln County as a whole. First responders and other volunteers aiding with emergency flood control or cleanup efforts are potentially at risk of injury due to accidents or possibly exposure to contaminated water. Reardan's risk of the town's water supply becoming contaminated by flood waters may be higher than in other areas, due to the high-water table. Depressions and low spots are likely to have standing water during prolonged rain events and during the spring due to the high-water table; thus, contaminants in the soil or on vegetation in these areas could impact the water supply.

The availability of food and other supplies is not likely to be impacted or interrupted by a flood event. Furthermore, the delivery of community services such as postal services, health care, law enforcement, and emergency response are also not likely to be impacted by flood events in Reardan. While individual homes may incur damages because of a flood, particularly those with basements on the north fringes of town, the economy of the community will not be impacted by this type of hazard.

Environmental damages resulting from a flood event are not likely to occur. In fact, this type of event will likely improve established wetland areas.

Value of Resources at Risk

There are approximately 123 parcels and 3 structures within the FEMA-identified floodplains (100- and 500-year) in Reardan, yielding a total structure value of \$222,887. The per structure value is based on a countywide average of \$74,296 and does not reflect the replacement cost of a structure. The average damage to structures was estimated based on the parcel's location as either completely within or out of the flood zone. The estimated value of contents is ½ the value of the improvements equating to an additional \$111,443 in potential losses. The damages will most likely not be equally distributed between buildings based on building materials, building location, and flood location. However, these estimates provide a basic approximation.

There is no critical infrastructure located in Reardan's floodplain. Currently, there are no repetitive loss properties in Reardan.

Earthquake

There are no recorded occurrences of earthquakes significantly impacting the town of Reardan; however, some minimal shaking has been felt because of larger earthquakes elsewhere. Reardan does not have any differing issues or levels of risk associated with this hazard than Lincoln County as a whole.

Probability of Future Occurrence

The Town has 10% chance of exceeding a 6-7% pga in the next 50 years.⁹³

Impacts and Value of Resources At Risk

Unreinforced masonry (URM) structures and unreinforced chimneys of homes will likely be damaged in the event of an earthquake. There are several publicly accessible unreinforced masonry structures in Reardan in addition to the numerous homes and other buildings throughout the Town with unreinforced chimneys. Damaged or collapsed chimneys could result in the secondary hazard of fire. Nonstructural damage caused by falling and swinging objects may be considerable after any magnitude earthquake. Damage to some older, more fragile bridges and land failure causing minor slides along roadways may isolate some residents.

In Reardan, nearly all the downtown structures are assumed to be unreinforced masonry including the R-Store, Bubba's Bar & Grill, Spokane Chimney, and the Red Rooster. These structures were built prior to the inclusion of articles for seismic stability in the Uniform Building Codes in 1972. The number and value of unreinforced masonry homes or homes with masonry chimneys in Reardan is unknown but estimated to include 100+ buildings.

Landslide Profile

The town of Reardan has a very low probability of experiencing damaging landslides. Slopes in and around the community are generally less than 25%. While small, low angle slumps may occur on eyebrows of the hills south of town, these will be infrequent and likely the result of water saturation or a major disturbance such as an earthquake or road construction.

Impacts and Value of Resources at Risk

There are no structures or infrastructure directly at risk from landslides within the town of Reardan.

Severe Weather Profile

The town of Reardan does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. The probability of a severe weather event occurring in Reardan on an annual basis is very high. However, the impacts to the community are usually minimal and are the same as those described for Lincoln County as a whole.

Impacts and Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Reardan. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. Additionally, snow rarely accumulates for long periods of time due to regular wind events. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer

⁹³ USGS. 2008 United States National Seismic Hazard Maps. U.S. Geological Survey. U.S. Department of Interior. Available online at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>. October 2009.

ones. Snow plowing in within the town limits is accomplished by the town's public works department. Private landowners are responsible for maintaining their own driveways or other private roads. Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Lincoln County schools are occasionally closed during and right after a severe winter storm because of cold temperatures and snow-covered roads.

Thunderstorms are not likely to be severe enough in Reardan to cause significant damages. However, the loss potential from flooding that results from severe thunderstorms could be significant.

Although the financial impacts of hail can be substantial and extended, accurately quantifying these impacts is problematic. Hail typically causes direct losses to structures and other personal property within Reardan. The most significant losses are most clearly seen in the agriculture sectors of the economy. Potential losses to agriculture can be disastrous. Crop damage from hail will also be different depending on the time of year and the type of crop. Most farmers carry insurance on their crops to help mitigate the potential financial loss resulting from a localized hail storm. Homeowners in Reardan rarely incur severe damage to structures (roofs); however, hail damage to vehicles is not uncommon. The damage to vehicles is difficult to estimate because the number of vehicles impacted by a specific ice storm is unknown. Additionally, most hail damage records are kept by various insurance agencies.

It is difficult to estimate potential losses in Reardan due to windstorms and tornadoes. Construction throughout the County has been implemented in the presence of high wind events, and therefore, the community is at a higher level of preparedness to high wind events than many other areas experiencing lower average wind speeds.

We have estimated losses based on wind and tornado damage as follows:

- 3% of the buildings damaged causing 50% of value loss (loss could be from downed or damaged trees, damaged outbuildings, damaged fences/poles, damage to siding, damaged landscaping etc.)
- 5% of the buildings received damage to roof (requiring replacement of roof equaling \$3,000)

Damages associated with sensitive receptor irritation have not been estimated. We have also not estimated the potential for a large-scale wildfire event associated with high winds. Based on the data provided by the County, there are 258 total parcels in Reardan with a total value of approximately \$21.2 million. Using the criteria outlined above an estimate of the impact of high winds in Reardan has been made. The potential wind and tornado damage to all buildings is estimated at approximately \$318,474. The estimated damage to roofs is approximately \$38,700.

Power failure often accompanies severe storms. Prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Wildland Fire Profile

Reardan is surrounded by an agricultural landscape. Vast areas of deep, rich soil deposits provide for extensive agriculture development. Lincoln County is the second highest wheat and barley producing county in the state. Other crops include grass seed, oats, hay and potatoes as well as extensive areas of fallow land set aside in the CRP. Most of these crops are vulnerable to wildfire at certain times of the year. New development occurs primarily near the community and along major roads. Occasionally farmland is subdivided between family members for new home sites or for development of new farming facilities.

Wildfire potential in the agricultural landscape is moderate in the rural farmland. Farming and ranching activities have the potential to increase the risk of a human-caused ignition. Large expanses of crops, CRP, rangeland or pasture provide areas of continuous fuels that may threaten homes and farmsteads. Under extreme weather conditions, escaped fires in these fuels could threaten individual homes or the community; however, this type of fire is usually quickly controlled. Clearings and fuel breaks disrupt a slow-moving wildfire enabling suppression before a fire can ignite heavier fuels. High winds increase the rate of fire spread and intensity of crop and rangeland fires. It is imperative that homeowners implement fire mitigation measures to protect their structures and families prior to a wildfire event.

Wildfire risk in the agricultural landscape is at its highest during late summer and fall when crops are cured, and daily temperatures are at their highest. A wind-driven fire in agricultural fuels or dry native fuel complexes would produce a rapidly advancing, but variable intensity fire. Fires burning in some types of unharvested fields would be expected to burn more intensely with larger flame lengths due to the greater availability of fuels resulting from the higher productivity of the vegetation. Fields enrolled in the CRP or set aside for wildlife habitat can burn very intensely due to an increased amount of fuel build-up from previous years' growth. Fires in these types of fuels are harder to extinguish completely due to the dense duff layer, often leading to hold over fires that may reemerge later causing additional fire starts.

Residents living in Reardan have access to the municipal water supply system and public fire hydrants. Outside these areas, development relies on individual, co-op, or multiple-home well systems. Creeks, ponds, and developed drafting areas provide water sources for emergency fire suppression in the rural areas to a limited extent. Irrigation systems can provide additional water supply for suppression equipment on a limited basis. Additional water resources distributed and documented throughout the agricultural landscape are needed to provide water for fire suppression.

Above ground, high voltage transmission lines cross the planning area in many directions in corridors cleared of most vegetation, which provides for a defensible space around the power line infrastructure and may provide a control point for fire suppression, if well maintained. Local public electrical utility lines are both above and below ground traveling through back yards and along roads and highways. Many of these lines are

exposed to damage from falling trees and branches. Power and communications may be cut to some of these during a wildfire event.

Lincoln County Fire District #4 protects the community of Reardan. The fire district provides structural fire protection as well as wildland fire protection. Mutual aid agreements between fire districts supplement wildland fire protection when needed. Additional fire protection is provided by the Washington DNR, which provides wildfire protection and suppression on privately owned forestland and state-owned forestland north of Highway 2 in Lincoln County. The DNR does not provide structural fire suppression but does provide wildfire protection on non-forested land that threatens DNR-protected lands. The BLM provides wildfire protection on their ownership within Lincoln County and has mutual aid agreements with the DNR for protection of forested land. BLM also does not provide structural fire suppression.

Probability of Future Occurrence

The probability of a wildland fire threatening Reardan on an annual basis is high. Homes and other structures located in the grasslands or agricultural fields within or surrounding the community have a high wildfire risk. Rangeland or grass fires are often the most dangerous due to high rates of spread. Fires in this fuel type are considered somewhat easier to suppress given the appropriate resources, but they can also be the most destructive. Homes along the perimeter of the community would have the highest risk due to their adjacency to flashy fuels.

Impacts of Wildland Fire Events

The potential impacts from a wildfire in Reardan are very similar to the impacts described for Lincoln County as a whole. All fires pose a significant safety risk to residents and emergency service personnel. Individual structures, property, and livelihoods could be severely damaged or lost because of a fire; however, the community is not likely to suffer severe or long-term economic losses.

A fire in the grasslands surrounding the community may benefit the ecological environment as nutrients are recycled into the soil. Generally, grass and forbs are rejuvenated by a low intensity fire and grow back quickly; however, heavy rains immediately after a fire could cause erosion.

Smoke from a nearby wildland fire may impact sensitive populations within the community due to degraded air quality conditions. Smoke and/or flames will also impact transportation corridors connecting Davenport to other communities; thus, travel and commerce may be interrupted.

Value of Resources at Risk

It is difficult to estimate potential losses in Reardan from wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is unlikely that more than a few structures or other properties within the city limits of Reardan would be lost or damaged by a wildland fire; however, residents in the immediate vicinity may be directly impacted. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard.

Avalanche Profile

The town of Reardan will not be directly impacted by this type of localized event due to the gentle topography and low snow accumulations.

Impacts and Value of Resources at Risk

The town of Reardan will not be impacted and has no assets at risk to avalanches.

Seiche Profile

Although Lincoln County's northern border has a moderate risk of being impact by a seiche on Lake Roosevelt, the town of Reardan will not be directly impacted by this type of localized event.

Impacts and Value of Resources at Risk

The town of Reardan will not be impacted and has no assets at risk to seiches.

Volcanic Eruption Profile

The town of Reardan does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The town of Reardan has no assets at direct risk of being impacted by a volcanic eruption. However, the secondary effects of ash and airborne particulates may have varying degrees of negative effects. Damages to property will likely be limited to vehicles and cleanup costs. Additionally, residents of Reardan will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

Drought Profile

The town of Reardan does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, the town does have its own policies concerning water conservation practices during the dry months. Additionally, the town may develop programs to deal with residents and businesses significantly impacted by drought if necessary.

Impacts and Value of Resources at Risk

The town of Reardan has no assets directly at risk to drought; however, the economic impacts of a drought or a wildland fire caused by extended dry periods would have a great impact on the community. Most of the population is employed either directly by the agriculture industry or to a service industry dependent on agriculture. Crop losses resulting from extended droughts would likely be considered a disaster for the community.

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Town of Wilbur Annex

Flood Profile

The town of Wilbur is affected by the floodplain of Goose Creek, which enters the community just north of U.S. Highway 2 on the eastern edge of town, flows through the downtown area, and exits along the western border. Goose Creek has a well-defined channel in Wilbur with trees and other vegetation along its banks.

Goose Creek is extremely prone to flash flooding from localized weather events. Rain-on-snow events can also have a significant effect on this watershed. Warm rains result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days. Low velocity flooding occurs in several of the nearby tributaries almost annually during the spring runoff period.

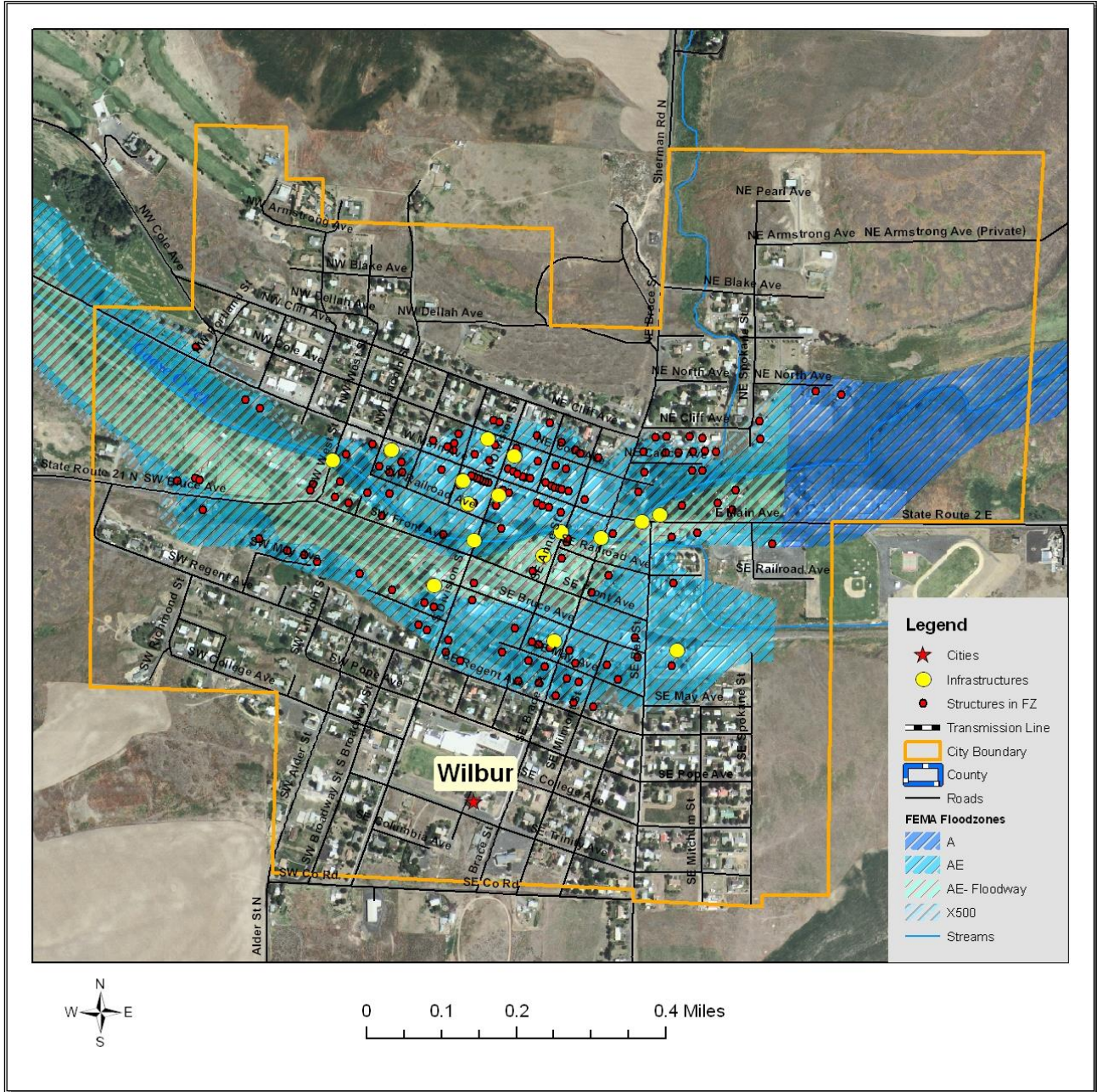
In 2010, Goose Creek within the town limits of Wilbur was dredged to remove built up sediments and accumulated debris to reduce the flood risk. The town determined that there are currently five sections of the Creek that are becoming narrower and posing additional flood risks to sections of residential and commercial properties. The town of Wilbur has proposed constructing a dam on Goose Creek to assist with flood control as well as provide irrigation water to nearby agricultural operations.

Rural residences, ranches, farms, and roadways located near smaller waterways may be at significant flood risk. The onset of flooding in the smaller drainages can range from extremely slow to very fast. This variability depends on the cause of flooding and other factors such as rainfall intensity, the areas receiving the rain, temperature, and the condition of the soil. Floods that occur quickly are usually caused by thunderstorms, while floods that occur more slowly are often the result of moderate, but prolonged rainfall, snowmelt, or a combination of both. In the case of intense rainfall immediately above developed areas, the onset of flooding may occur in a matter of minutes.

A high level of sediment is prevalent during periods of intense runoff. This sediment tends to cause a deteriorating condition in streambeds and channels through deposition. Natural obstructions to flood waters include trees, brush, and other vegetation along the stream banks in the floodplain area. Considerable debris has been allowed to accumulate in these channels, plugging culverts and bridges at several locations throughout the county.

As of June 14, 2018, the town of Wilbur had 27 NFIP policies in force, totaling almost \$3.1 million of insurance in force. Encouraging landowners to participate in the NFIP, especially those in flood-prone areas, is an ongoing mitigation action item.

Figure 5.31. Town of Wilbur FEMA Flood Insurance Rate Map.



Probability of Future Occurrence

The probability of flood events occurring in Wilbur is high. Low magnitude flood events can be expected along Goose Creek several times each year. Due to the flat topography, drainage infrastructure, and recent dredging of the channel within the community, much of the risk and potential impacts of these events have been mitigated. Nevertheless, floodwaters occasionally cause minor and temporary traffic issues because of plugged culverts or obstructions in the stream channel. Larger magnitude and high impact flood events have also occurred but are not likely in any given year. The 2010 dredging of the channel helped reduce vegetation along the banks and built-up sediments within the channel, which were exacerbating the potential for higher impact flood events. Larger flood events have the highest probability of occurrence in the winter or early

spring in Wilbur. Minor flash floods are common on Goose Creek and the numerous small tributaries feeding this drainage near the community. Flash flooding resulting from rain-on-snow events are more likely to cause flooding on Goose Creek than summer thunderstorms.

Impacts of Flood Events

The potential impacts from flooding in Wilbur are very similar to the impacts described for Lincoln County as a whole. First responders and other volunteers aiding with emergency flood control or cleanup efforts are potentially at risk of injury due to accidents or possibly exposure to contaminated water. Although unlikely, the town's water supply could be affected by contaminated flood waters entering the groundwater supply.

The major impacts from flooding in Wilbur are the restricted use of several streets, particularly U.S. Highway 2/Main Street. Numerous commercial and residential areas as well as public facilities could also be impacted by flood events. There are several bridge and culvert crossings both within the town and in the surrounding area.

The availability of food and other supplies is not likely to be impacted or interrupted by a flood event. Furthermore, the delivery of community services such as postal services, health care, law enforcement, and emergency response are also not likely to be impacted by flood events in Wilbur. While individual homes and businesses may incur damages, the economy of the community will not be impacted by most flood events. A 100-year plus flood event that damages the local grain elevators or public works and city shop may lead to temporary economic hardships within the community. However, large flood events of this magnitude have a higher probability of occurrence during the winter or spring when the elevators are more likely to be empty, thus lessening the potential economic impact.

Environmental damages resulting from a flood event are unlikely in Wilbur. Goose Creek occupies a relatively wide floodplain except for a short segment that has been channeled through the community. Scouring and erosion along the banks of the stream along this narrower section is possible, but due to grass and other vegetation, these impacts will most likely be minimal and localized. Contamination of the riparian area by floodwaters containing chemicals or other pollutants is a possibility but is more likely to be realized in the surrounding areas than within the community due to the hydrologic profile of the floodplain.

Value of Resources at Risk

There are approximately 1,309 parcels and 146 structures within the FEMA-identified floodplains (100- and 500-year) in Wilbur, yielding a total structure value of \$10.8 million. The per structure value is based on a countywide average of \$74,296 and does not reflect the replacement cost of a structure. The average damage to structures was estimated based on the parcel's location as either completely within or out of the flood zone. The estimated value of contents is ½ the value of the improvements equating to an additional \$5.4 million in potential losses. The damages will most likely not be equally distributed between buildings based on building materials, building location, and flood location. However, these estimates provide a basic approximation. For comparison, there have been three NFIP claims made in Wilbur since 1978 totaling \$2,478.

Critical infrastructure located within the identified floodplain for Wilbur includes the fire station, the public works building, two grain elevators, the post office, the Wilbur Clinic, the police station, the County shop, the community center, a gas station, and 5 bridges. Currently, there are no repetitive loss properties in Wilbur.

Earthquake

There are no recorded occurrences of earthquakes significantly impacting the town of Wilbur; however, some minimal shaking has been felt because of larger earthquakes elsewhere. Wilbur does not have any differing issues or levels of risk associated with this hazard than Lincoln County as a whole.

Probability of Future Occurrence

The Town has 10% chance of exceeding a 7-8% pga in the next 50 years.⁹⁴

Impacts and Value of Resources at Risk

Unreinforced masonry (URM) structures and unreinforced chimneys of homes will likely be damaged in the event of an earthquake. There are several publicly accessible unreinforced masonry structures in Wilbur in addition to the numerous homes and other buildings throughout the Town with unreinforced chimneys. Damaged or collapsed chimneys could result in the secondary hazard of fire. Nonstructural damage caused by falling and swinging objects may be considerable after any magnitude earthquake. Damage to some older, more fragile bridges and land failure causing minor slides along roadways may isolate some residents.

In Wilbur, nearly all the downtown structures are assumed to be unreinforced masonry. These structures were built prior to the inclusion of articles for seismic stability in the Uniform Building Codes in 1972. The number and value of unreinforced masonry homes or homes with masonry chimneys in Wilbur is unknown but estimated to include at least 25-50 buildings.

Landslide Profile

The town of Wilbur has a very low probability of experiencing damaging landslides. Slopes in and around the community are generally less than 20%. While small, low angle slumps may occur on eyebrows of the surrounding hills, these will be infrequent and likely the result of water saturation or a major disturbance such as an earthquake or road construction.

Impacts and Value of Resources at Risk

There are no structures or infrastructure directly at risk from landslides within the town of Wilbur.

Severe Weather Profile

The town of Wilbur does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. The probability of a severe weather event occurring in Wilbur on an annual basis is very high.

⁹⁴ USGS. 2008 United States National Seismic Hazard Maps. U.S. Geological Survey. U.S. Department of Interior. Available online at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>. October 2009.

However, the impacts to the community are usually minimal and are the same as those described for Lincoln County as a whole.

Impacts and Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Wilbur. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. Additionally, snow rarely accumulates for long periods of time due to regular wind events. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer ones. Snow plowing in within the town limits is accomplished by the town's public works department. Private landowners are responsible for maintaining their own driveways or other private roads. Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Lincoln County schools are occasionally closed during and right after a severe winter storm because of cold temperatures and snow-covered roads.

Thunderstorms are not likely to be severe enough in Wilbur to cause significant damages. However, the loss potential from flooding that results from severe thunderstorms could be significant.

Although the financial impacts of hail can be substantial and extended, accurately quantifying these impacts is problematic. Hail typically causes direct losses to structures and other personal property within Wilbur. The most significant losses are most clearly seen in the agriculture sectors of the economy. Potential losses to agriculture can be disastrous. Crop damage from hail will also be different depending on the time of year and the type of crop. Most farmers carry insurance on their crops to help mitigate the potential financial loss resulting from a localized hail storm. Homeowners in Wilbur rarely incur severe damage to structures (roofs); however, hail damage to vehicles is not uncommon. The damage to vehicles is difficult to estimate because the number of vehicles impacted by a specific ice storm is unknown. Additionally, most hail damage records are kept by various insurance agencies.

It is difficult to estimate potential losses in Wilbur due to windstorms and tornadoes. Construction throughout the County has been implemented in the presence of high wind events, and therefore, the community is at a higher level of preparedness to high wind events than many other areas experiencing lower average wind speeds.

We have estimated losses based on wind and tornado damage as follows:

- 3% of the buildings damaged causing 50% of value loss (loss could be from downed or damaged trees, damaged outbuildings, damaged fences/poles, damage to siding, damaged landscaping etc.)

- 5% of the buildings received damage to roof (requiring replacement of roof equaling \$3,000)

Damages associated with sensitive receptor irritation have not been estimated. We have also not estimated the potential for a large-scale wildfire event associated with high winds. Based on the data provided by the County, there are 516 total parcels in Wilbur with a total value of approximately \$38.1 million. Using the criteria outlined above an estimate of the impact of high winds in Wilbur has been made. The potential wind and tornado damage to all buildings is estimated at approximately \$572,033. The estimated damage to roofs is approximately \$77,400.

Power failure often accompanies severe storms. Prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Wildland Fire Profile

Wilbur is surrounded by an agricultural landscape. Vast areas of deep, rich soil deposits provide for extensive agriculture development. Lincoln County is the second highest wheat and barley producing county in the state. Other crops include grass seed, oats, hay and potatoes as well as extensive areas of fallow land set aside in the CRP. Most of these crops are vulnerable to wildfire at certain times of the year. New development occurs primarily near the community and along major roads. Occasionally farmland is subdivided between family members for new home sites or for development of new farming facilities.

Wildfire potential in the agricultural landscape is moderate in the rural farmland. Farming and ranching activities have the potential to increase the risk of a human-caused ignition. Large expanses of crops, CRP, rangeland or pasture provide areas of continuous fuels that may threaten homes and farmsteads. Under extreme weather conditions, escaped fires in these fuels could threaten individual homes or the community; however, this type of fire is usually quickly controlled. Clearings and fuel breaks disrupt a slow-moving wildfire enabling suppression before a fire can ignite heavier fuels. High winds increase the rate of fire spread and intensity of crop and rangeland fires. It is imperative that homeowners implement fire mitigation measures to protect their structures and families prior to a wildfire event.

Wildfire risk in the agricultural landscape is at its highest during late summer and fall when crops are cured, and daily temperatures are at their highest. A wind-driven fire in agricultural fuels or dry native fuel complexes would produce a rapidly advancing, but variable intensity fire. Fires burning in some types of unharvested fields would be expected to burn more intensely with larger flame lengths due to the greater availability of fuels resulting from the higher productivity of the vegetation. Fields enrolled in the CRP or set aside for wildlife habitat can burn very intensely due to an increased amount of fuel build-up from previous years' growth. Fires in these types of fuels are harder to extinguish completely due to the dense duff layer, often leading to hold over fires that may reemerge later causing additional fire starts.

Residents living in Wilbur have access to the municipal water supply system and public fire hydrants. Outside these areas, development relies on individual, co-op, or multiple-home well systems. Creeks, ponds, and

developed drafting areas provide water sources for emergency fire suppression in the rural areas to a limited extent. Irrigation systems can provide additional water supply for suppression equipment on a limited basis. Additional water resources distributed and documented throughout the agricultural landscape are needed to provide water for fire suppression.

Above ground, high voltage transmission lines cross the planning area in many directions in corridors cleared of most vegetation, which provides for a defensible space around the power line infrastructure and may provide a control point for fire suppression, if well maintained. Local public electrical utility lines are both above and below ground traveling through back yards and along roads and highways. Many of these lines are exposed to damage from falling trees and branches. Power and communications may be cut to some of these during a wildfire event.

Lincoln County Fire District #7 protects the community of Wilbur. The fire district provides structural fire protection as well as wildland fire protection. Mutual aid agreements between fire districts supplement wildland fire protection when needed. Additional fire protection is provided by the Washington DNR, which provides wildfire protection and suppression on privately owned forestland and state-owned forestland north of Highway 2 in Lincoln County. The DNR does not provide structural fire suppression but does provide wildfire protection on non-forested land that threatens DNR-protected lands. The BLM provides wildfire protection on their ownership within Lincoln County and has mutual aid agreements with the DNR for protection of forested land. BLM also does not provide structural fire suppression.

Probability of Future Occurrence

The probability of a wildland fire threatening Wilbur on an annual basis is high. Homes and other structures located in the grasslands or agricultural fields within or surrounding the community have a high wildfire risk. Rangeland or grass fires are often the most dangerous due to high rates of spread. Fires in this fuel type are considered somewhat easier to suppress given the appropriate resources, but they can also be the most destructive. Homes along the perimeter of the community would have the highest risk due to their adjacency to flashy fuels.

Impacts of Wildland Fire Events

The potential impacts from a wildfire in Wilbur are very similar to the impacts described for Lincoln County as a whole. All fires pose a significant safety risk to residents and emergency service personnel. Individual structures, property, and livelihoods could be severely damaged or lost because of a fire; however, the community is not likely to suffer severe or long-term economic losses.

A fire in the grasslands surrounding the community may benefit the ecological environment as nutrients are recycled into the soil. Generally, grass and forbs are rejuvenated by a low intensity fire and grow back quickly; however, heavy rains immediately after a fire could cause erosion.

Smoke from a nearby wildland fire may impact sensitive populations within the community due to degraded air quality conditions. Smoke and/or flames will also impact transportation corridors connecting Davenport to other communities; thus, travel and commerce may be interrupted.

Value of Resources at Risk

It is difficult to estimate potential losses in Wilbur from wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is unlikely that more than a few structures or other properties within the city limits of Wilbur would be lost or damaged by a wildland fire; however, residents in the immediate vicinity may be directly impacted. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard.

Avalanche Profile

The town of Wilbur will not be directly impacted by this type of localized event due to the gentle topography and low snow accumulations.

Impacts and Value of Resources at Risk

The town of Wilbur will not be impacted and has no assets at risk to avalanches.

Seiche Profile

Although Lincoln County's northern border has a moderate risk of being impact by a seiche on Lake Roosevelt, the town of Wilbur will not be directly impacted by this type of localized event.

Impacts and Value of Resources at Risk

The town of Wilbur will not be impacted and has no assets at risk to seiches.

Volcanic Eruption Profile

The town of Reardan does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The town of Reardan has no assets at direct risk of being impacted by a volcanic eruption. However, the secondary effects of ash and airborne particulates may have varying degrees of negative effects. Damages to property will likely be limited to vehicles and cleanup costs. Additionally, residents of Reardan will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

Drought Profile

The town of Wilbur does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, the town does have its own policies concerning water conservation practices during the dry months. Additionally, the town may develop programs to deal with residents and businesses significantly impacted by drought if necessary.

Impacts and Value of Resources at Risk

The town of Wilbur has no assets directly at risk to drought; however, the economic impacts of a drought or a wildland fire caused by extended dry periods would have a great impact on the community. Most of the

population is employed either directly by the agriculture industry or to a service industry dependent on agriculture. Crop losses resulting from extended droughts would likely be considered a disaster for the community.

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Lincoln Hospital District Annex

Flood Profile

The main Lincoln Hospital facility is in Davenport on the northeast side of town. The compound is completely outside of any floodplains. However, the Wilbur Clinic operated by the Lincoln Hospital District is within a floodplain. In the event of a major flood event on Goose Creek in Wilbur, the Clinic would likely be impacted. The Lincoln Hospital District property in Davenport does not currently participate in the NFIP due to little threat of flooding.

Probability of Future Occurrence

The probability of flood event on occurring in Wilbur is high, but the probability of a flood impacting the Wilbur Clinic is moderate. Low magnitude flood events can be expected along Goose Creek several times each year. Due to the flat topography, drainage infrastructure, and recent dredging of the channel within the community, much of the risk and potential impacts of these events have been mitigated. Nevertheless, floodwaters occasionally cause minor and temporary traffic issues because of plugged culverts or obstructions in the stream channel. Larger magnitude and high impact flood events have also occurred but are not likely in any given year. The 2010 dredging of the channel reduced vegetation along the banks and built-up sediments within the channel, which were exacerbating the potential for higher impact flood events. Larger flood events have the highest probability of occurrence in the winter or early spring in Wilbur. Minor flash floods are common on Goose Creek and the numerous small tributaries feeding this drainage near the community but are not likely to impact the Wilbur Clinic. Additionally, during a flood event, the Wilbur Clinic would be a high priority for emergency flood control measures.

Impacts of Flood Events

The District may see an increase in injuries because of flood events. All the Lincoln Hospital District's facilities are dependent on municipal water systems. A flood event may impact or contaminate the community's water supply; thus, impacting the Hospital and its clinics directly.

The Wilbur Clinic may be impacted by a high magnitude flood event on Goose Creek in Wilbur. Damages would include structural damages to the Clinic itself but may also include contamination of medical equipment and supplies. Services provided by the Clinic may be temporarily interrupted; however, citizens would be able to travel to the nearby Lincoln Hospital in Davenport to receive care if necessary.

Value of Resources at Risk

Goose Creek flood events may impact the Wilbur Clinic. This facility and its contents are valued at approximately \$500,000.

Earthquake

There are no recorded occurrences of earthquakes significantly impacting the Lincoln Hospital District and it does not have any differing issues or levels of risk associated with this hazard than Lincoln County as a whole. However, in the event of a damaging earthquake, Lincoln Hospital would likely experience an influx of injuries resulting from the quake. If the Hospital structure or associated equipment was damaged, patients would

require transport to other nearby medical facilities. Longer wait times may lead to more serious injuries or even deaths.

Probability of Future Occurrence

The area in which the District is located has a 10% chance of exceeding a 6-7% pga in the next 50 years.

Impacts and Value of Resources at Risk

The Lincoln Hospital in Davenport does have masonry components; however, the structure was built for use as a bomb shelter; thus, it is likely well reinforced and not at significant risk to earthquakes. Nevertheless, severe damage to the building would likely result in closure of the hospital due to safety issues until repairs could be made. Additionally, structural damage may, in turn, cause damage or complete loss of much of the medical equipment within the building due to collapses or contamination.

Landslide Profile

The Lincoln Hospital is in the northeastern corner of Davenport. The surrounding area is nearly flat. The Hospital does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, in the event of a significant landslide, the Lincoln Hospital would likely assist with any injuries.

Impacts and Value of Resources at Risk

The Lincoln Hospital facility in Davenport is not at risk to landslides due to its location in a relatively flat, developed area. The District has no other known assets or other resources at risk to landslides.

Severe Weather Profile

The Lincoln Hospital District does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, any injuries, including traffic accidents, resulting from severe storms would likely be treated at the hospital. The probability of a severe weather event occurring in Lincoln County on an annual basis is very high.

Impacts and Value of Resources at Risk

Lincoln Hospital will not likely incur major structural damages from severe weather events; however, damage to roofing, windows, or other structural components could result in closure of the hospital due to safety issues until repairs could be made. Additionally, structural damage may, in turn, cause damage or complete loss of much of the medical equipment within the building due to collapses or contamination.

Wildland Fire Profile

The Lincoln Hospital District does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

Due to its facilities' locations within developed communities, the Hospital District has a very low risk of being directly impacted by wildland fire; however, any injuries resulting from a wildfire, including smoke inhalation and heat exhaustion, would likely be treated at the hospital in Davenport.

Avalanche Profile

The Lincoln Hospital District will not be directly impacted by this type of localized event due to the gentle topography and low snow accumulations.

Impacts and Value of Resources at Risk

The Lincoln Hospital District will not be impacted and has no assets at risk to avalanches.

Seiche Profile

Although Lincoln County's northern border has a moderate risk of being impact by a seiche on Lake Roosevelt, the Lincoln Hospital District will not be directly impacted by this type of localized event.

Impacts and Value of Resources at Risk

The Lincoln Hospital District has no assets at risk to seiches; however, any injuries resulting from a seiche event would be routed to the District's medical facilities in Davenport.

Volcanic Eruption Profile

Lincoln Hospital District does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The Lincoln Hospital District facilities do not have any direct risk to volcanoes; however, there may be damage to the structures and cleanup costs associated with the ash fallout. Furthermore, any injuries resulting from a volcano, including the respiratory effects caused by ash inhalation, would likely be treated at the hospital.

Drought Profile

The Lincoln Hospital District does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The Lincoln Hospital District does not have any assets directly at risk to drought.

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Odessa Memorial Healthcare Center Annex

The Odessa Memorial Healthcare Center is also known as the Lincoln County Public Hospital District No.1.

Flood Profile

The Odessa Memorial Healthcare Center is in Odessa on the southeast side of town. The hospital facilities are outside of any floodplains.

Probability of Future Occurrences

The Odessa Memorial Healthcare Center is not at any direct risk of future flood events; however, indirect impacts to the facility from flooding within the community are expected infrequently. The probability of flood events impacting the Memorial Healthcare Center is the same as that described for the town of Odessa.

Impacts of Flood Events

The Healthcare Center may see an increase in injuries because of flood events. In addition, the hospital facilities are dependent on Odessa's municipal water system. A flood event may impact or contaminate the community's water supply.

During normal operations, the Healthcare Center has approximately 25 available beds. Relocating individuals from this facility because of a flood or other hazard event would be very difficult.

Value of Resources at Risk

Odessa Memorial Healthcare Center has no known assets or other resources at direct risk to flooding.

Earthquake

There are no recorded occurrences of earthquakes significantly impacting the Odessa Memorial Healthcare Center and it does not have any differing issues or levels of risk associated with this hazard than Lincoln County as a whole. However, in the event of a damaging earthquake, Odessa Memorial Healthcare Center would likely experience an influx of injuries resulting from the quake. If the Hospital structure or associated equipment was damaged, patients would require transport to other nearby medical facilities. Longer wait times may lead to more serious injuries or even deaths.

Probability of Future Occurrence

The area in which the District is located has a 10% chance of exceeding a 7-8% pga in the next 50 years.

Value of Resources at Risk

The Odessa Memorial Healthcare Center is an unreinforced masonry structure valued at approximately \$11,500,000. Significant damage to the building would likely result in closure of the hospital until repairs are made due to safety issues. Additionally, structural damage may, in turn, cause damage or complete loss of much of the medical equipment within the building due to collapses or contamination.

Landslide Profile

The Odessa Memorial Healthcare Center is located on the southwestern edge of Odessa. This area did not show a moderate or high risk in the Landslide Prone Landscapes model; however, there is some potential for slumps or rolling rocks in this area. The development along the base of this slope did not alter the hillside; thus, it is unlikely that the slope is unstable. During a severe storm or a prolonged freeze/thaw period, small-scale slumps or loose rocks may deliver mud and other debris into the Hospital parking lot. In extreme events, slide debris could damage the Hospital structure. The probability of this type of event is extremely low.

Impacts and Value of Resources at Risk

The Odessa Memorial Healthcare Center structure as well as surrounding parking and travel ways may have a limited risk of experiencing a small slide originating on the slope to the south of facility. It is unlikely that there would be significant damages to the Hospital; however, there would be cleanup costs associated with a slide event.

Severe Weather Profile

The Odessa Memorial Healthcare Center does not have any differing levels of risk associated with this hazard than Lincoln County as a whole. However, any injuries, including traffic accidents, resulting from severe storms would likely be treated at Memorial Healthcare Center in Odessa. The probability of a severe weather event occurring in Odessa on an annual basis is very high.

Impacts and Value of Resources at Risk

Memorial Healthcare Center will not likely incur major structural damages from severe weather events; however, damage to roofing, windows, or other structural components could result in closure of the hospital due to safety issues until repairs could be made. Additionally, structural damage may, in turn, cause damage or complete loss of much of the medical equipment within the building due to collapses or contamination.

Wildland Fire Profile

The Odessa Memorial Healthcare Center does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

Due to its facilities' locations within developed communities, the Hospital has a very low risk of being directly impacted by wildland fire; however, any injuries resulting from a wildfire, including smoke inhalation and heat exhaustion, would likely be treated at the hospital in Odessa.

Avalanche Profile

The Odessa Memorial Healthcare Center will not be directly impacted by this type of localized event due to the gentle topography and low snow accumulations.

Impacts and Value of Resources at Risk

The Odessa Memorial Healthcare Center will not be impacted and has no assets at risk to avalanches.

Seiche Profile

Although Lincoln County's northern border has a moderate risk of being impacted by a seiche on Lake Roosevelt, the Odessa Memorial Healthcare Center will not be directly impacted by this type of localized event.

Impacts and Value of Resources at Risk

The Odessa Memorial Healthcare Center has no assets at risk to seiches; however, some injuries resulting from a seiche event may be routed to the District's medical facilities in Odessa if the Lincoln Hospital District in Davenport is overwhelmed or unable to receive additional patients.

Volcanic Eruption Profile

The Odessa Memorial Healthcare Center does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

The Odessa Memorial Healthcare Center facilities do not have any direct risk to volcanoes; however, there may be damage to the structures and cleanup costs associated with the ash fallout. Furthermore, any injuries resulting from a volcano, including the respiratory effects caused by ash inhalation, would likely be treated at the hospital.

Drought Profile

The Odessa Memorial Healthcare Center does not have any differing levels of risk associated with this hazard than Lincoln County as a whole.

Impacts and Value of Resources at Risk

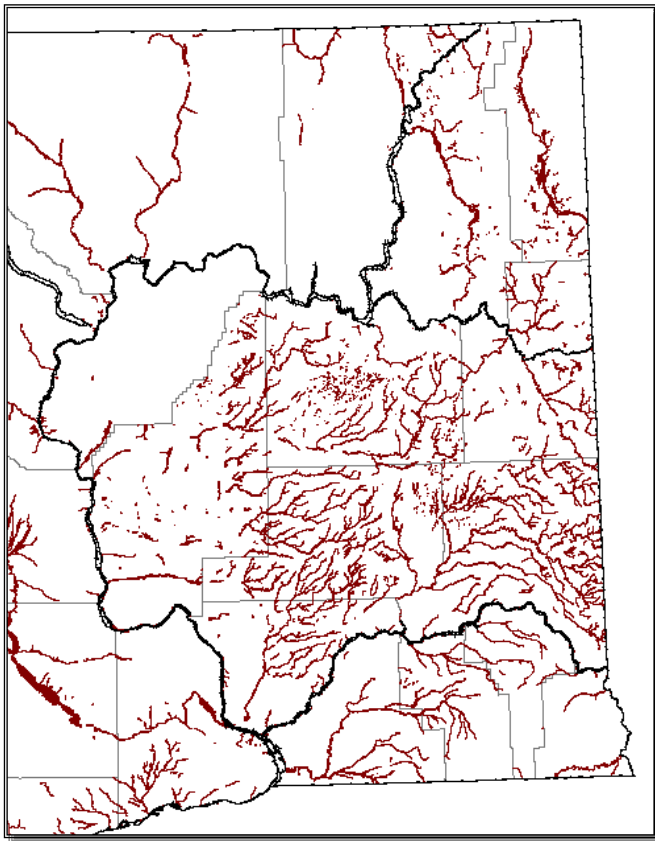
The Odessa Memorial Healthcare Center does not have any assets directly at risk to drought.

Lincoln County Conservation District Annex

Flood Profile

The flood history record in Lincoln County Conservation District is limited to flash floods and relatively small riverine flooding along minor drainages. Although many areas of the county flood on a regular basis, no damages have occurred due to naturally functioning floodplains. Nearly all flood damages within Lincoln County Conservation District have occurred within the incorporated communities. High intensity rainfall, rain-on-snow and rain-on-frozen soil events have been prominent causes for flooding through the hydrologic record. Floods in Lincoln County Conservation District may occur at any time between November and June with flash floods from thunderstorms occurring most commonly during the summer months.

Figure 5.32. FEMA 100 Year Riverine Flood Hazard Areas in Eastern Washington.

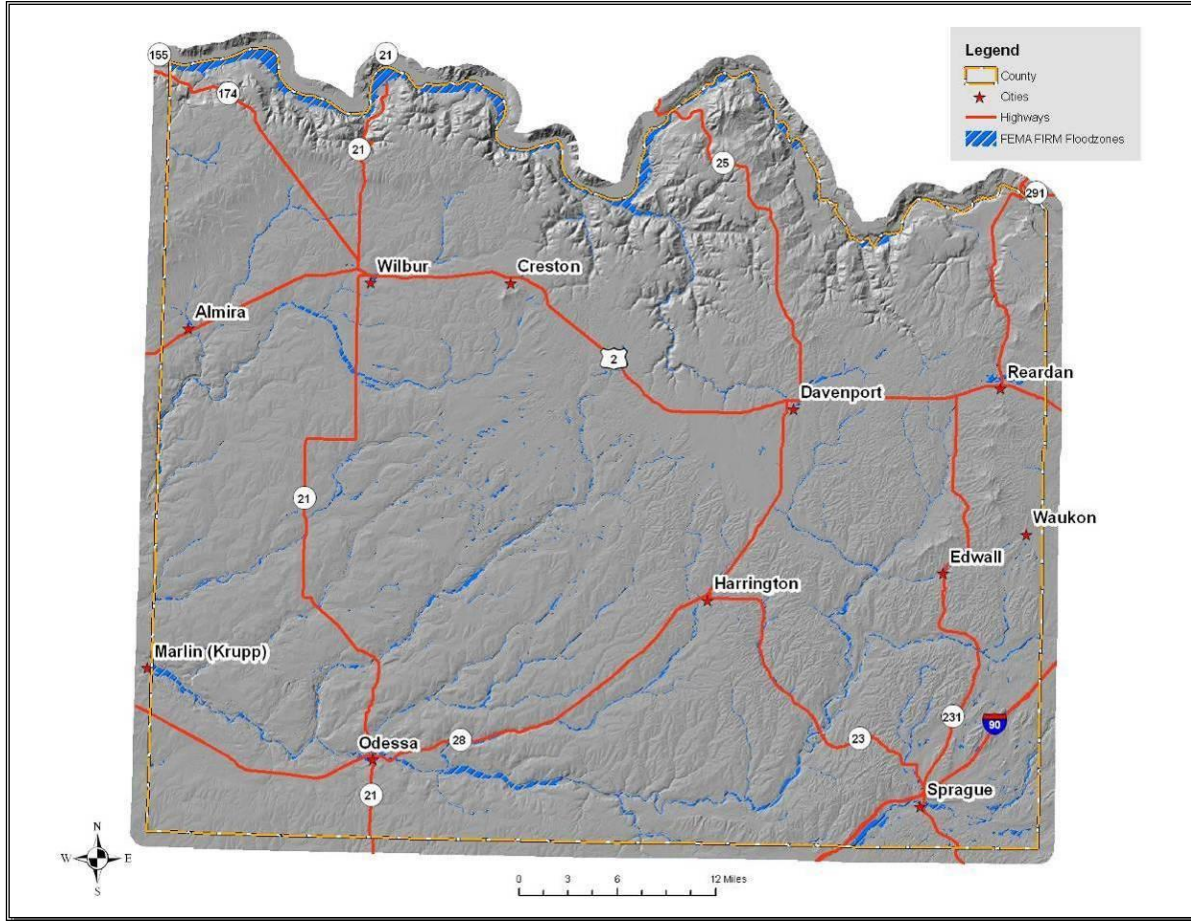


The only major watershed in Lincoln County Conservation District is the Columbia River which delineates the northern border of the County. There is very little risk of flooding along the Columbia River as this area is part of the Lake Roosevelt Reservoir. The water level of Lake Roosevelt is monitored and highly regulated for the purposes of providing not only irrigation water to the surrounding agricultural developments and hydroelectric power, but also to provide flood control for communities along this major drainage.

Lincoln County Conservation District does, however, contain multitudes of small tributaries that meander through mostly large, flat floodplains. These drainages are highly susceptible to flash flood events resulting from thunderstorms, rain-on-snow events, or rapid snowmelt. Riverine flooding is also a common occurrence. Because most of these waterways are shallow, channels are often breached with floodwaters occupying wide floodplains for days at a time. Some of the more

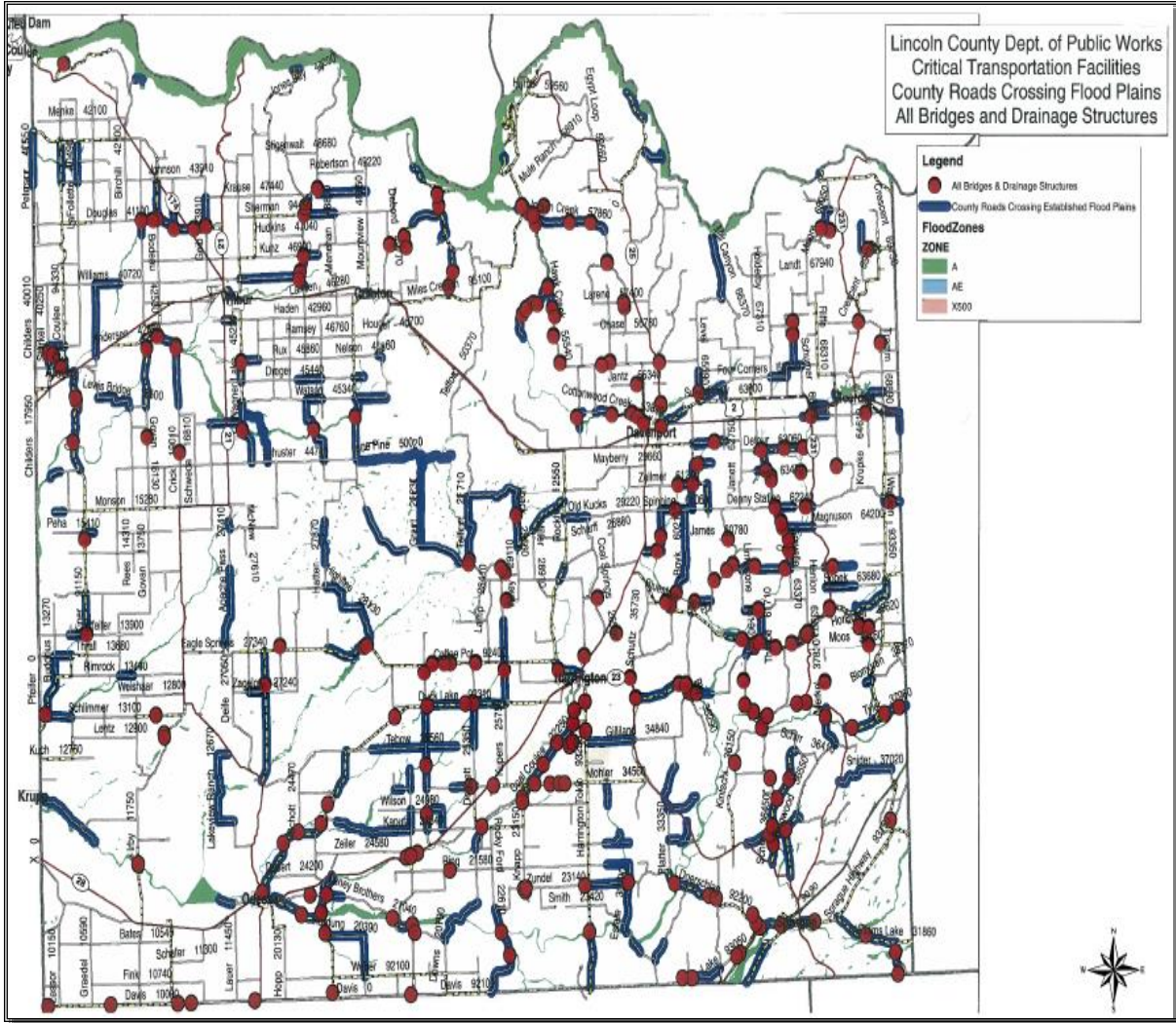
significant of these drainages include Lake Creek, Crab Creek, Sinking Creek, Wilson Creek, Hawk Creek, Duck Creek, Rock Creek, and Bluestem Creek. Most of these watersheds originate in Lincoln County Conservation District and eventually drain into the Columbia River (either on the north end of the County or to the west in Grant County) or Moses Lake. Hundreds of secondary tributaries drain into these waterways.

Figure 5.33. FEMA Floodplains in Lincoln County Conservation District, Washington.



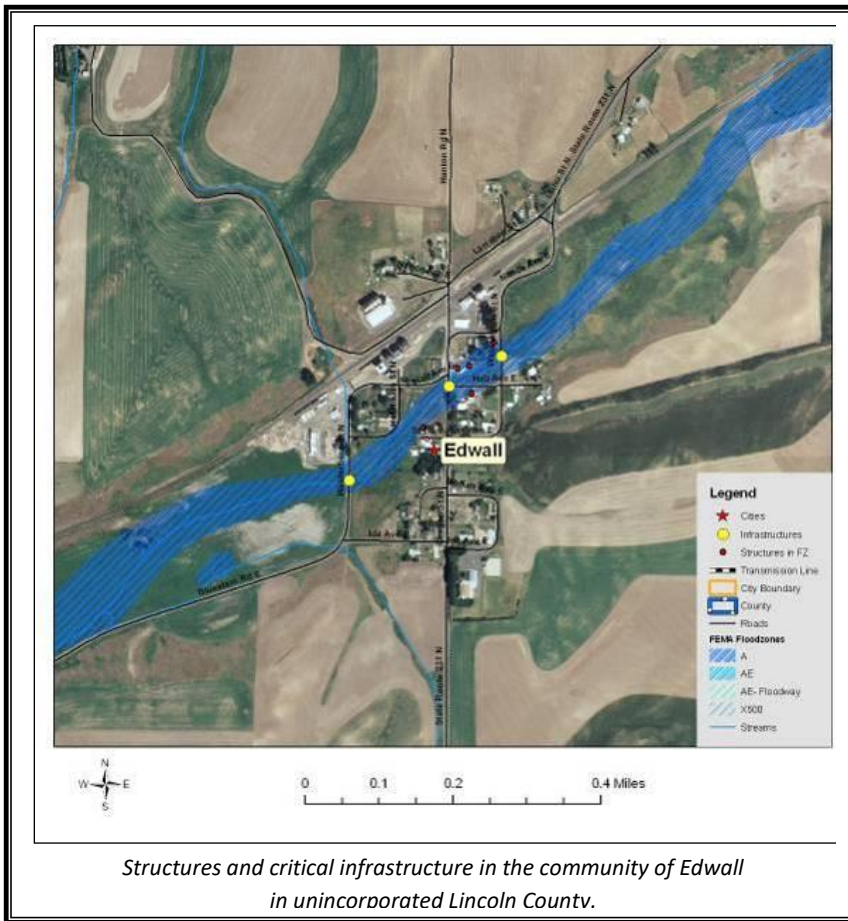
Any magnitude flood event may cause damage or blockages at drainage structures or to road segments. These types of events are difficult to anticipate; however, Lincoln County Conservation District does maintain a prioritized list of all road segments and infrastructure within established floodplain areas. The transportation infrastructure in Lincoln County Conservation District has been categorized by priority and significance in the event of natural or man-caused disasters. The priority for repairs or maintenance in an emergency event is given to roads, bridges, and structures on minor arterials (FFC 6), major collectors (FFC 7), and local access routes serving areas of rural residential development (FFC 8). Second-priority infrastructure may become first priorities during a localized event. Lincoln County Conservation District maintains its transportation infrastructure inventory and priority classification system as a GIS database at the Public Works office.

Figure 5.34. Critical Transportation Facilities Crossing Designated Floodplains.



Sediment has built up in many of the stream channels in Lincoln County Conservation District. This buildup and subsequent vegetative growth has narrowed channels and restricted the capacity of the stream. These channel restrictions can prevent the stream from following its natural meandering course, which can contribute to changes in the floodplain.

Figure 5.35. FEMA Floodplain in Unincorporated Community of Edwall.



Edwall is a small, unincorporated community on the eastern side of Lincoln County Conservation District. The floodplain in Edwall is caused by a small tributary of Crab Creek. The stream flows in a southwesterly direction through the middle of the community. This stream has caused minor flood damages in the past due to rapid runoff caused by rain-on-snow or major storm events and channel blockages.

Participation in the National Flood Insurance Program (NFIP) and subsequent adoption of the Uniform Building Codes, or more stringent local building codes, provide basic guidelines to communities on how to regulate development. When a county participates in the NFIP it enables property owners in the county to

insure against flood losses. By employing wise floodplain management, a participating county can protect its citizens against much of the devastating financial loss resulting from flood disasters. Careful local management of development in the floodplains results in construction practices that can reduce flood losses and the high costs associated with flood disasters to all levels of government.

An important part of being an NFIP community is the availability of low-cost flood insurance for those homes and businesses within designated flood plains, or in areas that are subject to flooding, but that are not designated as Special Flood Hazard Areas.

Table 5.4. NFIP Policy Statistics as of 6/14/2018 in Lincoln County Conservation District.

Community Name	Policies In-Force	Insurance In-Force	Written Premium In-Force	FIRM Effective Date	Floodplain Ordinance/ Manager	CRS Ranking
Lincoln County (unincorporated)	14	\$1,740,600	7,458	9/30/1988	Yes/Yes	-
Almira	-	-	-	9/30/1988	No/No	-
Creston	-	-	-	9/30/1988	Yes/Yes	-
Harrington	2	\$490,000	629	9/30/1988	Yes/Yes	-
Odessa	33	\$3,563,500	24,918	9/30/1988	Yes/Yes	-
Sprague	12	\$1,482,900	12,509	9/30/1988	Yes/Yes	-
Wilbur	27	\$3,095,700	19,688	9/30/1988	Yes/Yes	-
Reardan	-	-	-	-	No/No	-
Davenport	-	-	-	-	No/No	-

Overall participation by individuals and business in the NFIP appears to be low relative to the number of structures within the floodplain. There are several potential reasons for this.

- A lack of knowledge about the existence of the availability of low-cost flood insurance.
- Home and business owners unaware of their vulnerability to flood events.
- Current cost of insurance is prohibitive.

The first two reasons can be addressed through public education. The third could be addressed by all communities in the county taking advantage of the Community Rating System (CRS). To encourage communities to go beyond the minimum requirements and further prevent and protect against flood damage, the NFIP established the Community Rating System (CRS). To qualify for CRS, communities can do things like make building codes more rigorous, maintain drainage systems, and inform residents of flood risk. In exchange for becoming more flood-ready, the CRS community's residents are offered discounted premium rates. Based on your community's CRS ratings, you can qualify for up to a 45% discount of your annual flood insurance premium.

Local Event History

January-February 2017 Flood – Severe winter storms produced heavy precipitation, causing flooding and compromised and damaged many roads. Levels of damage varied from surface erosion to complete road failure. The City of Sprague declared a state of emergency due to flooding which threatened bridges.

Probability of Future Occurrence

The probability of flood events occurring in Lincoln County Conservation District is high. Low magnitude flood events can be expected several times each year. However, due to the flat topography and drainage infrastructure, the impacts of these events are slight and usually amount to minor and temporary traffic issues throughout the county. There have been large-magnitude and high-impact flood events, but these are not likely in any given year. These types of flood events have the highest probability of occurrence in the winter or early spring. Minor flash flood events are expected annually most likely because of summer thunderstorms or rain-on-snow events.

Lincoln County Conservation District is not considered to be one of the more at-risk and flood-vulnerable counties in Washington according to the State of Washington Hazard Mitigation Plan. Lincoln County Conservation District is also not in the top percentage of Washington counties having a high frequency of floods causing damage. The Washington State Hazard Mitigation Plan also reports that Lincoln County Conservation District has zero repetitive loss properties. Properties receiving two or more claim payments of more than \$1,000 from the National Flood Insurance Program within any rolling 10-year period are considered repetitive loss properties by FEMA.⁹⁵

Impacts of Flood Events

Due to the lack of large, swift bodies of water in Lincoln County Conservation District, the probability of a flood-related fatality is low. Nevertheless, flash flood events or accidents could result in a death or injury. First responders or other persons could be pinned under debris and drowned or receive trauma from debris being carried along the waterway. Once flood waters recede, mold can grow in wet material causing a public health hazard. Flood waters may contain sewage and hazardous chemicals that could be left on people's property following a flood event. Furthermore, water and food may be contaminated, and heat and electricity may be inoperable for a period of time. Although the probability of these types of impacts occurring at a moderate to large scale is very low, all these factors could contribute to a decline in current and long-term health of Lincoln County Conservation District residents.

The continuity of operations for Lincoln County Conservation District and most other jurisdictions within the county will not be compromised due to a flood event. The delivery of some services may be hindered by localized flooding in certain areas; however, due to the availability of alternative routes, this is not a significant concern. Damage to facilities, equipment, or files could impact certain organizations or public services depending on the extent of damage and duration of the event.

Flood events in Lincoln County Conservation District are most likely to affect private property by damaging homes, businesses, barns, equipment, livestock, and vehicles. Both water and contaminants can damage or permanently ruin equipment. Flood waters can also erode land. This particularly an issue when lands supporting roads, power lines, pipelines, sewage control facilities, levees, bridges, and other infrastructure are damaged by erosion.

In Lincoln County Conservation District, it is unlikely that flood events would cause any long-term environmental impacts. Some environmental impacts that may be realized by localized flooding could include erosion of stream banks, loss of riparian plant life, or contamination by chemicals or sewage. Flooding in some areas may have some environmental benefits such as establishing meanders that slow the streamflow, replenishing wetland areas, and replenishing the soil with nutrients from sediment.

Flooding in Lincoln County Conservation District is not likely to have a significant or long-term effect on the local economy. Depending on the magnitude of the event, individual residents and businesses may be adversely impacted, but the economic viability of the community will not be affected. Severe damage to

⁹⁵ "Washington State Enhanced Hazard Mitigation Plan". Washington Military Department Emergency Management Division, 2013. <https://mil.wa.gov/other-links/enhanced-hazard-mitigation-plan>

transportation infrastructure may have a short-term impact on certain communities due to the presence of state and U.S. highway routes, but alternative routes are available.

Value of Resources at Risk

There are approximately 114 structures totaling an estimated \$8.5 million within the FEMA-identified floodplains (100- and 500-year) in unincorporated areas of Lincoln County Conservation District. The per structure value is based on a countywide average home estimate of \$74,296 and does not reflect the replacement cost of a structure. According to Lincoln County Conservation District Emergency Management and the State Hazard Mitigation Plan, there are currently no repetitive loss properties within Lincoln County Conservation District. The average damage to structures was estimated based on the parcel's location as either completely within or out of the flood zone. The estimated value of contents is ½ the value of the improvements equating to an additional \$4.2 million in potential losses. The damages will most likely not be equally distributed between buildings based on building materials, building location, and flood location. However, these estimates provide a basic approximation.

Critical infrastructure located within the identified floodplain for unincorporated areas includes numerous road segments, 52 bridges or other drainage structures, the Lincoln Hill boat launch, the Seven Bays boat launch and marina, the Fort Spokane boat launch, the Detillion boat launch, and the Keller Ferry. The replacement value of a bridge in Lincoln County Conservation District averages \$1 million while other types of drainage structures typically average \$500,000 according to Lincoln County Public Works.

Earthquake Profile

Based on historical records, Lincoln County Conservation District has not experienced any seriously damaging earthquakes in recorded history. Several distant earthquakes produced intensities strong enough to be felt in eastern Washington, but no earthquake epicenters were recorded for the region. All earthquakes in eastern Washington have been shallow and most are at depths less than 6 kilometers. The largest earthquake in eastern Washington since 1969 was a shallow, magnitude 4.4 event northwest of Othello on December 20, 1973. Some of the most active earthquake areas in eastern Washington are near Entiat, south of Lake Chelan, and in the Saddle Mountains, south of Vantage. Many of the earthquakes in eastern Washington occur in clusters near the Saddle Mountains in folded volcanic rocks, which were extruded in southeastern Washington from 16.5 to 6 million years ago.⁹⁶

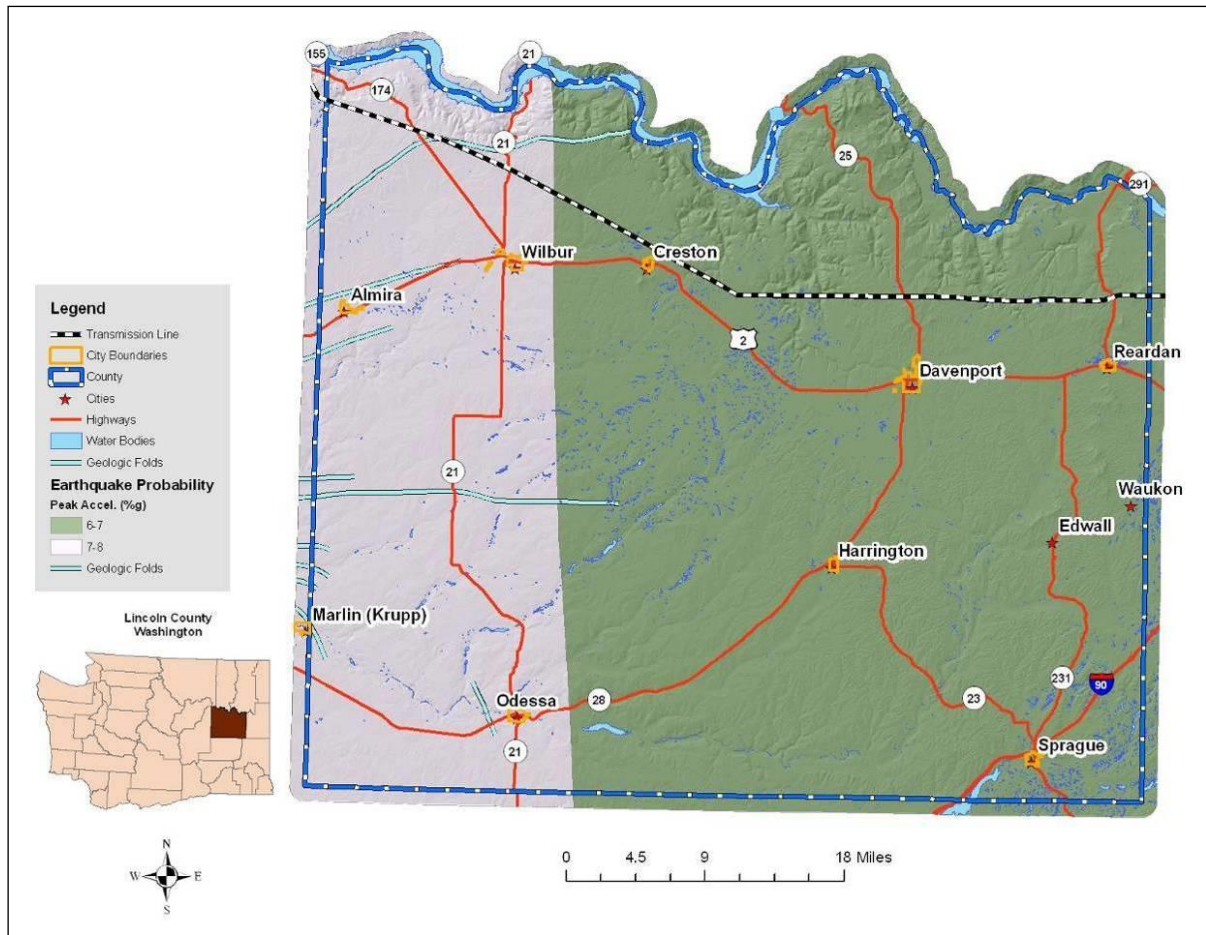
Probability of Future Occurrence

There are at least seven known geologic folds in the western part of Lincoln County Conservation District. These folds reach into the County from the west and dead-end. Peak ground acceleration (pga) in percent g is a measure of the ground motion, which decreases, the further you are from the earthquake. The USGS Shaking Hazard maps for the United States are based on current information about the rate at which earthquakes occur in different areas and on how far strong shaking extends from quake sources. Colors on

⁹⁶ Noson, Linda Lawrance, Anthony Qamar, and Gerald Thorsen. "Washington State Earthquake Hazards". Washington Division of Geology and Earth Resources Information Circular 85. Olympia, Washington, 1988. http://file.dnr.wa.gov/publications/ger_ic85_earthquake_hazards_wa.pdf.

the map show the levels of horizontal shaking that have a 1-in-10 chance of being exceeded in a 50-year period. Shaking is expressed as a percentage of “g” (g is the acceleration of a falling object due to gravity). This map is based on seismic activity and fault-slip rates and considers the frequency of occurrence of earthquakes of various magnitudes. Locally, this hazard may be greater than that shown, because site geology may amplify ground motions. As seen in Figure 5.5, much of the western third of Lincoln County Conservation District has 10% chance of exceeding a 7-8% pga in the next 50 years. This probability trends downwards to a 6-7% pga on the eastern two-thirds of the County.⁹⁷ No specific jurisdictions or special districts were identified as having differing issues or levels of risk associated with this hazard.

Figure 5.36. Regional Earthquake Probability Map.



Impacts of Earthquake Events

Past events suggest that an earthquake in the Lincoln County Conservation District area would cause little to no damage. Nonetheless, severity can increase in areas that have softer soils, such as unconsolidated sediments.

⁹⁷ USGS. 2008 United States National Seismic Hazard Maps. U.S. Geological Survey. U.S. Department of Interior. Available online at <http://earthquake.usgs.gov/hazards/products/conterminous/2008/>. October 2009.

Although unlikely in Lincoln County Conservation District, buildings that collapse can trap and bury people, putting lives at risk and creating cleanup costs. Upgrading existing buildings to resist earthquake forces is more expensive than meeting code requirements for new construction; thus, a high number of structures in Lincoln, particularly those built prior to seismic code requirements, remain at risk. Many critical facilities are housed in older buildings that are not up to current seismic codes.

Communities in Lincoln County Conservation District can expect some structural failure of older multistory unreinforced masonry buildings because of even lower intensity earthquakes. Cornices, frieze, and other heavy decorative portions of these types of structures may fail. The potential impacts of a substantial earthquake event are highly variable. Many of the structures and infrastructure throughout the county may not incur any damages at all; however, damage to roads, bridges, unreinforced masonry, chimneys, foundations, water lines, sewer lines, natural gas pipelines, and many other components are at risk. Fires can also be a secondary hazard to structures sustaining earthquake damage. The economic losses to business in the area may be very high if owners are forced to stop production or close their doors for even just a day.

Because structural damage by earthquakes is typically not complete destruction, but rather tends to be subtle cracking or settling that undermines the stability of the structure. These types of repairs can be very costly. Additionally, changes to the water table or even the topography can significantly impact local municipal and private wells and could result in the loss of traditional land uses.

Value of Resources at Risk

HAZUS®-MH MR5⁹⁸ is a regional earthquake loss estimation model that was developed by FEMA and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake loss estimations at a regional scale. To estimate potential earthquake losses in Lincoln County Conservation District, HAZUS was used to model a scenario based on the parameters of the nearest historic epicenter. The modeled earthquake occurred near Chelan, Washington (latitude 47.90, longitude -120.3) and was a 7.3 magnitude shallow crustal event, i.e. the most likely type of earthquake event to occur in Lincoln County Conservation District. The HAZUS model estimated direct earthquake damages, induced earthquake damage, social impacts, and economic losses. It should be noted that the figures have a high degree of uncertainty and should only be used for general planning purposes.

For the modeled earthquake scenario, the HAZUS software reported no expected damage to essential facilities including hospitals, schools, emergency operations centers, police stations, and fire stations. There are an estimated 8,000 buildings in Lincoln County Conservation District with a total building replacement value (excluding contents) of \$773 million. Approximately 94% of the buildings and 72% of the building value is associated with residential housing. The software also reported that 4 residential structures would be moderately damaged and 20 would be slightly damaged. Only 1 commercial building is expected to incur slight damages. Most residential structures expected to be damaged are manufactured homes.

The replacement value of the transportation and utility lifeline systems is estimated to be \$3.4 million and \$267 million, respectively. HAZUS estimated that no damages to the transportation system, potable water

⁹⁸ FEMA. Hazuz®-MH MR5. Department of Homeland Security. Federal Emergency Management Agency, Mitigation Division. Washington, D.C. November 2010.

and electric power system, or the utility system facilities would be expected. The HAZUS model also does not project any casualties or sheltering because of the earthquake scenario.

Figure 5.37. Summary of Utility System Pipeline Damage from HAZUS.

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	5,581	7	2
Waste Water	3,348	3	1
Natural Gas	2,232	1	0
Oil	0	0	0

HAZUS estimated the long-term economic impacts for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within Lincoln County Conservation District. HAZUS estimated that there would be approximately \$30,000 in economic losses attributed to bridge repairs, \$70,000 in economic losses from repairs to airport facilities, and \$10,000 in economic losses from repairs to the Keller Ferry facility. Minor economic losses are also expected due to repair of potable water distribution lines (\$30,000), wastewater facilities and distribution lines (\$40,000), natural gas distribution lines (\$10,000), and electrical power facilities (\$40,000).

The only known publicly accessible unreinforced masonry structure in unincorporated Lincoln County Conservation District is the Guardhouse at Fort Spokane. This building is a historical structure built in the late 1800s by the Army and is currently used as a Visitor’s Center from May to September. The value of this structure is not determinable.

Unreinforced masonry (URM) structures and unreinforced chimneys of homes will likely be damaged in the event of an earthquake. Damaged or collapsed chimneys could result in the secondary hazard of fire. Nonstructural damage caused by falling and swinging objects may be considerable after any magnitude earthquake. Damage to some older, more fragile bridges and land failure causing minor slides along roadways may isolate some residents.

Landslide Profile

To date, there is no recorded history of major landslides occurring in Lincoln County Conservation District; however, there is evidence of past landslides along the Columbia River on the northern edge of Lincoln County Conservation District. The probability of a major landslide event in Lincoln County Conservation District is moderate to low. Nevertheless, there are some areas in Lincoln County Conservation District that have specific landslide concerns. Areas that are generally prone to landslides are:

- On existing landslides, old or recent
- On or at the base or top of slopes
- In or at the base of minor drainage hollows
- At the base or top of an old fill slope
- At the base or top of a steep cut slope

The only major landslide potential in Lincoln County Conservation District occurs along the Columbia River drainage. While ancient alluvial fans provide evidence of historic landslides, the occurrence of new landslides and the reactivation of old landslides increased dramatically with the filling of reservoirs behind the Grand Coulee and Chief Joseph dams. Drawdowns for flood control and power generation also trigger new landslides and/or reactivate and extend old ones. Some of the landslide complexes extend for thousands of feet along the lakeshore, have head scarps in terraces 300 feet or more above reservoir level and extend well below its surface. With landslide activity common along hundreds of miles of shoreline, one hazard in such a setting is waves generated by fast-moving landslide masses.

Figure 5.38. Seven Bays Landslide Impact Zone.

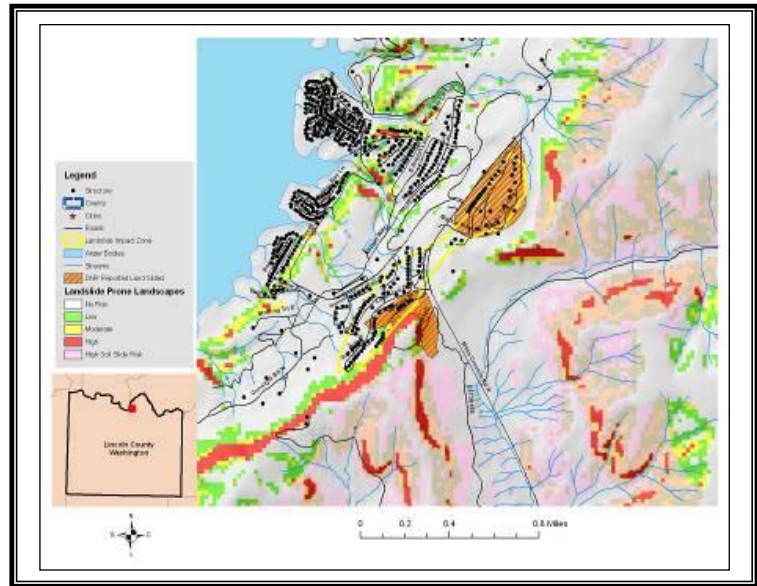
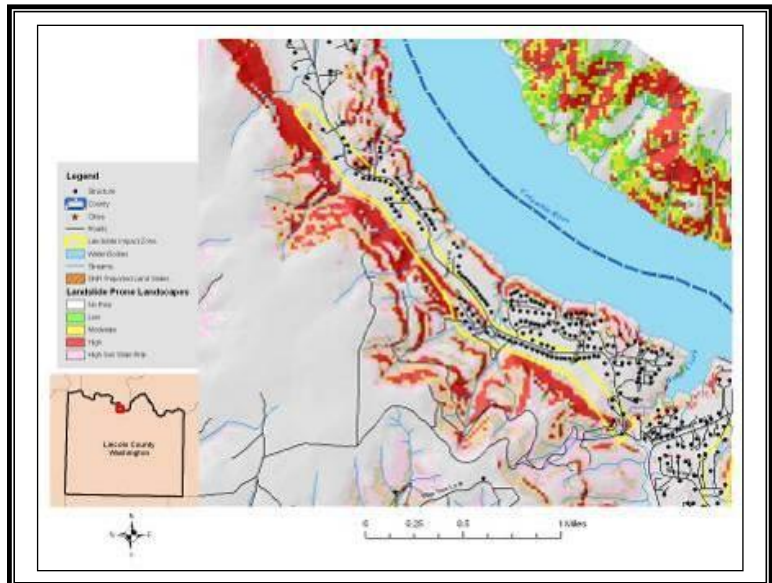
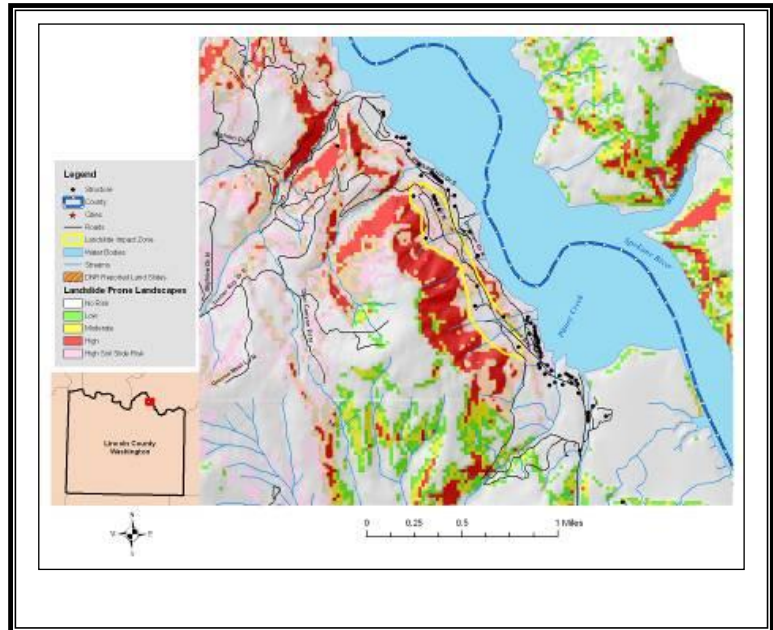


Figure 5.39. Sterling Valley Landslide Impact Zone



Most of the population in Lincoln County Conservation District has a low risk of landslides; however, homes and infrastructure located in or at the mouth of drainages have an elevated risk. Additionally, sections of some primary access routes are in low to moderate landslide prone areas. There is a moderate probability of small slides occurring on slopes ranging from 5-35%. This type of slide is common on the eyebrows of hills, especially where there has been soil disturbance. Generally, these low angle slides will have a low velocity and will not impact structures or infrastructure.

Figure 5.40. Porcupine Bay Landslide Impact Zone



Soil factors that increase the potential for landslide are soils developed from parent materials high in schist and granite, and soils that are less permeable containing a resistive or hardpan layer. These soils tend to exhibit higher landslide potential under saturated conditions than do well-drained

soils. To identify the high-risk soils in Clearwater County, the NRCS State Soils Geographic Database (STATSGO) layer was used to identify the location and characteristics of all soils in the County. The specific characteristics of each major soil type within the County were reviewed. Soils information that suggested characteristics pertaining to very low permeability and/or developed a hardpan layer and soils developed from schist and granite parent material were selected as soils with potential high landslide risk. High-risk soils magnify the effect slope has on landslide potential. Soils identified as having high potential landslide risk are further identified only in areas with slopes between 14° and 30° (25-60%). It is these areas that traditionally exhibit the highest landslide risk due to soil characteristics within a given landscape.

To portray areas of probable landslide risk due to slope related factors, slope models were used to identify areas of low, moderate and high risk. This analysis identified the low risk areas as slopes in the range of 20°-25° (36-46%), moderate as 26°-30° (48-60%) and high risk as slopes in the range of 31°-60° (60-173%). Slopes that exceeded 60° (173%) were considered low risk since sliding most likely had already occurred relieving the area of the potential energy needed for a landslide. From the coverage created by these two methods, it is possible to depict areas of assumed risk and their proximity to development and human activity. With additional field reconnaissance the areas of high risk can be further defined by overlaying additional data points identifying actual slide locations, thus improving the resolution by specifically identifying the highest risk areas. This method of analysis is like a method developed by the Clearwater National Forest in north central Idaho.⁹⁹

⁹⁹ McClelland, D.E., et al. 1977. Assessment of the 1995 and 1996 floods and landslides on the Clearwater National Forest Part 1: Landslide Assessment. Northern Region U.S. Forest Service. December 1977.

The Seven Bays, Porcupine Bay, Sterling Valley, and Redwine Canyon Landslide Impact Zones encompass relatively large population clusters along the Lake Roosevelt shoreline. In addition to the residences, landslides in these Impact Zones may affect several of county access roads. In many cases, there is only one well-maintained access route into the residential areas; thus, a closure or temporary delay could cause serious traffic concerns and possibly isolated some residents for an extended period.

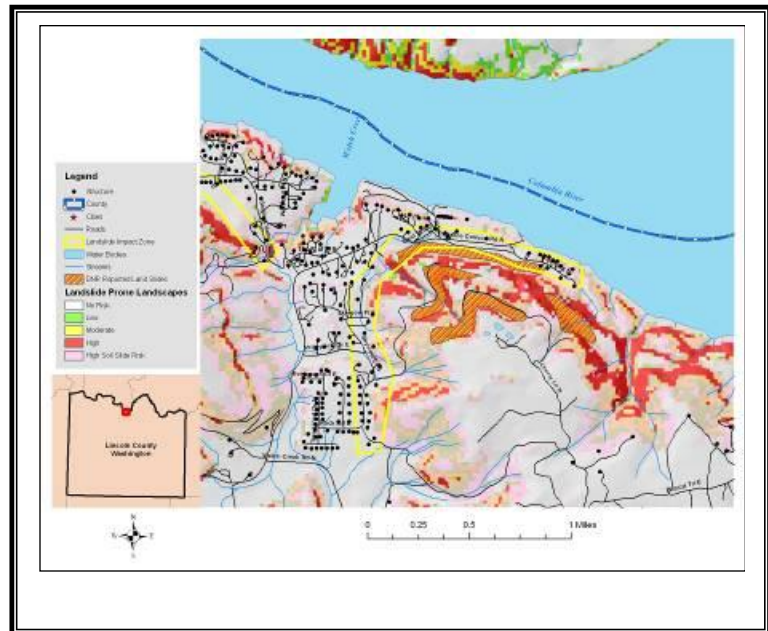
Many of the slopes and hillsides in these impact zones are comprised by material deposited by past landslides. In fact, much of the lower slopes near the valley floors are alluvial fans created by sediment being carried downstream and deposited at the mouths of the numerous small drainages. The Washington Department of Natural Resources has mapped areas of past landslide events in the Seven Bays and Redwine Canyon Impact Zones. The presence of deposited material indicates the historic occurrence of high-energy, short duration floods and debris flows in these chutes in response to severe climatic conditions, such as thunderstorms and rain-on-snow events. These events are historically infrequent, with recurrence cycles on the order of years to decades. However, they can result in significant damage to buildings and infrastructure, disrupt travel, reduce water quality, and jeopardize safety.

The largest landslides typically occur where human development or disturbance has exposed landslide-prone sediments to steep topography. The abundance of development within the Landslide Impact Zones, both residential and roadway, is likely further undermining the stability of the slope. Today, initiation and reactivation of landslides is closely tied to unusual climatic events and land-use changes. Even small landslide activity on the upper slopes can transform into high-energy debris flows that endanger roads, buildings, and people below. Landslide debris is highly unstable when modified through natural variations in precipitation, artificial cuts, fills, and changes to surface drainage and ground water.

Wildfires in these impact zones could cause a domino effect of multiple hazards. Higher intensity fires not only remove most of the vegetation, but they also cause soils to become hydrophobic or water repellent for a period after the fire. This combination leads to unusually high runoff after rain showers or during the spring runoff season. As streams and rivers begin to reach and exceed flood stage, bank failures and channel migration are common. Road building and other soil disturbances tend to exacerbate this effect leading to even more severe land and soil slides.

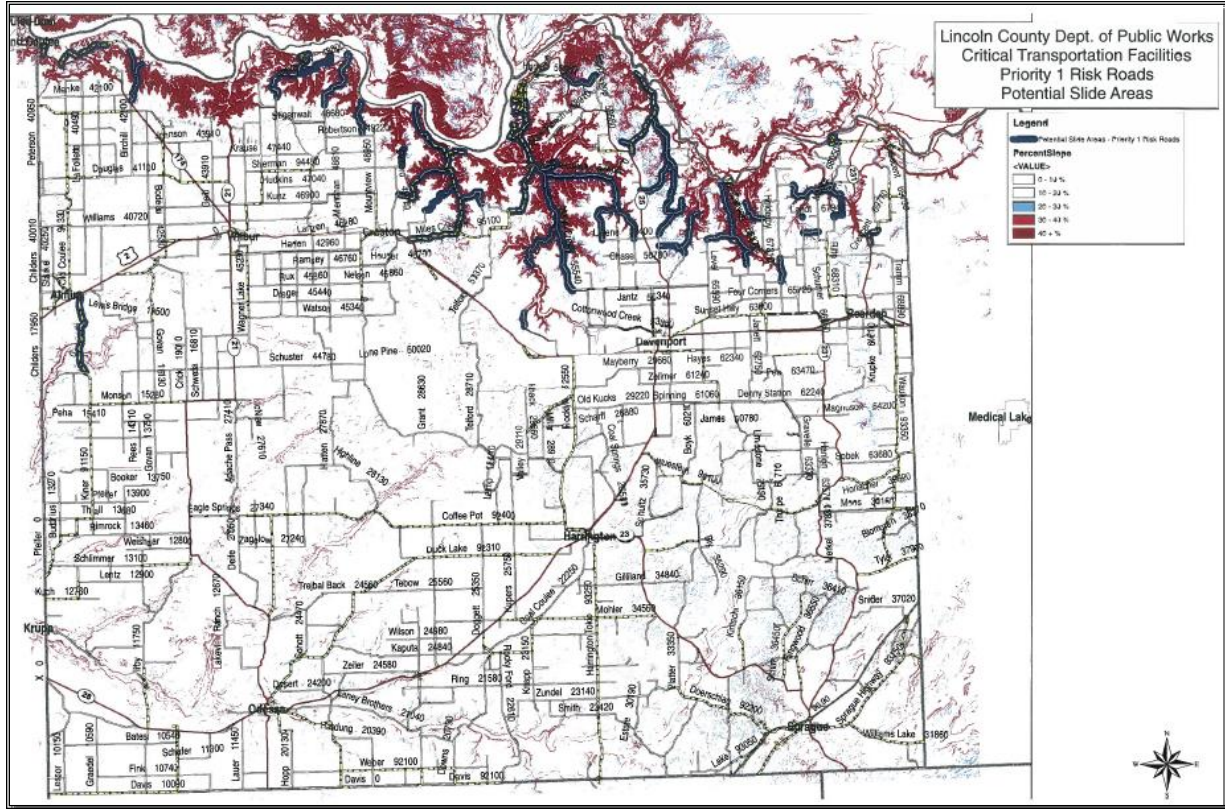
Lincoln County Conservation District has classified the transportation infrastructure by priority and significance in the event of a natural or man-caused disaster. The priority for repairs or maintenance in an

Figure 5.41. Redwine Canyon Landslide Impact Zone



emergency event is given to roads, bridges, and structures on minor arterials (FFC 6), major collectors (FFC 7), and local access routes serving areas of rural residential development (FFC 8). Lincoln County Conservation District maintains its transportation infrastructure inventory and priority classification system as a GIS database at the Public Works office.

Figure 5.42. Critical Transportation Facilities in Higher Potential Landslide Areas.



Local Event History

April 2017 Landslide – The Porcupine Bay Road accesses a National Park Service campground, boat ramp and some residences was blocked by a landslide in early April of 2017. This was a major slide that did not damage homes or cause injuries but did cause a portion of the Porcupine Bay Road and guardrail to slough off.

Figure 5.43. Porcupine Bay Road



Probability of Future Occurrence

Most of the landslide potential in Lincoln County Conservation District occurs in the steep canyons along the Columbia River. The canyons associated with Columbia River and Lake Roosevelt have a high propensity for slides based on the steeper slopes, unstable soils, and history of occurrence. Wildfires and/or severe storms that saturate the soils could lead to major slide events in these areas.

Nevertheless, not all the Lake Roosevelt shoreline is at risk to landslides and development has only occurred in specific areas rather than along the entire extent of the shore. The probability of occurrence of major, high velocity landslide events in this area, including those caused by severe local storms, is moderate. The probability of other areas in Lincoln County Conservation District experiencing a landslide event is very low.

Impacts of Landslide Events

In Lincoln County Conservation District, minor landslides along toe-slopes and roadways occur annually with minimal impact to residents. Major landslides in northern Lincoln County Conservation District could cause property damage, injury, and death and may adversely affect a variety of resources. For example, water supplies, fisheries, sewage disposal systems, forests, dams, and roadways can be affected for years after a slide event. The negative economic effects of landslides include the cost to repair structures, loss of property value, disruption of transportation routes, medical costs in the event of injury, and indirect costs such as lost timber and lost fish stocks.

Water availability, quantity, and quality can be affected by landslides and would have a very significant economic impact on Lincoln County Conservation District. The loss or redistribution of water would affect agricultural crops grown in certain areas, ranching activities, and personal and municipal wells.

Value of Resources at Risk

The cost of cleanup and repairs of roadways is difficult to estimate due to the variable circumstances with each incident including size of the slide, proximity to a State or County shop, and whether the slide occurred on the cut slope or the fill slope. Other factors that could affect the cost of the damage may include culverts, streams, and removal of debris. This type of information is impossible to anticipate; thus, no repair costs for damaged roadways have been estimated.

Table 5.5. Landslide Impact Zones in Lincoln County Conservation District.

Landslide Impact Zone	Number of Structures	Value of Structures at Risk
Seven Bays	90	\$8,638,662
Porcupine Bay	10	\$959,851
Sterling Valley	52	\$4,991,227
Redwine Canyon	44	\$4,223,346
Total	196	\$18,813,085

Slides in the identified Impact Zones are more likely to be larger and more damaging as weaknesses in the underlying rock formations give way. Although infrequent, this type of slide has the potential to not only block, but destroy road corridors, dam waterways, and demolish structures. The highest risk areas in these impact zones are typically at the higher elevations where slopes exceed 25% grade. There are numerous homes in each of these impact zones. Single slide events will not likely impact the entire population, but rather individual structures. Many of the main access and secondary roads could also be at risk from slides initiated in these impact zones.

Severe Weather

Severe weather in Lincoln County Conservation District ranges from the commonly occurring thunderstorms to hail, high winds, tornadoes, drought, dense fog, lightning, and snow storms.

All of Lincoln County Conservation District is at risk to severe winter weather events and there is a high probability of their continued occurrence in this area. Due to topography and climatologic conditions, the

higher elevations are often the most exposed to the effects of these storms. Commonly, higher elevations in the County will receive snowfall, while areas along the Lake Roosevelt shoreline may not. Periodically though, individual storms can generate enough force to impact the entire County at one time. From high winds to ice storms to freezing temperatures, there are all types of winter storms that take place during the course of any given year. Winter conditions can change very rapidly. It is not uncommon to have a snowstorm at night with sunshine the next day. Lincoln County Conservation District is not considered to be among the most vulnerable counties to winter storms and blizzards in Washington according to the Washington State Hazard Mitigation Plan.¹⁰⁰

Figure 5.44. Lincoln County Road in Winter



In Lincoln County Conservation District, ice storms occur when a layer of warm air is between two layers of cold air. Frozen precipitation melts while falling into the warm air layer, and then proceeds to refreeze in the cold layer above the ground. If the precipitate is partially melted, it will land on the ground as sleet. However, if the warm layer completely melts the precipitate, becoming rain, the liquid droplets will continue to fall, and pass through a thin layer of cold air just above the surface. This thin layer of air then cools the rain to a temperature below freezing (0 °C). However, the drops themselves do not freeze, a phenomenon called supercooling. When the supercooled drops strike the ground or anything else below 0 °C, they instantly freeze, forming a thin film of ice that can build up on trees, utilities, roads, and other structures, infrastructure, and personal property.¹⁰¹

Due to their relative frequency and minimal severity, severe thunderstorms are not well documented in Lincoln County Conservation District. Their impacts are limited and do not significantly affect the communities enough to declare a disaster. The secondary impacts of thunderstorms, floods, are emphasized within the flood sections of this document. Areas most vulnerable to this type of storm are those subject to a strong southwesterly flow of moist, unstable air that generates strong, sometimes violent thunderstorms with one or more of the following characteristics: strong damaging winds, large hail, waterspouts, or tornados.

Hail can occur in any strong thunderstorm, which means hail is a threat everywhere. Hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere. Large hail stones can fall at speeds faster than 100 miles per hour. Hail damage in Washington is very small in comparison with damage in areas of the central part of the United States. Often the hail that occurs does not grow to a size larger than one-half inch in diameter, and the areas affected are usually small. Quite often hail comes during early spring storms, when it is mostly of the small, soft variety with a limited

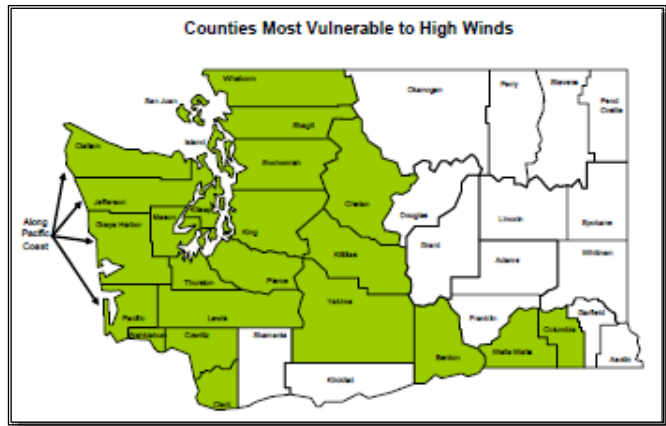
¹⁰⁰ "Washington State Enhanced Hazard Mitigation Plan". Washington Military Department Emergency Management Division, 2013. <https://mil.wa.gov/other-links/enhanced-hazard-mitigation-plan>.

¹⁰¹ Wikipedia. "Ice Storm". Wikimedia Foundation, Inc. March 2011. Available online at http://en.wikipedia.org/wiki/Ice_storm.

damaging effect. Later, when crops are more mature and more susceptible to serious damage, hail occurs in widely scattered spots in connection with summer thunderstorms.

Windstorms are frequent in Lincoln County Conservation District and they have been known to cause substantial damage. Under most conditions, the County's highest winds come from the south or southwest. Due to the abundance of agricultural development in Lincoln County Conservation District, crop damage due to high winds can have disastrous effects on the local economy. In the case of extremely high winds, some buildings may be damaged or destroyed. Wind damages will generally be categorized into four groups: 1) structure damage to roofs, 2) structure damage from falling trees, 3) damage from wind-blown dust on sensitive receptors, or 4) wind driven wildfires. Structural injury from damaged roofs is not uncommon in Lincoln County Conservation District. Airborne particulate matter increases during high wind events. When this occurs, sensitive receptors including the elderly and those with asthma are at increased risk to complications. The National Weather Service defines high winds as sustained winds of 40 mph or gusts of 58 mph or greater, not caused by thunderstorms, expected to last for an hour or more. Areas most vulnerable to high winds are those affected by a strong pressure difference from deep storms originating over the Pacific Ocean; an outbreak of very cold, Arctic air originating over Canada; or air pressure differences between western and eastern Washington that primarily affect the Columbia River Gorge, Cascade Mountain passes, ridges and east slopes, and portions of the Columbia Basin. Lincoln County Conservation District is not considered to be one of the most vulnerable to high winds in Washington State according to the Washington State Hazard Mitigation Plan.¹⁰²

Figure 5.45. Counties Most Vulnerable to High Winds



Lincoln County Conservation District and the entire region are at increased risk to wildfires during high wind events. Ignitions can occur from a variety of sources including downed power lines, lightning, or arson. Once ignited, only wildfire mitigation efforts around the community and scattered homes will assist firefighters in controlling a blaze. Details about wildfire mitigation are discussed in the wildland fire annexes of this Multi-Hazard Mitigation Plan.

A tornado is formed by the turbulent mixing of layers of air with contrasting temperature, moisture, density, and wind flow. This mixing accounts for most of the tornadoes occurring in April and May, when cold, dry air from the north or northwest meets warm, moister air moving up from the south. If this scenario was to occur and a major tornado was to strike a populated area in Lincoln County Conservation District, damage could be widespread. Businesses could be forced to close for an extended period, and routine services such as telephone or power could be disrupted. The National Weather Service defines a tornado as a violently

¹⁰² "Washington State Enhanced Hazard Mitigation Plan". Washington Military Department Emergency Management Division, 2013. <https://mil.wa.gov/other-links/enhanced-hazard-mitigation-plan>.

rotating column of air that contacts the ground; tornados usually develop from severe thunderstorms. Areas most vulnerable to tornado are those subject to severe thunderstorms or those with a recurrence rate of 5 percent or greater, meaning the County experiences one damaging severe thunderstorm event at least once every 20 years.

According to the Tornado Project¹⁰³ and the National Climatic Data Center¹⁰⁴, there were 6 reports of tornadoes in Lincoln County Conservation District between 1880 and 2000. They occurred in May 1957 (F0), April 1972 (F3), August 1978 (F1), May 1979 (F1), May 1997 (F1), and June 2009 (F0-1). There were 5 separate funnel clouds in the Davenport and Creston areas associated with the June 2009 event. The 1972 tornado was recorded as an F3 on the Fujita Tornado Scale, which correlates to approximately 158 to 206 mile per hour winds. This storm caused 1 injury.

Local Event History

August 2014 Dust Storm - On August 12th, 2014 a dust storm, or haboob, made its way across Lincoln County Conservation District ahead of thunderstorms blanketing the region in extremely low visibility. Winds generated during this event ranged from 40 to 50 mph. Many residents in the region lost power and there were numerous traffic accidents resulting from haboob. The National Weather Service says the state of Washington should expect these types of dust storms every couple of years.

Figure 5.46. Picture of Lincoln County Haboob.



November 2015 Severe Weather- On January 8, 2016, Governor Jay Inslee requested a major disaster declaration due to severe storms, straight-lines winds, flooding, landslides, and mudslides during the period of November 12-21, 2015. The Governor requested a declaration for Public Assistance for 31 counties and Hazard Mitigation statewide.

February 2017 Severe Weather - On April 5, 2017, Governor Jay Inslee requested a major disaster declaration due to severe winter storms, flooding, landslides, and mudslides during the period of January 30 to February 22, 2017. The Governor requested a declaration for Public Assistance for 15 counties and Hazard Mitigation statewide.

¹⁰³ Tornado Project. 1999. St. Johnsbury, Vermont. Available online at <http://www.tornadoproject.com/alltorns/watorn.htm#Columbia>.

¹⁰⁴ National Climatic Data Center. 2010. *Storm Events Database*. NOAA Satellite and Information Service. U.S. Department of Commerce. Available online at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>.

Probability of Future Occurrence

The probability of Lincoln County Conservation District experiencing a severe weather event on an annual basis is very high.

Extreme cold, snow accumulation, and wind events are common occurrences between November and March. Major winter storms are expected at least twice each year during the winter season; however, these weather patterns rarely last more than a few days. Severe ice storms also occur in Lincoln County Conservation District during the winter months. Severe and damaging ice storms have occurred in Lincoln County Conservation District twice in the last 5 years. The probability of this type of event is moderate to high annually.

Wind events are also common in Lincoln County Conservation District and can occur throughout the year. Wind is often associated with winter storms during the winter and thunderstorms during the warmer months but can also occur without additional storm influences. Significant wind events are expected 3-5 times annually.

Several major thunderstorms are expected in Lincoln County Conservation District each year between April and September; however, these types of events rarely cause serious damage.

Lincoln County Conservation District has a moderate probability of experiencing a damaging hail storm in any given year. These types of events most frequently occur in the spring but can occur throughout the summer as well.

Tornadoes are relatively rare, but the conditions for a funnel cloud to form are reported in Lincoln County Conservation District several times each year. Nevertheless, based on the historical record of tornadoes in this area, the probability for a small tornado to occur in Lincoln County Conservation District is low. The probability of a higher magnitude tornado occurring in this area is extremely low.

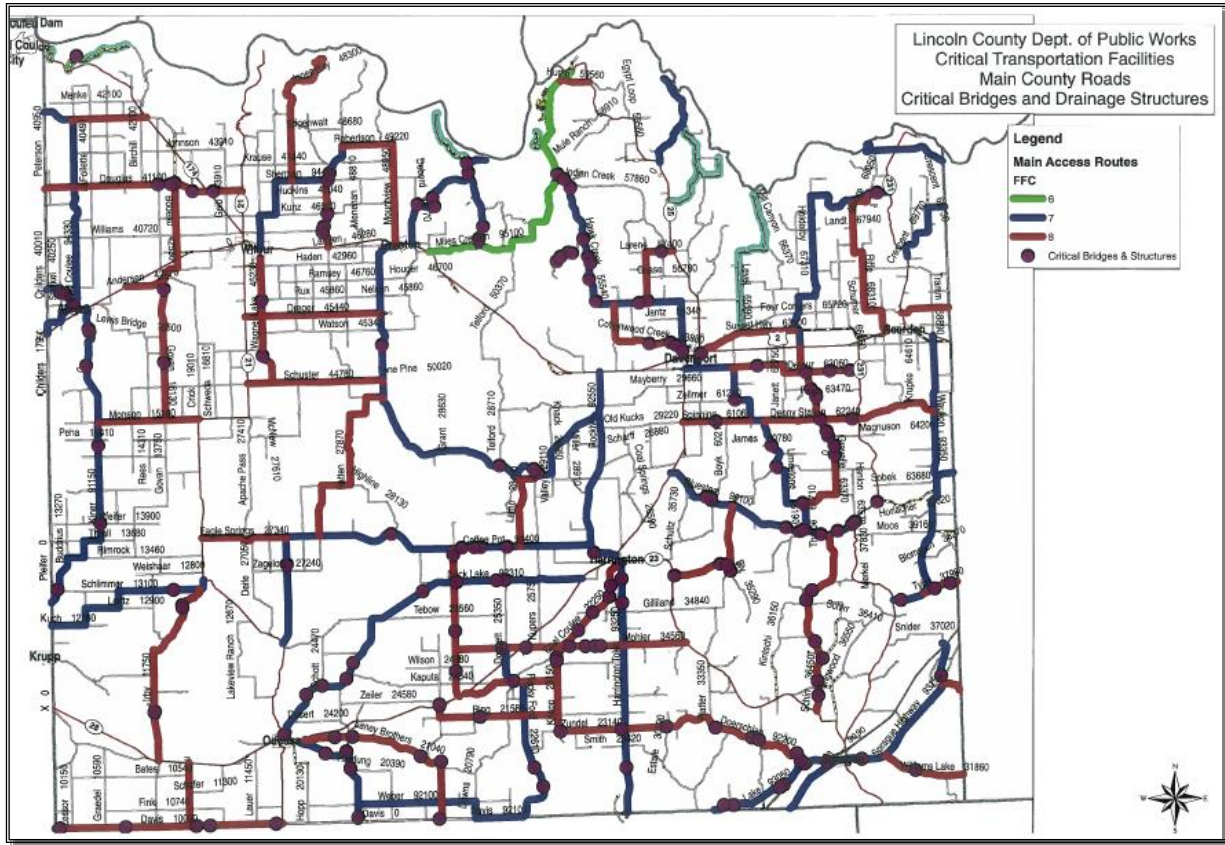
Impacts of Severe Weather Events

Winter storms with heavy snow, high winds, and/or extreme cold can have a considerable impact on Lincoln County Conservation District; however, most residents are well accustomed to the severe winter conditions in this part of Washington. Power outages and unplowed roads are a frequent occurrence throughout many parts of the County, but most residents are prepared to handle the temporary inconvenience. Snow loads on roofs, ice-slides off roofs onto vehicles or other buildings, and damaged frozen pipes are also potential hazards associated with winter weather. These events represent a significant hazard to public health and safety, a substantial disruption of economic activity, and a constant threat to structures during the winter months.

Lincoln County Conservation District has experienced several “ice storms” in recent memory. The freezing rain from an ice storm covers everything with a heavy layer of ice that can cause hazardous road conditions resulting in numerous accidents. Trees have been heavily damaged as branches break from the weight of the ice. The weight of the ice can also snap power lines and bring down utility poles. The loss of power during the winter months can last from a few hours to a few days and is particularly dangerous for those relying on electrical heat. The loss of a heat source can cause hypothermia, frost bite, or even death and can also lead to damages caused by frozen pipes.

Many types of severe weather events tend to impact transportation routes and related infrastructure, especially snow and thunderstorms. Lincoln County Conservation District has classified the transportation infrastructure by priority and significance in the event of a natural or man-caused disaster. The priority for repairs or maintenance in an emergency event is given to roads, bridges, and structures on minor arterials (FFC 6), major collectors (FFC 7), and local access routes serving areas of rural residential development (FFC 8). Lincoln County Conservation District maintains its transportation infrastructure inventory and priority classification system as a GIS database at the Public Works office.

Figure 5.47. Critical Transportation Facilities in Lincoln County Conservation District.



Wind usually accompanies snow storms in Lincoln County Conservation District; thus, large accumulations are not common as much of the snow is blown away. Commonly, heavy drifting is the cause of disruptions to normal commuting activities (delays and inability to plow roads and driveways). High wind events during the spring and summer months could lead to crop damages as well.

The potential impacts of a severe hail storm in Lincoln County Conservation District include crop damage, downed power lines, downed or damaged trees, broken windows, roof damage, and vehicle damage. Hail storms can, in extreme cases, cause death by exposure. The most common direct impact from ice storms to people is traffic accidents. The highest potential damage from hail storms in Lincoln County Conservation District is the economic loss from crop damage. Even small hail can cause significant damage to young and tender plants and fruit. Trees can also be severely damaged by hail.

So far, tornadoes have not had any serious impacts on Lincoln County Conservation District residents. Minor damages may occur because of the high winds associated with a tornado.

Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Lincoln County Conservation District. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. Additionally, due to the lack of significant topographic features, the wind tends to blow much of the snow accumulation away.

Snow plowing in Lincoln County Conservation District occurs from a variety of departments and agencies. The state highways are maintained by the State of Washington. Plowing of county roads is done by the County Road Department and the road departments of the individual cities. Lincoln County Conservation District has developed a pre-determined list of critical routes to prioritize the plowing of arterials and other main access routes. Private landowners are responsible for maintaining their own driveways or other private roads.

Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on Lincoln County Conservation District residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer ones. More rural parts of the County are sometimes better prepared to deal with power outages for a few days due to the frequent occurrence of such events; however, prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Lincoln County Conservation District schools are occasionally closed during and right after a severe winter storm because of cold temperatures and snow-covered roads.

Thunderstorms do occur within Washington affecting all counties, but usually are localized events. Their impacts are limited and do not significantly affect the communities enough to declare a disaster. The loss potential from flooding that results from severe thunderstorms can be significant in Lincoln County Conservation District.

Although the financial impacts of hail can be substantial and extended, accurately quantifying these impacts is problematic. Hail typically causes direct losses to structures and other personal property as well as to the extensive agricultural development in Lincoln County Conservation District. Potential losses to agriculture can be disastrous. They can also be very localized; thus, individual farmers can have significant losses, but the event may not drastically affect the economy of the County. Furthermore, crop damage from hail will also be different depending on the time of year and the type of crop. Most farmers carry insurance on their crops to help mitigate the potential financial loss resulting from a localized hail storm. Federal and state aid is available for County's with declared hail disasters resulting in significant loss to local farmers as well as the regional economy. Homeowners in Lincoln County Conservation District rarely incur severe damage to structures (roofs); however, hail damage to vehicles is not uncommon. The damage to vehicles is difficult to estimate because the number of vehicles impacted by a specific ice storm is unknown. Additionally, most hail damage records are kept by various insurance agencies.

It is difficult to estimate potential losses in Lincoln County Conservation District due to windstorms and tornadoes. Construction throughout the County has been implemented in the presence of high wind events, and therefore, the community has a higher level of preparedness to high wind events than many other areas experiencing lower average wind speeds.

Losses based on wind and tornado damage are estimated as follows:

- 3% of the buildings damaged causing 50% of value loss (loss could be from downed or damaged trees, damaged outbuildings, damaged fences/poles, damage to siding, damaged landscaping etc.)
- 5% of the buildings received damage to roof (requiring replacement of roof equaling \$3,000)

Damages associated with sensitive receptor irritation have not been estimated. We have also not estimated the potential for a large-scale wildfire event associated with high winds. Based on the data provided by the County, there are 3,913 total parcels in unincorporated Lincoln County Conservation District with a total value of approximately \$375.6 million. Using the criteria outlined above an estimate of the impact of high winds on the County has been made. The potential wind and tornado damage to all buildings is estimated at approximately \$5.6 million. The estimated damage to roofs is approximately \$588,000.

Wildland Fire Profile

The Lincoln County Community Wildfire Protection Plan¹⁰⁵ provides a comprehensive analysis of the wildland fire risks and recommended protection and mitigation measures for all jurisdictions in Lincoln County. The information in the “Wildland Fire” sections of this Lincoln County Conservation District Annex is excerpted from that more detailed document.

Lincoln County is in northeast Washington. The county encompasses approximately 2,311 square miles and has an elevation range of 980 to 3,500 feet above sea level. Land is owned by private individuals, corporations, the state of Washington, and the federal government. Federal lands are managed by the Bureau of Land Management, National Park Service, and the Bureau of Reclamation. State lands include parcels managed by the Washington Department of Natural Resources and Washington Department of Fish and Wildlife. Lincoln, the seventh largest county in the state, is bordered on the west by Grant County, to the south by Adams and Whitman County, to the east by Spokane County, and to the north by Stevens County, Ferry County, and a small part of Okanogan County. Lincoln County lies within the channeled scablands of the Columbia Basin, a region formed by ice age flooding and windblown volcanic ash. Many small pothole lakes are scattered throughout the scoured basalt scablands connected by Lake Creek and Crab Creek on the southern and eastern side of the county. The terrain is predominantly flat with alternating rolling hills and shallow canyons or coulees. Along the northern boundary the topography becomes steep as it plunges into wide valleys formed by the Spokane and Columbia Rivers. The mild climate, abundance of sunshine and low annual precipitation results in an environment that is potentially very prone to wildland fire. Although much of the native grasslands have been converted for agricultural purposes, there are many areas of native

¹⁰⁵ King, Tera and V. Bloch. 2008. Lincoln County Community Wildfire Protection Plan. Northwest Management, Inc. Moscow, Idaho.

vegetation and fallow farm land that cures early in the summer and remains combustible until winter. If ignited, these areas burn rapidly, potentially threatening people, homes, and other valued resources.

Cover vegetation and wildland fuels exhibited across the county have been influenced by massive geologic events during the Pleistocene era that scoured and shifted the earth's surface leaving areas of deep rich soil interspersed with rocky canyons and deep valleys. In addition to the geological transformation of the land, wildland fuels vary within a localized area based on slope, aspect, elevation, management practices, and past disturbances. Geological events and other factors have created distinct landscapes that exhibit different fuel characteristics and wildfire concerns.

Lincoln County Conservation District has four predominant landscapes types that exhibit distinct terrain and wildland fuels: agricultural lands, channeled scablands, western river breaks, and eastern river breaks. These landscapes, although intermixed in some areas, exhibit specific fire behavior, fuel types, suppression challenges, and mitigation recommendations that make them unique from a planning perspective.

The gentle terrain that dominates Lincoln County Conservation District facilitates extensive farming and ranching operations. Agricultural fields occasionally serve to fuel a fire after curing; burning in much the same manner as low grassy fuels. Fires in grass and rangeland fuel types tend to burn at relatively low intensities with moderate flame lengths and only short-range spotting. Common suppression techniques and resources are generally quite effective in this fuel type. Homes and other improvements can be easily protected from direct flame contact and radiant heat through adoption of precautionary measures around structures. Rangelands with a significant shrub component will have much higher fuel loads with greater spotting potential than grass and agricultural fuels. Although fires in agricultural and rangeland fuels may not present the same control problems as those associated with large, high intensity fires in timber, they can cause significant damage if precautionary measures have not been taken prior to a fire event. Wind driven fires in these fuel types spread rapidly and can be difficult to control. During extreme drought and when pushed by high winds, fires in agricultural and rangeland fuels can exhibit extreme rates of spread, which complicates suppression efforts.

Forest and woodland fuels are mostly present in the canyons and river breaks on sloping terrain less favorable to clearing for agricultural development. A patchwork of ponderosa pine and Douglas-fir stands occupy sheltered areas on favorable soil where moisture is not a limiting factor. Wooded areas tend to be on steep terrain intermingled with grass and shrubland providing an abundance of ladder fuels which lead to horizontal and vertical fuel continuity. These factors, combined with arid and windy conditions characteristic of the river valleys in the region, can result in high intensity fires with large flame length and fire brands that may spot long distances. Such fires present significant control problems for suppression resources and often results in large wildland fires.

Development is rapidly occurring along the Spokane and Columbia River breaks on the north side of the county. Many people have purchased small tracts of land in this location and built dwellings amongst the trees and shrubland. Scenic vistas and rolling topography with proximity to Lake Roosevelt National Recreation Area make this area desirable. However, the risk of catastrophic loss from wildfires in this area is significant. Fires igniting along the bottom of the canyon have the potential to grow at a greater rate of speed on the steeper slopes and rapidly advance to higher elevations. Within the forest and woodland areas, large

fires may easily produce spot fires up to 2 miles away from the main fire, compounding the problem and creating fires on many fronts. Fire suppression efforts that minimize loss of life and structures in this area are largely dependent upon access, availability and timing of equipment, prior fuels mitigation activities, and public awareness.

Local Event History

Detailed records of wildfire ignitions and extents from the Washington Department of Natural Resources (DNR) and Bureau of Land Management (BLM) have been analyzed. In interpreting these data, it is important to keep in mind that the information represents only the lands protected by the agency specified and may not include all fires in areas covered only by local fire departments or other agencies.

The Federal and State agencies database of wildfire ignitions (1973-2015) used in this analysis includes ignition and extent data within their jurisdictions. During this period, the agencies recorded an average of 12 wildfire ignition per year resulting in an average total burn area of 7,848 acres per year. The highest number of ignitions (22) occurred 1998, while the greatest number of acres burned in a single year occurred in 2007 with over 62,700 acres burned. According to this dataset, most fires occurring in Lincoln County Conservation District are human caused; however, naturally ignited caused fires occur as well. The unknown caused fires contribute to a significant number of acres burned in Lincoln County Conservation District. These could be ‘unknown’ because of a lack of qualified fire investigator(s) in the County.

Table 5.6. Summary of ignitions in Lincoln County Conservation District from state and federal databases 1973-2015.

Cause	Acres Burned	Percent	Number of Ignitions	Percent
Human-caused	264	61%	134,357	48%
Natural	114	26%	29,210	10%
Unknown	57	13%	118,972	42%
Total	435	100%	282,530	100%

Figure 5.48. Summary of Lincoln County Conservation District Ignitions by Cause (2008-2018).

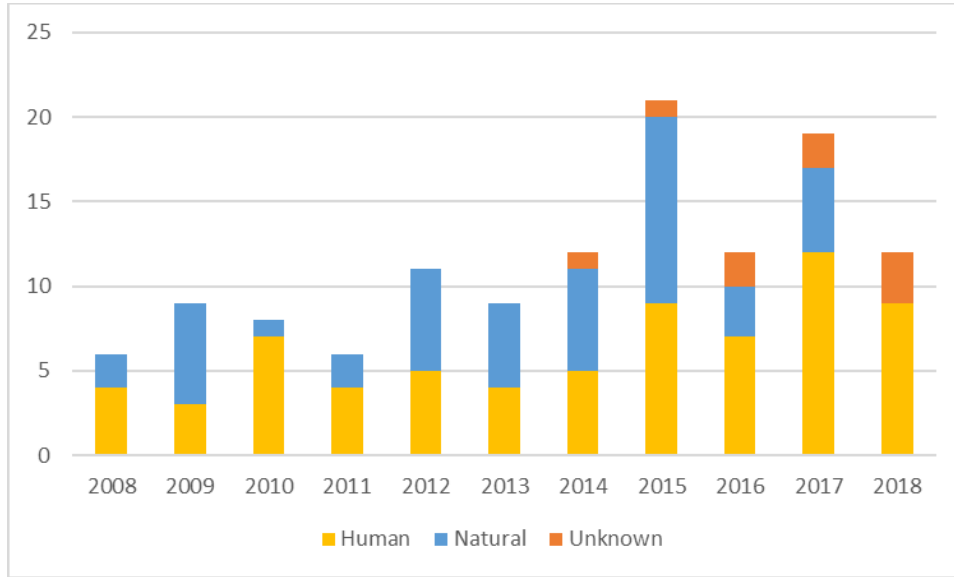
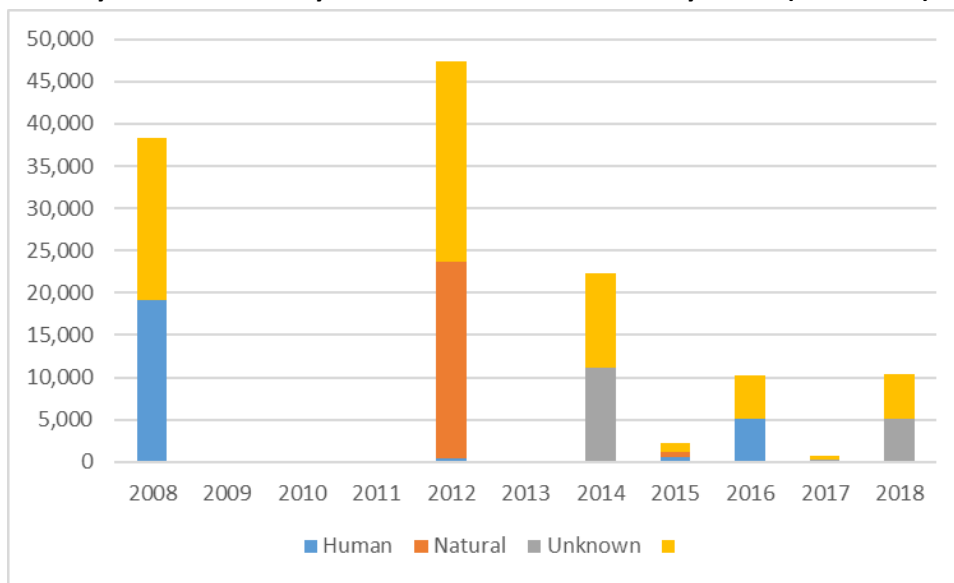


Figure 5.49. Summary of Lincoln County Conservation District Acres by Cause (2008-2018).



Probability of Future Occurrence

Fire was once an integral function of most ecosystems in northeastern Washington. The seasonal cycling of fire across the landscape was as regular as the July, August and September lightning storms plying across the canyons and mountains. Depending on the plant community composition, structural configuration, and buildup of plant biomass, fire resulted from ignitions with varying intensities and extent across the landscape. Shorter return intervals between fire events often resulted in less dramatic changes in plant composition.¹⁰⁶

¹⁰⁶ Johnson, C. G. 1998. Vegetation Response after Wildfires in National Forest of Northeastern Oregon. 128 pp.

The fires burned from 1 to 47 years apart, with most at 5- to 20-year intervals.¹⁰⁷ With infrequent return intervals, plant communities tended to burn more severely and be replaced by vegetation different in composition, structure, and age.¹⁰⁸ Native plant communities in this region developed under the influence of fire, and adaptations to fire are evident at the species, community, and ecosystem levels. Fire history data (from fire scars and charcoal deposits) suggest fire has played an important role in shaping the vegetation in the Columbia Basin for thousands of years.

Ideally, historical fire data would be used to estimate the annual probability for fires in Lincoln County Conservation District. However, current data are not adequate to make credible calculations because the data for local, state, and federal responsibility areas are not reported by the same criteria. Nevertheless, the data reviewed above provide a general picture of the level of wildland-urban interface fire risk for Lincoln County overall. Based on the historical information available, Lincoln County has a very high probability of wildland fires occurring on an annual basis, with larger fires occurring every 2 to 5 years.

Ignition potential is also high throughout the County. Recreational areas, major roadways, debris burning, and agricultural equipment are typically the most likely human ignition sources. Lightning is also a common source of wildfires in Lincoln County.

Impacts of Wildland Fire Events

Wildland fires, big and small, are dangerous to both Lincoln County residents and emergency response personnel. Wildland fire suppression activities have a very high frequency of injuries, such as heat exhaustion and smoke inhalation, and have caused numerous deaths nationwide. Fire events in Lincoln County typically result in a multi-department and agency response effort; thus, coordinating activities and ensuring everyone's safety is paramount.

Residents with property in the path of wildland fire will likely suffer the greatest impacts through loss of structures and/or the value of any timber or agricultural crops on their land. Many fires require an evacuation of nearby residences to ensure the safety of citizens. Evacuation procedures require the coordination of law enforcement and fire service organizations and may involve temporary sheltering in extreme cases.

Lincoln County Conservation District, like most areas, has sensitive populations, such as elderly residents and children, who may be affected by air quality during a wildland fire. Smoke and particulates can severely degrade air quality, triggering health problems. In areas heavily impacted by smoke, people with breathing problems might need additional services from doctors or emergency rooms.

Commerce in Lincoln County Conservation District and the rest of the region may also be interrupted by wildland fires. Transportation corridors will likely be temporarily closed or slowed due to a fire burning in the

¹⁰⁷ Barrett, J. W. 1979. *Silviculture of ponderosa pine in the Pacific Northwest: The state of our knowledge*. USDA Forest Service. General Technical Report PNW-97. Pacific Northwest Forest and Range Experiment Station. Portland, Oregon. 106pp.

¹⁰⁸ Johnson, C.G.; et al. 1994. *Biotic and Abiotic Processes of Eastside Ecosystems: the Effects of Management on Plant and Community Ecology, and on Stand and Landscape Vegetation Dynamics*. Gen. Tech. Report PNW-GTR-322. USDA-Forest Service. PNW Research Station. Portland, Oregon. 722pp.

area. Heavy smoke from a wildfire several miles away could be dense enough to make travel unsafe on roadways.

The environmental impacts from a fire are dependent on the vegetation present and the intensity of the fire. Most of the rangeland and forest ecosystems present in Lincoln County Conservation District are adapted to periodic fire events and are benefitted by occasional, low intensity burns. On the other hand, overcrowded forest conditions or over mature stands of sage brush will likely burn much more intensely than occurred historically. These types of fires tend to result in a high rate of mortality in the vegetation and often adversely impact soil conditions. High intensity fires are also much more dangerous and difficult to suppress.

Lincoln County Conservation District is actively pursuing funds to help with wildland fire mitigation projects and public education programs. While mitigation efforts will significantly improve the probability of a structure's survivability, no amount of mitigation will guarantee survival.

Value of Resources at Risk

It is difficult to estimate potential losses in Lincoln County Conservation District due to wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard.

Typically, structures located in forested areas without an adequate defensible space or fire-resistant landscaping have the highest risk of loss. Nevertheless, homes and other structures located in the grasslands or agricultural regions are not without wildfire risk. Grass fires are often the most dangerous due to high rates of spread. Fires in this fuel type are considered somewhat easier to suppress given the appropriate resources, but they can also be the most destructive.

Avalanche Profile

There have been no reported damages or lives lost due to an avalanche in Lincoln County Conservation District. The northern border of the County along Lake Roosevelt has the highest propensity for avalanches due to the steeper terrain; however, this area rarely accumulates a significant amount of snow. Any avalanche danger in this area would most likely be associated with drifts or other small accumulations sliding onto a road. There are currently no avalanche mitigation programs occurring in Lincoln County Conservation District.

Probability of Future Occurrence

The probability of an avalanche along the northern border of Lincoln County Conservation District is low. The most significant risk is associated with small slides along roadsides, which occurs occasionally, but with little impact.

Impacts of Avalanche Events

It is unlikely that residents of Lincoln County Conservation District would experience any significant impact from an avalanche. Damage to cut or fill slopes along roads in the northern fringe of the County may occur

due to small snow slides carrying debris. Slides onto roads would likely require removal by Lincoln County Conservation District Public Works but pose very little danger.

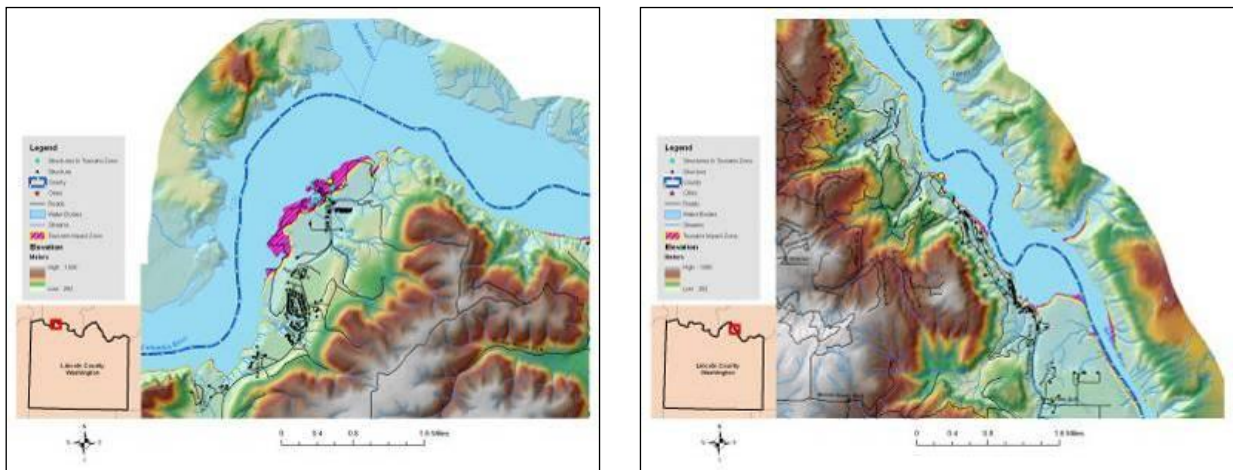
Value of Resources at Risk

Lincoln County Conservation District has no assets at significant risk of avalanches due to the topography and low snow accumulations.

Seiche Profile

The northern border of Lincoln County Conservation District is formed by the Columbia River. There is a moderate probability of landslides causing localized seiches in this vicinity. The shores of Lake Roosevelt have been subject to several hundred landslides since the reservoir was filled during construction of Grand Coulee Dam in the 1930's and early 1940's. The greatest percentage of landslide activity occurred during initial filling of the reservoir, but many slope failures also have been caused by intermittent drawdown of the reservoir level. In addition, occasional slope failures have occurred as natural phenomena, related more to wet winters than to fluctuations of the reservoir.¹⁰⁹

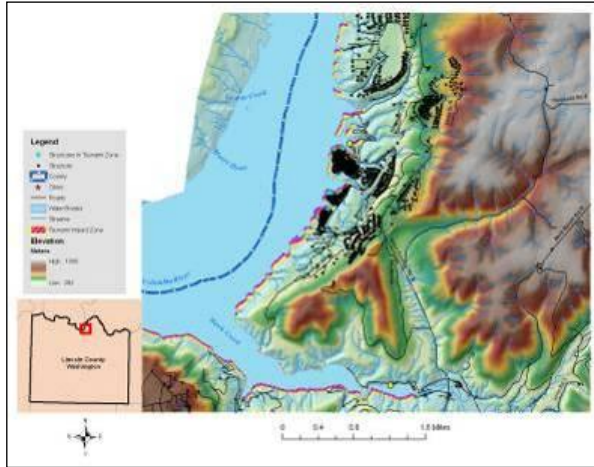
Figure 5.50. Community Seiche Profiles



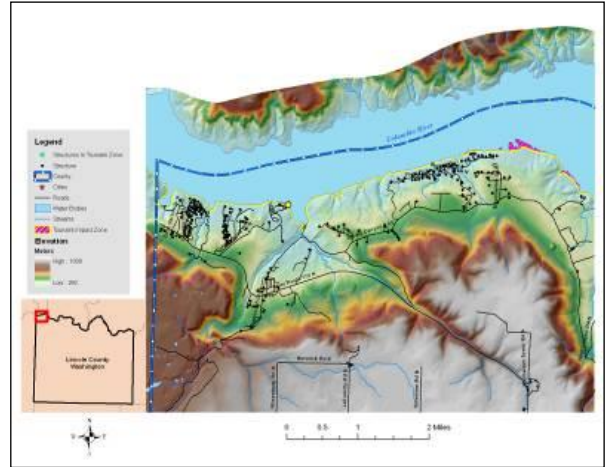
Keller

Porcupine Bay

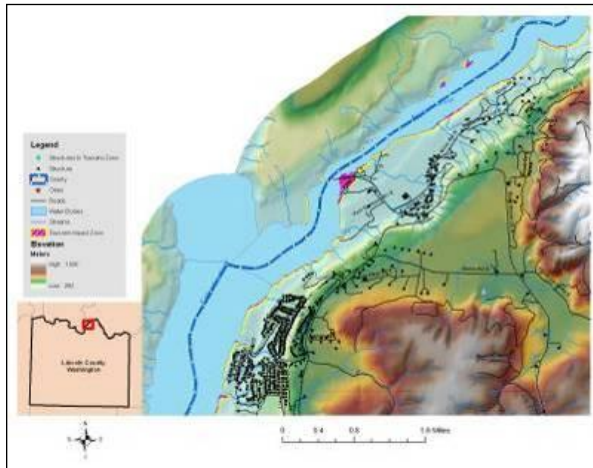
¹⁰⁹ Highland, Lynn M. and Robert L. Schuster. "Significant Landslide Events in the United States." U.S. Geologic Survey. Available online at http://landslide.usgs.gov/docs/faq/significantls_508.pdf.



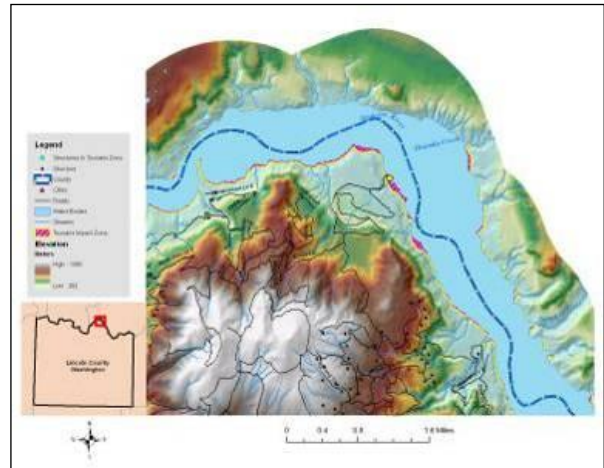
Seven Bays



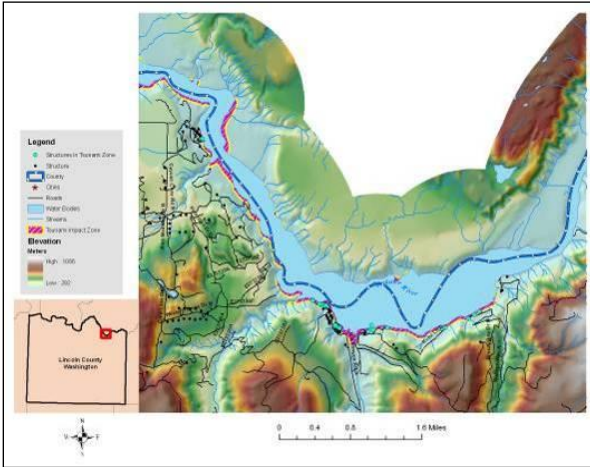
Spring Canyon



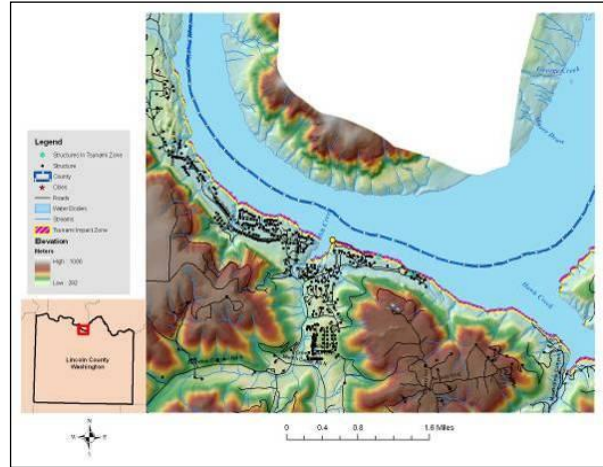
Fort Spokane



Detillion



Arrowhead Bay



Hawk Creek

Based on past events, it was determined that most of the landslides along Lake Roosevelt had produced a 30 foot or less wave on the opposite shore. For the purposes of this document, the Lincoln County Conservation District shoreline was evaluated to determine where and what type of development or resources were in this potential Impact Zone. The Seiche Impact Zone is based on a 32.8-foot (10 meter) wave hitting above the Lake Roosevelt full pool level. The maps above depict the Impact Zone in areas with significant development or infrastructure at risk.

Local Event History

There have been no seiche events since the last version of the plan was approved. The event below was the last known event that affected Lincoln County Conservation District.

August 2009 Seiche – A large landslide occurred near the Blue Creek drainage on the Spokane Indian Reservation side of the Spokane Arm of Lake Roosevelt. This resulted in a 12-foot wave hitting Porcupine Campground on the southern shores less than a thousand yards across the Lake. Numerous people were in the water at Porcupine Bay during the event. Damage to National Park Service facilities including log booms, docks, and a swim platform was estimated at \$250,000.

Figure 5.51. August 2009 Seiche



Probability of Future Occurrence

The probability of a seiche causing a direct impact on Lincoln County Conservation District is unknown but believed to be moderate based on recent events. The probability of landslides continuing to occur along Lake Roosevelt as a function of saturated soils, changing land uses, or fluctuations in the reservoir level is high; however, the location of these slides is difficult to predict. Additionally, the size of the landslide will determine the size of the wave and the potential impact on the opposite shore.

Impacts of Seiche Events

Due to the lower population density and the lack of infrastructure within approximately 30 feet of the Lake Roosevelt shoreline, it is unlikely that a seiche would cause significant damages within the County. However, depending on the location, direction that the wave propagates, time of day, and time of year, property damages, casualties, and possibly fatalities from a seiche could be high within an impacted area, particularly if a seiche wave collides directly with an intensely populated recreational area.

Boats and other watercraft that happen to be impacted by seiche may be toppled, but this is unlikely. Smaller vessels have a higher risk of being overturned by a large wave. Nevertheless, boats in the direct vicinity of a landslide, may be severely damaged or sunk by falling debris and outwash. This would also be very dangerous for persons on board and would likely result in injuries or even death.

Value of Resources at Risk

Currently, there are 55 structures with an approximate total value of \$4.1 million based on the County Assessor's data. Individual crops, structures, or docks may be damaged, but widespread losses are unlikely. Most of the infrastructure within the Impact Zone is recreational facilities including the National Park Service's Spring Canyon facility, Lincoln Hill launch ramp, Hawk Creek launch ramp, Seven Bays launch ramp and marina, Fort Spokane launch ramp, Detillion launch ramp, and the Porcupine Bay launch ramp. The Keller Ferry facility is also at risk. All these recreational sites are valued in the millions.

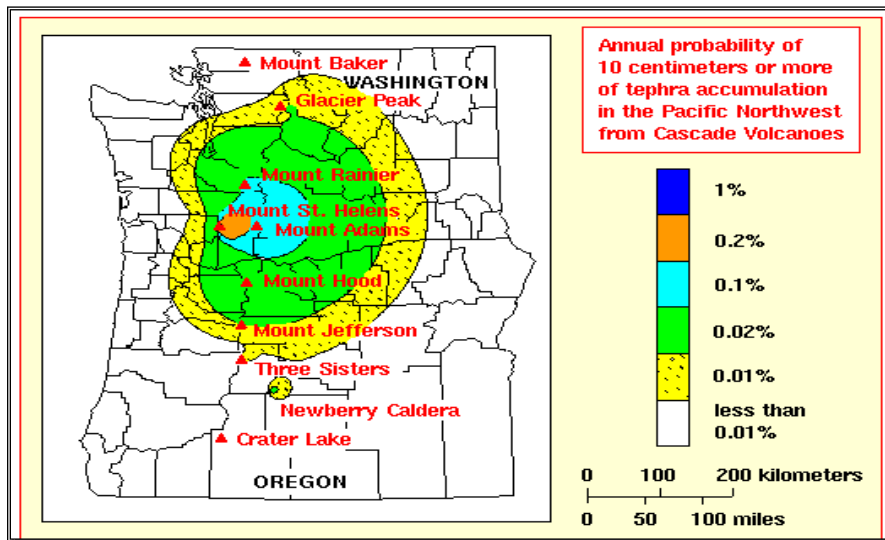
Volcanic Eruption Profile

Lincoln County Conservation District is not directly at risk of experiencing a volcano; however, there is a high probability that ash and other particulates from an eruption in western Washington or Oregon would be carried to and deposited within the County. The Mount St. Helens eruption in 1980 deposited several inches of ash causing widespread damages to vehicles and other equipment in Lincoln County Conservation District.

The airborne particulates can also cause respiratory problems for both people and animals. These affects are particularly notable for populations already dealing with respiratory illnesses.

The most serious ash fallout risk in Lincoln County Conservation District is due to Mount St. Helens, the most prolific producer of tephra (solid material thrown into the air by volcanic eruption) in the Cascades during the past few thousand years. Figure 5.11. provides estimates of the annual probability of tephra fall affecting the region, based on the combined likelihood of tephra-producing eruptions occurring at Cascade volcanoes, the relationship between thickness of a tephra-fall deposit and distance from its source vent, and regional wind patterns. Probability zones extend farther east of the range because winds blow from westerly directions most of the time. The map shows probabilities for a fall of 10 centimeters (about 4 inches) or greater. Even though Mount Adams is a meager tephra producer, the region around Mount Adams has the highest probability of tephra fall of anywhere in the western conterminous United States, owing to its location just downwind of Mount St. Helens.¹¹⁰

Figure 5.52. Annual Probability of 10cm or more of Tephra Accumulation.



Probability of Future Occurrence

The geologic history is fragmented for most of the volcanoes in the Cascade Range, thus, the probability of one of these volcanoes entering a new period of eruptive activity is difficult to estimate. In general, the annual probability that Lincoln County Conservation District will be significantly affected by a volcanic eruption is very low.

Impacts of Volcanic Eruptions

Lincoln County Conservation District, like most areas, has sensitive populations, such as elderly residents and children, who may be affected by air quality during ash fall. Ash fall can severely degrade air quality, triggering

¹¹⁰ W.E. Scott, R.M. Iverson, J.W. Vallance, and W. Hildreth, 1995, *Volcano Hazards in the Mount Adams Region, Washington: U.S. Geological Survey Open-File Report 95-492.*

health problems. In areas with considerable ash fall, people with breathing problems might need additional services from doctors or emergency rooms.

Volcanic eruptions can also disrupt the normal flow of commerce and daily human activity without causing severe physical harm or damage. Ash that is a few inches thick can halt traffic, cause rapid wear of machinery, clog air filters, block drains, creeks, and water intakes, and impact agriculture. Removal and disposal of large volumes of deposited ash can also have significant impacts on government and business.

The interconnectedness of the region's economy can be disturbed after a volcanic eruption. Roads, railroads, and bridges nearest the volcano can be damaged from lahars and mudflows, which will influence intra-state travel and commerce. In addition, the movement of goods via the Columbia River can also be halted due to debris in the river and tephra in the air. The Mount St. Helens event in May 1980 cost the trade and commerce industry an estimated \$50 million in only two days, as ships were unable to navigate the Columbia.

Local accounts of the Mount St. Helens eruption did not indicate that the ash deposition adversely affected crops. In fact, some noted that the addition of volcanic ash increased the water retention properties of the soil.

Clouds of ash often cause electrical storms that start fires and damp ash can short-circuit electrical systems and disrupt radio communication. Volcanic activity can also lead to the closure of recreation areas, along the Columbia River in Lincoln County Conservation District, as a safety precaution.

Value of Resources at Risk

Lincoln County Conservation District has no assets at direct risk of being impacted by a volcanic eruption. However, the secondary effects of ash and airborne particulates may have varying degrees of negative effects within the County. Damages to property will likely be limited to vehicles and cleanup costs. Additionally, residents of Lincoln County Conservation District will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

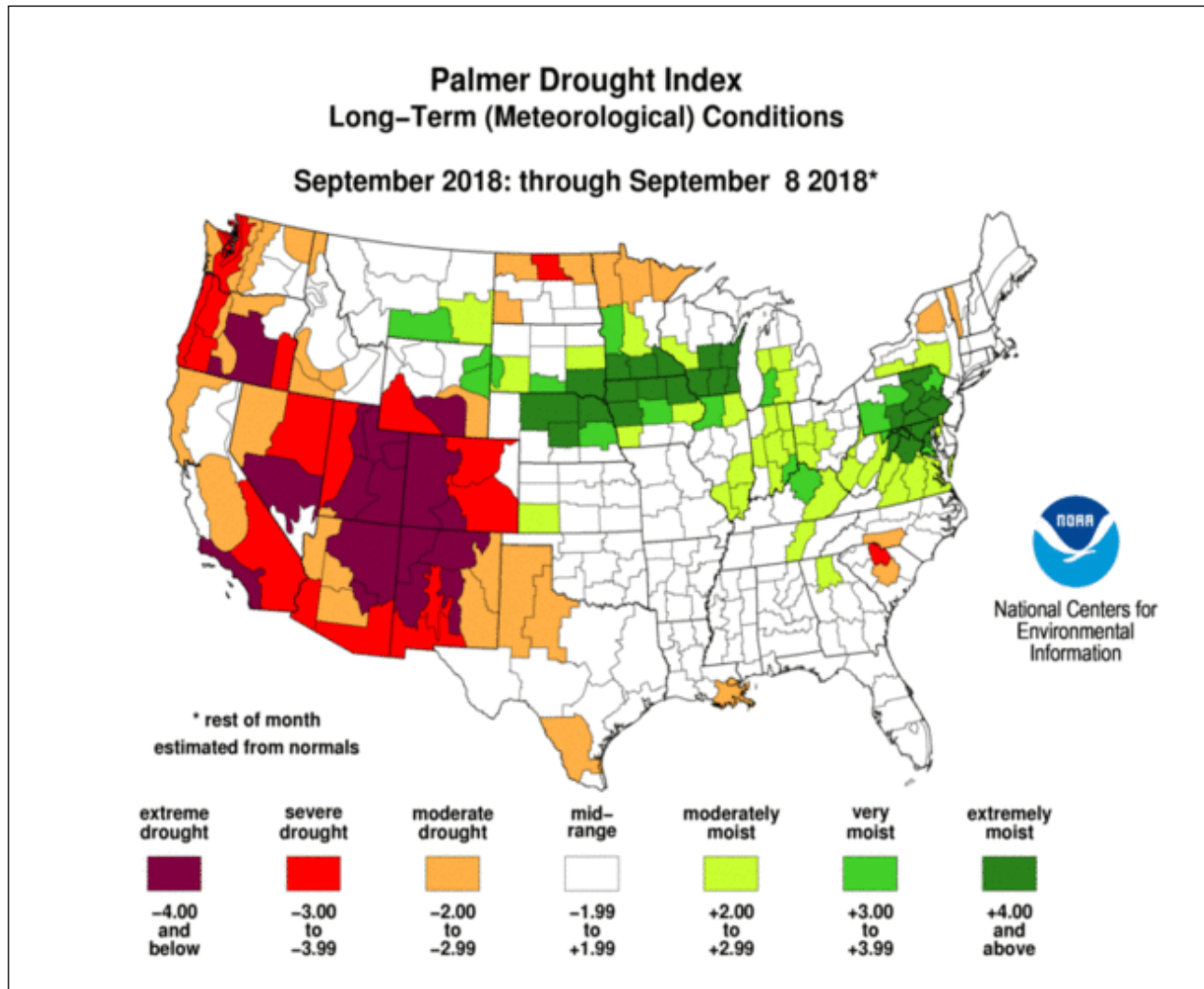
Drought Profile

Drought is a condition of prolonged dryness that is severe enough to reduce soil moisture, water, and snow levels below the minimum necessary for sustaining plant, animal, and economic systems.¹¹¹ The Washington State Legislature in 1989 gave permanent drought relief authority to the Department of Ecology and enabled them to issue orders declaring drought emergencies. Nearly all areas of the State are vulnerable to drought. In every drought, agriculture is adversely impacted, especially in non-irrigated areas such as the dry land farms and rangelands in Lincoln County Conservation District. Droughts impact individuals (farm owners, tenants, and farm laborers), the agricultural industry, and other agriculture-related sectors.

¹¹¹ "Washington State Enhanced Hazard Mitigation Plan". Washington Military Department Emergency Management Division, 2013. <https://mil.wa.gov/other-links/enhanced-hazard-mitigation-plan>.

The severity of drought is measured by the Palmer Index in a range of 4 (extremely wet) to -4 (extremely dry). The Palmer Index incorporates temperature, precipitation, evaporation and transpiration, runoff and soil moisture when designating the degree of drought.

Figure 5.53. Palmer Drought Severity Index for September 2018.¹¹²



Drought affects water levels for use by industry, agriculture, and individual consumers. Water shortages affect firefighting capabilities through reduced flows and pressures. Drought also affects power production. Much of Washington State’s power is produced by hydro-electric dams. When water levels drop, electric companies cannot produce enough power to meet demand and are forced to buy electricity from other sources

Oftentimes, drought is accompanied by extreme heat. When temperatures reach 90 degrees and above, people are vulnerable to sunstroke, heat cramps, and heat exhaustion. Pets and livestock are also vulnerable

¹¹² National Integrated Drought Information System. Drought.gov. website: <https://www.drought.gov/drought/data-maps-tools/current-conditions>. Accessed September, 2018.

to heat-related injuries. Crops can be vulnerable as well. In the past Washington State droughts, wheat has been scorched, apples have sunburned and peeled, and yields were significantly lessened.

Drought increases the danger of wildland fires. In Lincoln County Conservation District, fires in rangeland areas are particularly dangerous due to typically high rates of spread and the scattered nature of structures and infrastructure that could potentially be affected.

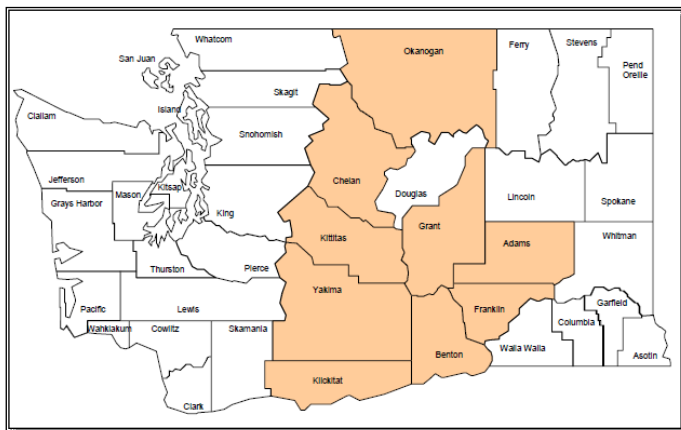
High quality agricultural soils exist in much of Lincoln County Conservation District. Many areas of the county sustain dry land crops such as wheat that are dependent upon moisture through the winter and spring and dry arid conditions in the summer. According to the 2007 Census of Agriculture, Lincoln County Conservation District had 798 farms totaling 1,090,178 acres. The market value of these farms was reportedly \$126,216,000 with government payments totaling \$15,371,000.¹¹³ While Lincoln County Conservation District does experience droughts, on the whole, they are mild and do not cause long term damage.

Local Event History

2015 Drought – “The 2015 growing season in Washington State was one of the driest on record due to early, rapid snow melt. In addition, temperatures during the 2015 water year (October 1, 2014 – September 30, 2015) were far above average. Due to high temperatures, precipitation at high elevations that would ordinarily result in snow accumulation (sustaining irrigation networks through the summer) fell as rain instead. As a result, summer streamflow throughout the state was much lower than usual. During the last week of August, the height of the 2015 drought, 85% of Washington was in extreme drought status.”¹¹⁴

Probability of Future Occurrence

Figure 5.54. Counties Most Vulnerable to Drought



The Washington State Hazard Mitigation Plan does not consider Lincoln County Conservation District to be one of the counties most vulnerable to drought in Washington. Lincoln County Conservation District was in a severe drought condition 10-15% of the time between 1895 and 1995, 20-30% of the time between 1985 and 1995, and 30-40% of the time between 1976 and 1977.

It is critical that the people inhabiting each geographic region understand their exposure to the drought hazard: for example, the probability of drought occurrence at various severity levels. However, the risks associated with drought for any region

¹¹³ Washington State Homeland Security Region 9. “Regional Threat/Risk Assessment and Vulnerability Analysis Report”. Spokane, Washington. January 2011.

¹¹⁴ McLain, K., Hancock, J., Drennan, M., 2017. 2015 Drought and Agriculture. A study by the Washington State Department of Agriculture. AGR PUB 104-495 (N/2/17).

are products of both the region's exposure to the event and the vulnerability of its society to a drought at that point in time. Vulnerability, unlike the natural event, is determined by varied social factors.

- Population changes
- Population shifts (region to region and rural to urban)
- Demographic characteristics
- Environmental awareness (or lack thereof)
- Level of technology
- Wisdom and applicability of government policies
- Land management practices
- Social behavior

These factors change over time and thus vulnerability is likely to increase or decrease in response to these changes. Subsequent droughts in the same region will have different effects, even if they are identical in intensity, duration, and spatial characteristics, because societal characteristics will have changed. However, much can be done to lessen societal vulnerability to drought through the development of preparedness plans that emphasize risk management and the adoption of appropriate mitigation actions and programs.

Impacts of Drought Events

The impacts of drought are diverse and often ripple through the economy. Thus, impacts are often referred to as either direct or indirect. A loss of yield resulting from drought is a direct or first-order impact of drought. However, the consequences of that impact (for example, loss of income, farm foreclosures, and government relief programs) are secondary or even tertiary impacts.

The impacts of drought in Lincoln County Conservation District can be classified into one of three principal types: economic, environmental, and social.

Economic Losses - Economic impacts range from direct losses in the broad agricultural and agriculturally related sectors (including forestry and fishing), to losses in recreation, transportation, banking, and energy sectors. Other economic impacts would include added unemployment and loss of revenue to local, state, and federal government.

Environmental Impacts - Environmental losses include damages to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; and soil erosion. These losses are difficult to quantify but growing public awareness and concern for environmental quality has forced public officials to focus greater attention on them.

Impacts on Society - Social impacts mainly involve public safety, health, conflicts between water users, and inequities in the distribution of impacts and disaster relief programs. As with all-natural hazards, the economic impacts of drought are highly variable within and between economic sectors and geographic regions, producing a complex assortment of winners and losers with the occurrence of each disaster.

Value of Resources at Risk

The 2015 and other past drought years in Washington caused only minor damages and crop losses. There were no threats to any critical facilities. Thus, a minor to moderate drought has a low probability of affecting the County's economy directly due to the availability of irrigation waters. An extreme and prolonged drought could result in limited availability of irrigation water; thus, causing severe crop losses countywide.

In the event of an extended drought cycle, water shortages may lead to crop failures, or at the least, the necessity to plant lower value crops that are less water-dependent. Most of the population is employed either directly by the agriculture industry or to a service industry dependent on agriculture. Crop losses resulting from extended droughts would likely be considered a disaster for Lincoln County Conservation District. Lower water levels may also affect the County's ability to efficiently transport crops to available markets. Barging of goods on the Columbia River could be reduced due to lower water levels.

Domestic and municipal water shortages are also likely to occur during an extended drought. Efforts to conserve water resources, including public education on conservation techniques, are encouraged by Lincoln County Conservation District during the summer months.

Chapter 6

Mitigation Strategy

IN THIS SECTION:

- Mechanisms to Incorporate Mitigation Strategies
- Prioritization of Action Items
- Jurisdictional Mitigation Strategies
 - Lincoln County Annex
 - City of Davenport Annex
 - City of Sprague Annex
 - Town of Almira Annex
 - Town of Creston Annex
 - Town of Harrington Annex
 - Town of Odessa Annex
 - Town of Reardan Annex
 - Town of Wilbur Annex
 - Lincoln Hospital District Annex
 - Odessa Memorial Healthcare Center Annex

Mitigation Strategy

Critical to the implementation of this Multi - Hazard Mitigation Plan will be the identification of, and implementation of, an integrated schedule of action items targeted at achieving an elimination of lives lost and reduction in structures destroyed, infrastructure compromised, and unique ecosystems damaged that serve to sustain the way-of-life and economy in Lincoln County, Washington. Since there are many management agencies and thousands of private landowners in this area, it is reasonable to expect that differing schedules of adoption will be made and varying degrees of compliance will be observed across all ownerships.

All risk assessments were made based on the conditions existing during 2010, thus, the recommendations in this section have been made considering those conditions. However, the components of risk and the preparedness of the Counties' resources are not static. It will be necessary to fine-tune this Plan's recommendations annually to adjust for changes in the components of risk, population density changes, infrastructure modifications, and other factors.

Mechanisms to Incorporate Mitigation Strategies

Lincoln County and the incorporated cities encourage the philosophy of instilling disaster resistance in normal day-to-day operations. By implementing plan activities through existing programs and resources, the cost of mitigation is often a small portion of the overall cost of a project's design or program. Through their resolution of adoption as well as their participation on the planning committee, each jurisdiction is aware of, and committed to incorporating the risk assessments and mitigation strategies contained herein. It is anticipated that the research, local knowledge, and documentation of hazard conditions coalesced in this document will serve as a tool for decision-makers as new policies, plans, and projects are evaluated.

There are several planning processes and mechanisms in Lincoln County that will either use the risk assessment information presented in this document to inform decisions or will integrate the mitigation strategy directly into capital improvement, infrastructure enhancement, and training projects; prevention campaigns; and land use and development plans. Although not inclusive, the following is a list of mechanisms available to each jurisdiction for incorporating the mitigation requirements:

Lincoln County Mechanisms

1. Comprehensive Plan
2. Transportation Plan
3. Emergency Operations Plan
4. Building Codes and Ordinances
5. Departmental Budgets
6. Site Master Plans (wastewater treatment, landfill, etc.)
7. Personnel Training Programs

Incorporated City Mechanisms

1. Transportation Plans
2. City Budgets

3. Building Codes and Ordinances
4. Site Master Plans (airport, business incubators, etc.)

Hospital District Mechanisms

1. Emergency Operations Plan
2. Annual Budget
3. Board of Directors Bylaws (Operational Protocols)

Agencies and other Organization Mechanisms

1. Annual Budget
2. Prevention Programs
3. Training Programs
4. Long Term Land Use Plans (Forest Plans, Wildlife Management Area Plans, etc.)

The Lincoln County Emergency Manager is responsible for educating the Board of Commissioners and other County departments as well as city planners on the contents and incorporation requirements of the Multi-Hazard Mitigation Plan. The Emergency Manager and other planning committee partners should be aware of the risk assessments and mitigation strategies respective to their jurisdictions to include them in the planning processes and discussions for other types of projects as they come up. The Lincoln County Emergency Manager is responsible for ensuring that each participating jurisdiction as well as other partners have a copy of the Multi-Hazard Mitigation Plan readily available for reference purposes. Furthermore, as previously mentioned, the Lincoln County Emergency Manager is responsible for annual and 5-year evaluations of the Multi-Hazard Mitigation Plan. The annual meetings will serve a dual purpose of updating the document and refreshing each jurisdiction's memory of the contents and mitigation requirements of Multi-Hazard Mitigation Plan. Members of the planning committee are also responsible of educating decision-makers in their own jurisdictions on the use and incorporation of mitigation requirements of this document into other planning mechanisms such as those listed above.

Prioritization of Action Items

The prioritization process includes a special emphasis on benefit-cost analysis review. The process reflects that a key component in funding decision is a determination that the project will provide an equivalent or more in benefits over the life of the project when compared with the costs. Projects will be administered by local jurisdictions with overall coordination provided by the Lincoln County Emergency Manager.

County Commissioners and the elected officials of all jurisdictions have evaluated opportunities and established their own unique priorities to accomplish mitigation activities where existing funds and resources are available and there is community interest in implementing mitigation measures. If no federal funding is used in these situations, the prioritization process may be less formal. Often the types of projects a county can afford to do on their own are in relation to improved codes and standards, department planning and preparedness, and education. These types of projects may not meet the traditional project model, selection criteria, and benefit-cost model. Lincoln County will use this Multi-Hazard Mitigation Plan as guidance when considering pre-disaster mitigation proposals brought before the Board of Commissioners by department heads, city officials, fire districts, and local civic groups.

When federal or state funding is available for hazard mitigation, there are usually requirements that establish a rigorous benefit-cost analysis as a guiding criterion in establishing project priorities. Lincoln County understands the basic federal grant program criteria which will drive the identification, selection, and funding of the most competitive and worthy mitigation projects. FEMA's three grant programs (the Hazard Mitigation Grant Program, the Flood Mitigation Assistance, and Pre-Disaster Mitigation program) that offer federal mitigation funding to state and local governments all include the benefit-cost and repetitive loss selection criteria.

The prioritization of new projects and deletion of completed projects will occur annually and be facilitated by the Lincoln County Emergency Manager and the joint planning committee. All mitigation activities, recommendations, and action items mentioned in this document are dependent on available funding and staffing.

Prioritization Scheme

All the action item and project recommendations made in this Plan were prioritized by each respective jurisdiction in coordination with their governing body. Each jurisdiction's representative on the planning committee met with their governing bodies and prioritized their own list of projects and mitigation measures through a group discussion and voting process. Although completed individually, each jurisdiction's mitigation strategy was discussed and analyzed on the merits described in the STAPLEE process including the social, technical, administrative, political, legal, economical, and environmental factors associated with each recommended action item. Projects were ranked on a "High", "Moderate", or "Low" scale with emphasis on project feasibility and the benefit/cost correlation.

Jurisdictional Mitigation Strategies

Lincoln County Annex

Table 6.1. Lincoln County Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Install an amateur radio tower to provide additional coverage of the Sprague-Odesa area.	Goal #2, 3, 4, 5, and 8 Priority Ranking: High	Partnership: Lincoln County Emergency Management and Amateur Radio Group	Washington EMD, BLM, FAA, Washington DOT	Original Item continue into 2019 update with revised timeline	2021
	Actively participate on the Region 9 All Hazard Coordinating Group in order to implement the “Regional Prioritized Strategies” outlined in the Homeland Security Region 9 All Hazards Emergency Preparedness Strategic Plan and integrate the mission, goals, and strategies into local planning mechanisms and emergency management functions.	Goal #2, 5, and 7 Priority Ranking: Low	Partnership: Lincoln County Emergency Management and incorporated communities		Original Item continue into 2019 update with revised timeline, ranking and combined with another Item	2019-2020

Table 6.1. Lincoln County Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Assess ingress and egress routes accessing rural subdivisions and develop a prioritized list for developing alternative emergency access routes.	Goal #2, 3, 4, and 8 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Priority Ranking: High</div>	Lincoln County Planning Commissions	Local Home Owners' Associations, Developers, and local Fire Districts	Original Item continue Item into 2019 update with revised responsible department, potential resources and timeline	2020
	Install emergency communications system updates to provide interoperability with all emergency services throughout the County.	Goal #2, 3, 4, and 8 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Priority Ranking: High</div>	Lincoln County Emergency Management	Washington EMD, WSP	Completed but keep Action Item to provide maintenance and updates	2025
	Continue to update the County's road inventory and assessment to further identify deficiencies.	Goal #2, 3, 4, and 8 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Priority Ranking: Moderate</div>	Lincoln County Public Works		Completed but keep Action Item to provide maintenance and updates	2019-2023

Table 6.1. Lincoln County Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Obtain funding to address high priority road and other infrastructural improvements throughout Lincoln County.	Goal #2, 3, 4, and 8 Priority Ranking: High	Lincoln County Public Works	Washington DOT, Washington EMD, Washington DNR, BLM	Original Item continue Item into 2019 update with revised timeline	2023
	Address problems with arsenic levels in public water supplies.	Goal #2, 3, 5, and 8 Priority Ranking: High	Lincoln County Public Health	Washington DOE, Washington DOH	Completed	N/A
	Re-emphasize safety concerns with Burlington Northern about blocking access points between Edwall and State Route 231.	Goal #2, 3, 4, 5, and 8 Priority Ranking: High	Partnership: Washington Department of Transportation, community of Edwall, and Burlington Northern Railroad	Washington DOT, Burlington Northern Railroad	Original Item continue Item into 2019 update with revised timeline	2020
	Continue to support research and monitoring projects that improve prediction and advanced warning systems for hazard events.	Goal #1, 2, 3, and 6 Priority Ranking: Moderate	Lincoln Board of County Commissioners	NOAA, Washington EMD, Washington DNR, National Drought Mitigation Center, USDA NRCS, BLM	Original Item continue Item into 2019 update with revised timeline	2021

Table 6.1. Lincoln County Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
Flood	Construct flood control infrastructure upstream of Edwall and Sprague to reduce the flood risk from both seasonal flood events and 100 year events.	Goal #2, 3, 4, 5, and 8 Priority Ranking: High	Lincoln Board of County Commissioners	Washington EMD, Washington DOE, USDA NRCS	Original Item continue Item into 2019 update with revised timeline and added the community of Sprague	2023
	Encourage homeowners in flood prone areas to participate in the National Flood Insurance program.	Goal #1, 2, 3, and 8 Priority Ranking: Moderate	Lincoln County Emergency Management, Lincoln County Planning Commission and City Councils		Original Item continue Item into 2019 update with revised timeline and responsible organizations	2019-2023
Seiche	Work with neighboring government entities to identify landslide prone areas along the shoreline of Lake Roosevelt and corresponding wave impact areas in Lincoln County.	Goal #1, 2, and 3 Priority Ranking: High	Partnership: Lincoln County Emergency Management, Stevens County, Ferry County, Spokane Tribe of Indians, Confederated Tribes of the Colville Reservation, Washington Department of Natural Resources, NPS and BLM	BOR, NPS, BLM, USDA NRCS, WSU	Original Item continue Item into 2019 update with revised timeline, ranking and responsible organizations	2020

Table 6.1. Lincoln County Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
Landslide	Work with local partners to improve slope stability (native plant restoration, reestablishment of natural grade, manmade structures, etc.) in identified high risk areas.	Goal #1, 2, and 3 Priority Ranking: High	Partnership: Lincoln County Emergency Management, USDA Natural Resources Conservation Service, WSU Extension, Washington Department of Natural Resources, and BLM	USDA NRCS, WSU Extension, Washington DNR, BLM	Original Item continue Item into 2019 update with revised timeline and ranking	2022
	Incorporate identified high-risk landslide areas into land use planning processes to prevent additional development in hazardous areas.	Goal #1, 2, 3, 5 and 8 Priority Ranking: High	Lincoln County Planning Commission		Original Item continue Item into 2019 update with revised responsible department and timeline	2020
Drought	Develop a water conservation plan to improve landowner water consumption during times of drought.	Goal #1 and 3 Priority Ranking: Medium	Partnership: Lincoln County Emergency Management, USDA Natural Resources Conservation Service, and WSU Extension		Original Item continue Item into 2019 update with revised timeline and ranking	2020

Table 6.1. Lincoln County Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Continue working with regional partners to sustainably and responsibly manage water resources in the Upper Columbia Basin watershed.	Goal #1, 3, and 5 <div style="border: 1px solid black; padding: 2px;">Priority Ranking: Low</div>	Partnership: Lincoln County Emergency Management, USDA Natural Resources Conservation Service, Washington Water Resources Program, Washington Department of Ecology, BLM, etc.	BOR	Original Item continue Item into 2019 update with revised timeline, responsible department and ranking	2019-2023

City of Davenport

Table 6.2. City of Davenport Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Construct airport runway improvements to allow larger aircraft access for emergency deliveries or staging of supplies and to relieve safety concerns.	Goal #1, 3, 5, and 8 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Priority Ranking: High</div>	Partnership: Federal Aviation Administration, Washington State Department of Transportation Aviation and Davenport City Council	FAA, Washington EMD, Washington DNR, BLM	Original Item continue Item into 2019 update with revised timeline and responsible organizations	2020
	Coordinate with Lincoln County Emergency Management to actively participate on the Region 9 All Hazard Coordinating Group, on behalf of Davenport, to implement the “Regional Prioritized Strategies” outlined in the Homeland Security Region 9 All Hazards Emergency Preparedness Strategic Plan and integrate the mission, goals, and strategies into local planning mechanisms and emergency management functions.	Goal #2, 4, and 5 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Priority Ranking: Low</div>	Partnership: Davenport City Council and Lincoln County Emergency Management		Original Item continue Item into 2019 update with revised timeline, ranking and Action Item	2019-2020

Table 6.2. City of Davenport Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Construct an aircraft hangar to be used by regional emergency personnel as a staging area, command post, and storage facility.	Goal #1, 3, 5, and 8 Priority Ranking: Moderate	Partnership: Davenport City Council, State of Washington, and Lincoln County	FAA, Washington DNR, BLM	EMD, Original Item continue Item into 2019 update with revised timeline	2022
	Construct an addition to the Airport Lounge to be used as a command center for air assault operations and briefing area for pilots and staff.	Goal #1, 2, 4, and 5 Priority Ranking: Moderate	Partnership: Davenport City Council, State of Washington, and Lincoln County	FAA, Washington DNR, BLM	EMD, Original Item continue Item into 2019 update with revised timeline	2022
Earthquake	Rebuild or reinforce masonry buildings subject to damage by earthquake, specifically the fire station.	Goal #1, 2, 5, 7, and 8 Priority Ranking: High	Davenport City Council	Fire Service grants, Washington EMD	Original Item continue Item into 2019 update with revised timeline and Action Item	2023
Flood	Dredge Cottonwood Creek channel and remove vegetation to allow better flow during high water events.	Goal #1, 2, and 5 Priority Ranking: Moderate	Davenport City Council	Washington DOE, Washington Water Resources Program, Washington DNR, BLM	Original Item continue Item into 2019 update with revised timeline	2020

Table 6.2. City of Davenport Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Encourage the city of Davenport to participate in the National Flood Insurance program.	Goal #1, 2, 3, 5, 6, and 7 Priority Ranking: Moderate	Davenport City Council		Original Item continue Item into 2019 update with revised Action Item and timeline	2023
Severe Weather	Re-wire critical facilities to allow portable generator to be plugged in during a power outage. Coordinate with County to determine what type and size generator will be available.	Goal #1, 2, 5, and 8 Priority Ranking: High	Davenport City Council	Washington EMD	Original Item continue Item into 2019 update with revised Action Item and timeline	2021-2023

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City of Sprague

Table 6.3. City of Sprague Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Plan and install a communication system at City Hall to alert the community that there has been a disaster situation and provide instructions. System may include a siren and public address system.	Goal #1, 2, and 3 Priority Ranking: High	Sprague City Council and Public Works Department	Washington EMD, Lincoln County, BLM, Washington DNR, Fire Service grant programs	Original Item continue Item into 2019 update with revised timeline	2020
	Work with local organizations to develop a sheltering plan for people affected by hazardous events.	Goal #1, 2, 3, and 4 Priority Ranking: High	Partnership: Lincoln County Fire District #1, Sprague Chamber of Commerce, Sprague School District, and local churches	Lincoln County Emergency Management, American Red Cross	Completed	N/A
	Obtain and install a permanent backup generator for city well #3.	Goal #1 and 2 Priority Ranking: High	Sprague City Council and Public Works Department	Washington EMD, Lincoln County Emergency Management	In progress	2019

Table 6.3. City of Sprague Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Coordinate with Lincoln County Emergency Management to actively participate on the Region 9 All Hazard Coordinating Group, on behalf of Sprague, to implement the “Regional Prioritized Strategies” outlined in the Homeland Security Region 9 All Hazards Emergency Preparedness Strategic Plan and integrate the mission, goals, and strategies into local planning mechanisms and emergency management functions.	Goal #2 and 3 Priority Ranking: Low	Partnership: Sprague City Council and Lincoln County Emergency Management	Lincoln County Management Emergency	Original Item continue Item into 2019 update with revised Action Item, ranking and timeline	2019-2020
	Obtain three portable backup generators to provide power at emergency shelters or wherever needed.	Goal #1, 2, and 4 Priority Ranking: Moderate	Sprague City Council and Public Works Department	Washington County Management EMD, Lincoln Emergency	Original Item continue Item into 2019 update with revised timeline	2022
	Upgrade 500 feet of 4 inch water main to 6 inch pipe to supply 2 fire hydrants.	Goal #1 and 2 Priority Ranking: Moderate	Sprague City Council and Public Works Department		Original Item continue Item into 2019 update with revised timeline	2021

Table 6.3. City of Sprague Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Upgrade the booster pump on the north side to improve water pressure to fire hydrants in that area.	Goal #1 and 2 Priority Ranking: Low	Sprague City Council and Public Works Department	Washington EMD, Lincoln County Emergency Management, Washington DOE, Washington DOH	Original Item continue Item into 2019 update with revised timeline	2023
Flood	Construction of a dam, or holding ponds, above Negro Creek, east of the City, to be used only during a high water flooding situation.	Goal #1, 2, and 3 Priority Ranking: Low	Sprague City Council and Lincoln Board of County Commissioners	Washington ECY, Washington EMD, Washington DNR	Original Item continue Item into 2019 update with revised timeline	2029
	Encourage homeowners in flood prone areas to participate in the National Flood Insurance program.	Goal #1, 2, and 3 Priority Ranking: Moderate	Sprague City Council and Public Works Department		Original Item continue Item into 2019 update with revised timeline	2019-2023
	Clear obstructing vegetation from the Negro Creek channel.	Goal #1 and 2 Priority Ranking: Low	Sprague Public Works Department	Washington ECY, Washington EMD, Washington DNR	Original Item continue Item into 2019 update with revised timeline	2019-2023

Table 6.3. City of Sprague Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Develop a Flood Damage Assessment and Repair Plan to identify damages from recent flooding and repair measures for city infrastructure	Goal #1, 2 and 3 Priority Ranking: Low	City of Sprague	Community Development Block Grant, funded	New item	2019
	Implement recommendations from the Flood Damage Assessment and Repair Plan	Goal #1, 2 and 3 Priority Ranking: Low	City of Sprague, Lincoln County Emergency Management, Lincoln EDC	Washington EMD, FEMA, Ecology	New item	2019-2020
Severe Weather	Establish an emergency snow plowing fund to assist in an extreme snow season.	Goal #1 and 2 Priority Ranking: Low	Sprague City Council and Public Works Department		Original Item continue Item into 2019 update with revised timeline	2019
	Re-wire critical facilities to allow portable generator to be plugged in during a power outage. Coordinate with County to determine what type and size generator will be available.	Goal #1, 2, 5, and 8 Priority Ranking: High	Sprague City Council	Washington EMD	Original Item continue Item into 2019 update with revised Action Item and timeline	2021-2023

Town of Almira

Table 6.4. Town of Almira Mitigation Strategies.

Hazard	Action Item	Priority Ranking Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Work with local organizations to develop a sheltering plan for people affected by hazardous events in the Almira area.	Goal #1 and 4 Priority Ranking: Moderate	Partnership: Lincoln County Fire District #8 and Lincoln County Emergency Management	American Red Cross, Lincoln County Emergency Management	Completed but continue Action Item in 2019 plan with revised timeline	2021
	Install emergency communications system updates to provide interoperability with all emergency services throughout the County.	Goal #1 and 4 Priority Ranking: High	Partnership: Almira Town Council and Lincoln County Emergency Management	Lincoln County Emergency Management, Washington EMD, Washington DNR, BLM	In progress	2019-2023
	Coordinate with Lincoln County Emergency Management to actively participate on the Region 9 All Hazard Coordinating Group, on behalf of Almira, to implement the “Regional Prioritized Strategies” outlined in the Homeland Security Region 9 All Hazards Emergency Preparedness Strategic Plan and integrate the mission, goals, and strategies into local planning mechanisms and emergency management functions.	Goal #1 Priority Ranking: Low	Partnership: Almira Town Council and Lincoln County Emergency Management	Lincoln County Emergency Management	Original Item continue Item into 2019 update with revised Action Item, ranking and timeline	2019-2020

Table 6.4. Town of Almira Mitigation Strategies.

Hazard	Action Item	Priority Ranking Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Work with train companies to limit blockages of access to/from Almira.	Goal #4 Priority Ranking: High	Partnership: Washington Department of Transportation, Almira Town Council, and Burlington Northern Railroad	Washington DOT, Burlington Northern Railroad	Original Item continue Item into 2019 update with revised Action Item and timeline	2020
	Conduct an inventory and assessment of town-maintained roads to determine deficiencies/inadequacies and develop a prioritized improvement schedule.	Goal #4 Priority Ranking: High	Partnership: Almira Town Council		Original Item continue Item into 2019 update with revised timeline	2021
	Address problems with arsenic levels in public water supply.	Goal #1, 2, 3, and 4 Priority Ranking: High	Partnership: Almira Town Council and Lincoln County Public Health	Washington ECY, Washington DOH, Lincoln County Emergency Management	Completed	N/A
Flood	Construct flood control infrastructure on waterways upstream of Almira to reduce the flood risk from both seasonal flood events and 100 year events.	Goal #4 Priority Ranking: High	Lincoln County Commission	Washington ECY, Washington DNR, Lincoln County Emergency Management	Original Item continue Item into 2019 update with revised timeline	2023

Table 6.4. Town of Almira Mitigation Strategies.

Hazard	Action Item	Priority Ranking Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Encourage homeowners in flood prone areas to participate in the National Flood Insurance program.	Goal #1 and 4 Priority Ranking: Moderate	Almira Town Council		Original Item continue Item into 2019 update with revised timeline	2020
Severe Weather	Develop a fund to be used for emergency plowing of secondary roads during high snow accumulation events.	Goal #2 and 4 Priority Ranking: Moderate	Partnership: Almira Town Council and Lincoln County Emergency Management		Original Item continue Item into 2019 update with revised timeline and Action Item	2020
	Re-wire critical facilities to allow portable generator to be plugged in during a power outage. Coordinate with County to determine what type and size generator will be available.	Goal #1, 2, 5, and 8 Priority Ranking: High	Almira City Council	Washington EMD	New Item	2021-2023

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Town of Creston

Table 6.5. Town of Creston Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Continue to establish the Town's Green House Gas Reduction Emission Policy to monitor the efficiency of the pumps in water and sewer systems and maintain them at peak efficiency.	Goal #2 and 4 Priority Ranking: Moderate	Creston Town Council and Maintenance Operators	Washington ECY	Original Item continue Item into 2019 update with revised timeline	2020
	Coordinate with Lincoln County Emergency Management to actively participate on the Region 9 All Hazard Coordinating Group, on behalf of Creston, to implement the "Regional Prioritized Strategies" outlined in the Homeland Security Region 9 All Hazards Emergency Preparedness Strategic Plan and integrate the mission, goals, and strategies into local planning mechanisms and emergency management functions.	Goal #1 Priority Ranking: Low	Partnership: Creston Town Council and Lincoln County Emergency Management	Lincoln County Emergency Management	Original Item continue Item into 2019 update with revised timeline, ranking and Action Item	2019-2020
	Replace 4,400 existing 50+ year old 4" steel and AC water mains with 8" PVC water mains and approximately 30 water meters that have been identified to be in poor condition.	Goal #1 and 4 Priority Ranking: High	Creston Town Council, Varella, and Associates Engineering, and private contractors	Washington EMD, community block grants	In progress and continue into updated 2019 plan	2019-2023

Table 6.5. Town of Creston Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Replace obsolete/substandard fire hydrants that cannot convey adequate fire flow at eight locations.	Goal #1 and 4 Priority Ranking: High	Creston Town Council, Varella, and Associates Engineering, and private contractors	Fire Service grant programs, Washington EMD	Original Item continue Item into 2019 update with revised timeline	2019
Flood	Identification, classification, and regulation of Critical Areas inundated by 100 year flood as identified by the Department of Urban and Region Planning at Eastern Washington University.	Goal #1 and 4 Priority Ranking: Moderate	Creston Town Council, Eastern Washington University Department of Urban and Region Planning, and others	Washington ECY, Washington EMD, BLM, Washington DNR	Original Item continue Item into 2019 update with revised timeline	2021
	Encourage homeowners in flood prone areas to participate in the National Flood Insurance program.	Goal #1, 2, and 4 Priority Ranking: Low	Creston Town Council		Original Item continue Item into 2019 update with revised timeline	2020-2023
Severe Weather	Work with local jurisdictions as well as FEMA to mitigate and lessen impacts of severe weather events, particularly prolonged freezing and ice storms.	Goal #1, 2, 3, 4, and 5 Priority Ranking: Moderate	Creston Town Council		Original Item continue Item into 2019 update with revised timeline	2019-2023

Table 6.5. Town of Creston Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Re-wire critical facilities to allow portable generator to be plugged in during a power outage. Coordinate with County to determine what type and size generator will be available.	Goal #1, 2, 5, and 8 <div style="border: 1px solid black; padding: 2px;">Priority Ranking: High</div>	Creston Town Council	Washington EMD	New Item	2021-2023

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Town of Harrington

Table 6.6. Town of Harrington Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Re-line and repaint the city's water storage tank.	Goal #1 Priority Ranking: High	Harrington Town Council	Washington EMD, community block grants	Original Item continue Item into 2019 update with revised timeline	2023
	Coordinate with Lincoln County Emergency Management to actively participate on the Region 9 All Hazard Coordinating Group, on behalf of Harrington, to implement the "Regional Prioritized Strategies" outlined in the Homeland Security Region 9 All Hazards Emergency Preparedness Strategic Plan and integrate the mission, goals, and strategies into local planning mechanisms and emergency management functions.	Goal #1 Priority Ranking: Low	Partnership: Harrington Town Council and Lincoln County Emergency Management	Lincoln County Emergency Management	Original Item continue Item into 2019 update with revised timeline, ranking and Action Item	2019-2020
	Assess the school facilities and Memorial Hall for sheltering capabilities and inventory needed equipment and supplies.	Goal #1 and 3 Priority Ranking: Moderate	Harrington Town Council	American Red Cross, Lincoln County Emergency Management	In progress but continue Action Item in 2019 update	2021

Table 6.6. Town of Harrington Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Continue to enforce ordinances and regulations related to building in hazard areas.	Goal #2, 3, and 4 Priority Ranking: High	Harrington Town Council		Original Item continue Item into 2019 update with revised timeline	2023
Flood	Encourage homeowners in flood prone areas to participate in the National Flood Insurance program.	Goal #3 Priority Ranking: Low	Harrington Town Council		Original Item continue Item into 2019 update with revised timeline	2021
	Work with FEMA to adopt the 1985 FEMA flood insurance rate map as the official floodplain for the town.	Goal #3 Priority Ranking: Low	Harrington Town Council	Washington County Management ECY, Lincoln Emergency	Completed	N/A
Severe Weather	Re-wire critical facilities to allow portable generator to be plugged in during a power outage. Coordinate with County to determine what type and size generator will be available.	Goal #1, 2, 5, and 8 Priority Ranking: High	Harrington Town Council	Washington EMD	New Item	2021-2023

Town of Odessa

Table 6.7. Town of Odessa Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Obtain and install backup generator for Community Center.	Goal #1 and 2 <div style="border: 1px solid black; padding: 2px; width: fit-content;">Priority Ranking: High</div>	Odessa Administration and Public Works	Washington EMD	Original Item continue Item into 2019 update with revised timeline	2020
	Coordinate with Lincoln County Emergency Management to actively participate on the Region 9 All Hazard Coordinating Group, on behalf of Odessa, to implement the “Regional Prioritized Strategies” outlined in the Homeland Security Region 9 All Hazards Emergency Preparedness Strategic Plan and integrate the mission, goals, and strategies into local planning mechanisms and emergency management functions.	Goal #1 <div style="border: 1px solid black; padding: 2px; width: fit-content;">Priority Ranking: Low</div>	Partnership: Odessa Town Council and Lincoln County Emergency Management	Lincoln County Emergency Management	Original Item continue Item into 2019 update with revised timeline, ranking and Action Item	2019-2020
	Obtain and install backup generators on Well #3 and #4.	Goal #1 and 2 <div style="border: 1px solid black; padding: 2px; width: fit-content;">Priority Ranking: High</div>	Odessa Administration and Public Works	Washington EMD	Original Item continue Item into 2019 update with revised timeline	2023

Table 6.7. Town of Odessa Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
Flood	Clear obstructing vegetation from the Crab Creek channel.	Goal #1 and 2 Priority Ranking: High	Partnership: Administration and Public Works and FEMA	Odessa Washington ECY, BLM, Washington DNR	Original Item continue Item into 2019 update with revised timeline	2023
	Encourage homeowners in flood prone areas to participate in the National Flood Insurance program.	Goal #1 and 2 Priority Ranking: High	Odessa Town Council		Original Item continue Item into 2019 update with revised timeline	2020-2022
Severe Weather	Obtain and install backup generator at Public Works and Police Department building.	Goal #1 and 2 Priority Ranking: Moderate	Odessa Administration and Public Works	Washington EMD	Original Item continue Item into 2019 update with revised timeline	2019
	Re-wire critical facilities to allow portable generator to be plugged in during a power outage. Coordinate with County to determine what type and size generator will be available.	Goal #1, 2, 5, and 8 Priority Ranking: High	Odessa Town Council	Washington EMD	New Item	2021-2023

Table 6.7. Town of Odessa Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
Wildland Fire	Increase capacity upgrades to water system to address wildfire protection. Including but not limited to reservoir and supply improvements at the Commercial Complex	Goal #1 and 2 <div style="border: 1px solid black; padding: 2px; width: fit-content;"> Priority Ranking: High </div>	Odessa Public Works		New Item	2022

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Town of Reardan

Table 6.8. Town of Reardan Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Secure a portable generator that could power the town's primary well or the emergency well.	Goal #2 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Priority Ranking: High</div>	Reardan Town Council	Washington EMD	Original Item continue Item into 2019 update with revised timeline	2021
	Coordinate with Lincoln County Emergency Management to actively participate on the Region 9 All Hazard Coordinating Group, on behalf of Reardan, to implement the "Regional Prioritized Strategies" outlined in the Homeland Security Region 9 All Hazards Emergency Preparedness Strategic Plan and integrate the mission, goals, and strategies into local planning mechanisms and emergency management functions.	Goal #1 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Priority Ranking: Low</div>	Partnership: Reardan Town Council and Lincoln County Emergency Management	Lincoln County Emergency Management	Original Item continue Item into 2019 update with revised timeline, ranking and Action Item	2019-2020

Table 6.8. Town of Reardan Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Modify town wells to be compatible with portable power sources.	Goal #2 Priority Ranking: High	Reardan Town Council	Washington County Management, EMD, Lincoln Emergency	Original Item continue into 2019 update with revised timeline	2021
	Establish emergency sheltering plan to coordinate the Community Hall, Fire Station, Churches, and School facilities. Also plan for medical aid, food preparation and food distribution during an emergency.	Goal #1and 2 Priority Ranking: Moderate	Reardan Town Council, School District, Fire District #4, Community Hall Association, and Church Administrations	American Red Cross, Lincoln County Management, Emergency	Currently in place but continue to maintain agreements with cooperators and re-evaluate plan as needed	2023
	Replace approximately 8,000 feet of 50+ year old steel pipe with C-900 or equivalent plastic pipe.	Goal #2 Priority Ranking: Moderate	Reardan Town Council	Washington EMD	In progress, continue into 2019 update with revised timeline	2022

Table 6.8. Town of Reardan Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
Flood	Encourage homeowners in flood prone areas to participate in the National Flood Insurance program.	Goal #2 Priority Ranking: Low	Reardan Town Council		Original Item continue Item into 2019 update with revised timeline	2021-2022
Severe Weather	Re-wire critical facilities to allow portable generator to be plugged in during a power outage. Coordinate with County to determine what type and size generator will be available.	Goal #1, 2, 5, and 8 Priority Ranking: High	Reardan Town Council	Washington EMD	New Item	2021-2023
	For severe winter conditions, organize plan to handle heating outages due to prolonged power outages and encourage residents to have generators.	Goal #1 and 2 Priority Ranking: High	Reardan Town Council, School District, Lincoln County Fire District #4, Community Hall Association, Avista, and Church Administrations.	Lincoln County Emergency Management	Original Item continue Item into 2019 update with revised timeline and Action Item	2021

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Town of Wilbur

Table 6.9. Town of Wilbur Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Drill a well near the airport to provide adequate water supplies for the existing population as well as for future industrial growth and fire suppression.	Goal #2 and 3 Priority Ranking: Moderate	Wilbur Town Council	Washington EMD, community block grants	Original Item continue Item into 2019 update with revised timeline	2023
	Coordinate with Lincoln County Emergency Management to actively participate on the Region 9 All Hazard Coordinating Group, on behalf of Wilbur, to implement the "Regional Prioritized Strategies" outlined in the Homeland Security Region 9 All Hazards Emergency Preparedness Strategic Plan and integrate the mission, goals, and strategies into local planning mechanisms and emergency management functions.	Goal #1 Priority Ranking: Low	Partnership: Wilbur Town Council and Lincoln County Emergency Management	Lincoln County Emergency Management	Original Item continue Item into 2019 update with revised timeline, ranking and Action Item	2019-2020
Flood	Construct a dam on Goose Creek to assist with flood control and provide irrigation water.	Goal #2 and 3 Priority Ranking: High	Wilbur Administration and Grants & Contracts	US Army Corps of Engineers, Washington ECY, Washington DNR, BLM, Washington Water Resources Program, USDA NRCS	Original Item continue Item into 2019 update with revised timeline	2023

Table 6.9. Town of Wilbur Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Encourage homeowners in flood prone areas to participate in the National Flood Insurance program.	Goal #1 and 2 Priority Ranking: High	Wilbur Town Council		Original Item continue Item into 2019 update with revised timeline	2021-2022
	Remove obstructions for the Goose Creek stream channel to improve water flow and help prevent flooding.	Goal #2 and 3 Priority Ranking: High	Wilbur Public Works	Washington ECY, Washington DNR, BLM, Washington Water Resources Program	Original Item continue Item into 2019 update with revised timeline	2021-2023
Severe Weather	Obtain three portable backup generators to power town wells and the community center or an alternative emergency shelter during severe weather events.	Goal #2 and 3 Priority Ranking: High	Wilbur Public Works	Washington EMD	Original Item continue Item into 2019 update with revised timeline	2021
	Obtain a permanent backup generator for town well #1.	Goal #2 and 3 Priority Ranking: High	Wilbur Public Works	Washington EMD	Original Item continue Item into 2019 update with revised timeline	2021

Table 6.9. Town of Wilbur Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
	Re-wire critical facilities to allow portable generator to be plugged in during a power outage. Coordinate with County to determine what type and size generator will be available.	Goal #1, 2, 5, and 8 <div style="border: 1px solid black; padding: 2px;">Priority Ranking: High</div>	Wilbur Town Council	Washington EMD	New Item	2021-2023

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Lincoln Hospital District

Table 6.10. Lincoln Hospital District Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Move and remodel Emergency Room from a 2 bed setup to a six bed setup with one bay designed as a temporary isolation/quiet room.	Goal #1, 2, and 3 Priority Ranking: High	Lincoln Hospital Facilities Management and Finance	Washington EMD, private donors, community block grants	Completed	N/A
	Build an addition off of the Operating Room area creating recovery rooms for surgery patients and an enhanced Operating Room	Goal #1, 2, and 3 Priority Ranking: High	Lincoln Hospital Facilities Management, Finance, and Operating Room	Washington EMD, private donors, community block grants	Original Item continue Item into 2019 update with revised timeline	2023
Severe Weather	Wire proposed new construction projects (above) into the generator emergency power grid providing additional sheltering capabilities during severe weather events.	Goal #1, 2, and 3 Priority Ranking: High	Lincoln Hospital Facilities Management, Finance, and Operating Room	Washington EMD, private donors, community block grants	Original Item continue Item into 2019 update with revised timeline	2022

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Odessa Memorial Healthcare Center

Table 6.11. Odessa Memorial Healthcare Center Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
General	Maintain and periodically test the backup generator for the hospital building.	Goal #1 and 2 Priority Ranking: High	Odessa Memorial Healthcare Center Environmental Services Department		Original Item continue Item into 2019 update with revised timeline	At least annually
	Work with the city of Odessa to improve sheltering capacity within the community.	Goal #1, 2, 3, 4, and 5 Priority Ranking: High	Odessa Memorial Healthcare Center	American Red Cross	Original Item continue Item into 2019 update with revised timeline	Ongoing
	Continuously improve the Hospital's emergency operations plans and procedures by conducting interagency trainings and working collaboratively with other public agencies.	Goal #1, 3, and 4 Priority Ranking: High	Odessa Memorial Healthcare Center		Original Item continue Item into 2019 update with revised timeline	At least annually
Severe Weather	Wire any new construction projects into the emergency power grid in order to provide additional sheltering capabilities during severe weather events.	Goal #1, 2, 4, and 5 Priority Ranking: High	Odessa Memorial Healthcare Center Environmental Services Department	Washington EMD, private donors, community block grants	Original Item continue Item into 2019 update with revised timeline	Ongoing

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Lincoln County Conservation District

Table 6.12. Lincoln County Conservation District Mitigation Strategies.

Hazard	Action Item	Goals Addressed	Responsible Departments or Organizations	Potential Resources	2019 Status	Projected Completion Year
All	Post-hazard events outreach and education utilizing informational meetings, newsletters, social media and brochures.	Goal # 1 & 2 Priority Ranking: Moderate	Lincoln County Conservation District		New Item	2023
	Assist landowners with technical assistance in mitigating pre and post hazard events.	Goal # 1, 2, 3 and 4 Priority Ranking: High	Lincoln County Conservation District		New Item	2023
Wildland Fire	Seek funding for fire resiliency, including informational meeting and outreach activities, home assessments, forest health actives, and home hardening activities.	Goal # 1 and 2 Priority Ranking: High	Lincoln County Conservation District	Lincoln County Fire Districts, Washington DNR and BLM	New Item	2021
	Assist landowners in post fire recovery and protecting natural resources. Finding seedling and planting, technical assistance, planting living snow fences.	Goal #1 and 2 Priority Ranking: High	Lincoln County Conservation District	Lincoln County Fire Districts, Washington DNR and BLM	New Item	As needed

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Wildland Fire Action Items

Wildfire mitigation efforts must be supported by a set of policies and regulations at the county level that maintain a solid foundation for safety and consistency. The recommendations enumerated here serve that purpose. Because these items are regulatory in nature, they will not necessarily be accompanied by cost estimates. These recommendations are policy related and therefore are recommendations to the appropriate elected officials; debate and formulation of alternatives will serve to make these recommendations suitable and appropriate.

<i>Table 6.13. Action Items in Safety and Policy</i>				
Action Item	Goals Addressed	Responsible Organization	Timeline	2019 Status
6.13.a: Incorporate the Lincoln County Community Wildfire Protection Plan, by reference, into the Lincoln County Hazard Mitigation Plan.	CWPP Goal #4 & 11 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Lincoln County Board of Commissioners Support: Lincoln County Planning Department	2019	Renew for 2019
6.13.b: Consider adopting countywide regulations or codes that will improve rural subdivisions' fire resistance as well as ensure new developments are constructed using fire safe standards.	CWPP Goal #3, 4, 6, 8, and 13 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Moderate</div>	Lead: Lincoln County Board of Commissioners Support: Lincoln County Fire Districts	2019	In-progress
6.13.c: Distribute annual Firewise-type educational brochures with building permit applications.	CWPP Goal #5, 6, 8, and 11 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Lincoln County Building Department Support: Washington DNR Northeast Region	2023	Renew for 2019
6.13.d: Support prescribed burning as an effective tool to reduce hazardous fuels in the WUI within applicable regulations as is appropriate.	CWPP Goal #2 and 9 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Lincoln County Fire Districts Support: Washington DNR, NRCS, NPS, BLM	2019	Renew for 2019

Table 6.13. Action Items in Safety and Policy

Action Item	Goals Addressed	Responsible Organization	Timeline	2019 Status
6.13.e: Continue to work with developers and private landowners to enhance road layout and adherence to accepted road standards that will improve emergency services' accessibility as well as provide for better road connectivity.	CWPP Goal #3, 4, 6, 7, 8, 11, and 12 High	Lead: Lincoln County Planning Department Support: Lincoln County Board of Commissioners	2020	In-progress
6.13.f: Begin dialogue between Lincoln County and the Washington DNR, Southeast Region to provide fire protection services on wooded properties south of Highway 2 in Lincoln County.	CWPP Goal #3, 8, 9, 10, 11, and 13 High	Lead: Lincoln County Fire Districts and Washington DNR Support: Lincoln County Board of Commissioners	6 months	In-progress
6.13.g: Continue to regulate and actively enforce all fireworks-related restrictions in Lincoln County.	CWPP Goal #2, 3, 4, and 9 High	Lead: Lincoln County Sheriff's Office and Washington DNR Support: Lincoln County Fire Districts, NPS	2023	Completed but continue
6.13.h: Discuss the need to develop a local contact list of individuals that could be used in an advisory capacity to fire suppression teams.	CWPP Goal #3, 7, 10, and 13 High	Lead: Lincoln County Sheriff's Office Support: Lincoln County Fire Districts	2019	Renewed Item
6.13.i: Continue to encourage residents to develop pre-emergency communication plans including phone trees and contact lists.	CWPP Goal #3, 7, 10, and 13 Moderate	Lead: Lincoln County Sheriff's Office Support: Lincoln County Fire Districts	2023	Completed but continue

Table 6.13. Action Items in Safety and Policy

Action Item	Goals Addressed	Responsible Organization	Timeline	2019 Status
6.13.j: Maintain the Lincoln County Livestock Evacuation Plan.	CWPP Goal #3, 4, 5, and 11 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Low</div>	Lead: Livestock Evacuation Volunteer Group Support: Lincoln County Sheriff's Office	2023	A group was formed who developed a list of potential resources that is available in dispatch as well as a phone tree
6.13.n: Continue to encourage County residents to sign their cell phone numbers up with the Countywide "My State USA" emergency notification service.	CWPP Goal #3, 7, 10, and 13 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Moderate</div>	Lead: Lincoln County Sheriff's Office Support: Lincoln County Fire Districts, Conservation District, DNR	2023	Renewed Item

The protection of people and structures will be tied together closely because the loss of life in the event of a wildland fire is generally linked to a person who could not, or did not, flee a structure threatened by a wildfire or to a firefighter combating that fire. Many of the recommendations in this section involve education and increasing wildfire awareness among Lincoln County residents.

Residents and policy makers of Lincoln County should recognize certain factors that exist today, the absence of which would lead to increased risk of wildland fires in Lincoln County. The items listed below should be acknowledged and recognized for their contributions to the reduction of wildland fire risks:

Shrub/Steppe Management has a significant impact on the fuel composition and structure in Lincoln County. The shrub/steppe management programs of the BLM, FWS, BOR, WADNR and numerous private landowners in the region have led to a reduction of wildland fuels. Furthermore, shrub/steppe systems are dynamic and will never be completely free from risk. Treated areas will need repeated treatments to reduce the risk to acceptable levels in the long term.

Table 6.14. Action Items for Fire Prevention, Education, and Mitigation

Action Item	Goals Addressed	Responsible Organization	Timeline	2019 Status
6.14.a: Implementation of youth and adult wildfire educational programs.	CWPP Goal #5 and 12 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Washington DNR, BLM, and Lincoln County Conservation District Support: Lincoln County Fire Districts and local schools	2019-2023	Completed but continue

Table 6.14. Action Items for Fire Prevention, Education, and Mitigation

Action Item	Goals Addressed	Responsible Organization	Timeline	2019 Status
6.14.b: Prepare for wildfire events in high risk areas by working with HOA and individual property owners to conduct home site risk assessments and develop Firewise communities	CWPP Goal #2, 3, 5, 7, 8, and 13 High	Lead: Washington DNR Support: Lincoln County Conservation District	2019-2023	Completed but continue
6.14.c: Work with WSU Extension, Master Gardeners, and other existing programs to offer firewise landscaping clinics to assist property owners in maintaining fire-resistant defensible space around structures.	CWPP Goal #5, 8, and 11 Moderate	Lead: Lincoln County Conservation District Support: Spokane Master Gardeners and WSU Extension	2019	Completed but continue
6.14.d: Develop educational handbook regarding construction in high risk wildfire areas to be handed out with building permits.	CWPP Goal #5, 8, and 11 High	Lead: Lincoln County Building Department Support: Washington DNR, Conservation District	2019	Renew for 2019
6.14.e: Install wildfire safety zones around the Washington Department of Fish and Wildlife office and housing in Creston.	CWPP Goal #2, 8, and 9 Moderate	Lead: Washington Department of Fish and Wildlife	2019-2023	Completed but continue
6.14.f: Investigate potential for the establishment of a developed shooting range near Sprague to reduce fire ignitions in this area.	CWPP Goal #2, 6, 9, and 11 Moderate	Lead: Lincoln County Fire District #1 Support: BLM	2023	In-progress
6.14.g: Work with the National Park Service to identify and treat high wildfire risk areas within the Lake Roosevelt National Recreation Area, particularly in areas experiencing intense public use.	CWPP Goal #2, 3, 9, and 11 High	Lead: Lincoln County CWPP Planning Committee and NPS Support: Lincoln County Fire Districts	2019	Renew for 2019

Table 6.14. Action Items for Fire Prevention, Education, and Mitigation

Action Item	Goals Addressed	Responsible Organization	Timeline	2019 Status
6.14.h: Explore a Lincoln County fire prevention coop to provide a continuing public wildfire education program and better capture defensible space and prevention teachable moments.	CWPP Goal #3, 4, 5, & 7 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Moderate</div>	Lead: Washington DNR and BLM Support: Lincoln County Fire Districts and WSU Extension	2019	New for 2019
6.14.i: Maintain a forest and range public education program to encourage healthy management of natural resources on private property.	CWPP Goal #5 and 11 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Moderate</div>	Lead: Conservation District Support: Lincoln County Conservation District, WSU Extension and Washington DNR	2019-2023	Completed but continue
6.14.j: Explore creating a grant funded fire prevention position for Lincoln County.	CWPP Goal #5, 8, and 10 <div style="border: 1px solid black; padding: 2px; display: inline-block;">Moderate</div>	Lead: Conservation District Support: WSU Extension and Washington DNR	2023	Renew for 2019
6.14.k: Provide funding to WSU Extension to be active in Lincoln County	CWPP Goal #5, 8, and 10 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Washington DNR Support: CWPP committee and Conservation District	2023	Renew for 2019

Infrastructure Enhancements

Critical infrastructure refers to the communications, transportation, power lines, and water supply that service a region or a surrounding area. All these components are important to central Washington and to Lincoln County specifically. These networks are, by definition, a part of the wildland urban interface in the protection of people, structures, infrastructure, and unique ecosystems. Without supporting infrastructure, a community’s structures may be protected, but the economy and way of life lost. As such, a variety of components will be considered here in terms of management philosophy, potential policy recommendations, and mitigation recommendations.

Table 6.15. Action Items for Fire Prevention, Education, and Mitigation

Action Item	Goals Addressed	Responsible Organization	Timeline	2019 Status
6.15.a: Inventory, map and provide signage for onsite water sources such as hydrants, underground storage tanks, and drafting or dipping sites on all ownerships across the county.	CWPP Goal #7, 8, 10, and 13 High	Lead: Lincoln County Fire Districts Support: Lincoln County GIS Department	2021	Partially completed, District #5 In-progress
6.15.b: Support efforts to provide funding for upgrading the emergency service communication infrastructure to provide for better emergency response and notification countywide.	CWPP Goal #3, 7, 10, and 13 High	Lead: L-Comm	2023	Completed but continue
6.15.c: Improve ingress/egress and create fuel breaks by conducting roadside fuels treatments.	CWPP Goal #2 and 8 High	Lead: Conservation District Support: Lincoln County Road Department, BLM & WDFW	2023	Renew for 2019
6.15.d: Re-establish water crossing at Sinking Creek on Smith Prather Road North to provide access to this area for fire suppression apparatus.	CWPP Goal #3, 7, 8, and 13 High	Lead: Lincoln County Road Department Support: Lincoln County Board of Commissioners	2023	Renew for 2019
6.15.e: Replace bridge and maintain road surface between Walter Road East and Smith Road East to provide access for fire suppression apparatus.	CWPP Goal #3, 7, 8, and 13 High	Lead: Lincoln County Fire District #6 Support: Area landowners	2023	Renew for 2019

Resource and Capability Enhancements

There are several resource and capability enhancements identified by the rural and wildland firefighting districts in Lincoln County. All the needs identified by the districts are in line with increasing the ability to respond to emergencies and are fully supported by the CWPP steering committee.

The implementation of each action item will rely on either the isolated efforts of the rural Fire Protection Districts or a concerted effort by the county to achieve equitable enhancements across all the districts. Given

historic trends, individual departments competing against neighboring departments for grant monies and equipment will not necessarily achieve countywide equity.

Table 6.16. Action Items for Fire Prevention, Education, and Mitigation

Action Item	Goals Addressed	Responsible Organization	Timeline	2019 Status
<p>6.16.a: Develop additional water resource sites to supplement fire suppression efforts throughout Lincoln County.</p> <ul style="list-style-type: none"> - Douglas/Sorensen Road - Kiner/Monson Road - Bald Ridge north of Reardan - Highway 231 north of Reardan - Junction of Neal Canyon/Spring Canyon Roads 	<p>CWPP Goal #8, 10, and 13</p> <p>High</p>	<p>Lead: Lincoln County Fire Districts</p> <p>Support: Lincoln County Conservation District</p>	2023	Renew for 2019
<p>6.16.b: Improve departmental capability by establishing a program to increase the retention and recruitment of volunteer firefighters.</p>	<p>CWPP Goal #3, 10, and 13</p> <p>High</p>	<p>Lead: Lincoln County Fire Districts</p>	2019-2023	Renew for 2019
<p>6.16.c: Update personal protective equipment for all fire districts in Lincoln County.</p>	<p>CWPP Goal #3, 10, and 13</p> <p>High</p>	<p>Lead: Lincoln County Fire Districts</p> <p>Support: Washington DNR</p>	2019-2023	Renew for 2019
<p>6.16.d: Enhance radio availability in each district, link to existing dispatch, improve range within the region, and convert to a consistent standard of radio types.</p>	<p>CWPP Goal #3, 7, 8, 10, and 13</p> <p>High</p>	<p>Lead: L-Comm</p> <p>Support: Lincoln County Fire Districts</p>	2019-2023	Completed but continue

Table 6.16. Action Items for Fire Prevention, Education, and Mitigation

Action Item	Goals Addressed	Responsible Organization	Timeline	2019 Status
6.16.e: Obtain funding for three additional apparatus and portable generators for Fire District #7.	CWPP Goal #2, 3, 8, 10, and 13 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Lincoln County Fire District #7 Support: Washington DNR	2023	Renew for 2019
6.16.f: Obtain funding for building additions at Fire District #7's Creston and Lincoln stations.	CWPP Goal #2, 3, 8, 10, and 13 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Lincoln County Fire District #7	2023	Renew for 2019
6.16.g: Obtain funding for a new fire station and updated rolling stock for Fire District #3.	CWPP Goal #2, 3, 8, 10, and 13 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Lincoln County Fire District #3 Support: Washington DNR	2023	Renew for 2019
6.16.h: Obtain support and funding for the construction of a fire station and the necessary equipment and training in Fire District #9.	CWPP Goal #2, 3, 8, 10, and 13 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Lincoln County Fire District #9 Support: Washington DNR	2023	Renew for 2019
6.16.i: Obtain funding for the construction of a multi-agency Fire/EMS station with bays for both fire apparatus and EMS equipment with OSHA-approved exhaust removal systems, meeting rooms, offices, and residency quarters for Fire District #5 and Davenport Ambulance.	CWPP Goal #2, 3, 8, 10, and 13 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Lincoln County Fire District #5 Support: Davenport Ambulance	2023	Renew for 2019
6.16.j: Obtain funding for the installation of additional fire hydrants around the perimeter of Wilbur to help protect the community from approaching wildland fires.	CWPP Goal #2, 3, 7, 8, 10, and 13 <div style="border: 1px solid black; padding: 2px; display: inline-block;">High</div>	Lead: Town of Wilbur	2021	Renew for 2019

Table 6.16. Action Items for Fire Prevention, Education, and Mitigation

Action Item	Goals Addressed	Responsible Organization	Timeline	2019 Status
<p>6.16.k: Continue to work with local landowners to provide access to irrigation systems for fire suppression purposes and obtain funding for the necessary adapters.</p>	<p>CWPP Goal #3, 5, 7, 8, and 11</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin-left: 20px;">High</div>	<p>Lead: Lincoln County Fire Districts</p>	<p>2019-2023</p>	<p>Renew for 2019</p>
<p>6.16.l: Obtain funding for a Class A pumper in Edwall, wildland engines, and wildland gear for Lincoln County Fire District #4.</p>	<p>CWPP Goal #2, 3, 8, 10, and 13</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin-left: 20px;">High</div>	<p>Lead: Lincoln County Fire District #4 Support: Washington DNR</p>	<p>2021</p>	<p>Renew for 2019</p>
<p>6.16.m: Obtain funding for the purchase and operation of a fire and rescue boat, specifically for the patrol of the Lake Roosevelt National Recreation Area.</p>	<p>CWPP Goal #2, 3, 8, 10, and 13</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin-left: 20px;">High</div>	<p>Lead: Lincoln County Sheriff's Office Support: Lincoln County Board of Commissioners and Lincoln County Fire Districts</p>	<p>2021</p>	<p>Renew for 2019</p>

Proposed Project Areas

The following project areas were identified by the CWPP steering committee and from citizens' recommendations during the public meetings. Most of the sites were visited during the field assessment phase. The areas where these projects are located were noted as having multiple factors contributing to the potential wildfire risk to residents, homes, infrastructure, and the ecosystem. Treatments within the project areas will be site specific, but will likely include homeowner education, creation of a wildfire defensible space around structures, fuels reduction, and access corridor improvements. All work on private property will be performed with consent of, and in cooperation with the property owners. Specific site conditions may call for other types of fuels reduction and fire mitigation techniques as well. Defensible space projects may include but are not limited to commercial or pre-commercial thinning, pruning, brush removal, chipping, prescribed burning, installation of greenbelts or shaded fuel breaks, and general forest and range health improvements.

The steering committee does not want to restrict funding to only those projects that are high priority because what may be a high priority for a specific community may not be a high priority at the county or agency level. Regardless, the project may be just what the community needs to mitigate disaster. The flexibility to fund a variety of diverse projects based on varying criteria, landowner participation, and available dollars is a necessity for a functional mitigation program at the county and community level.

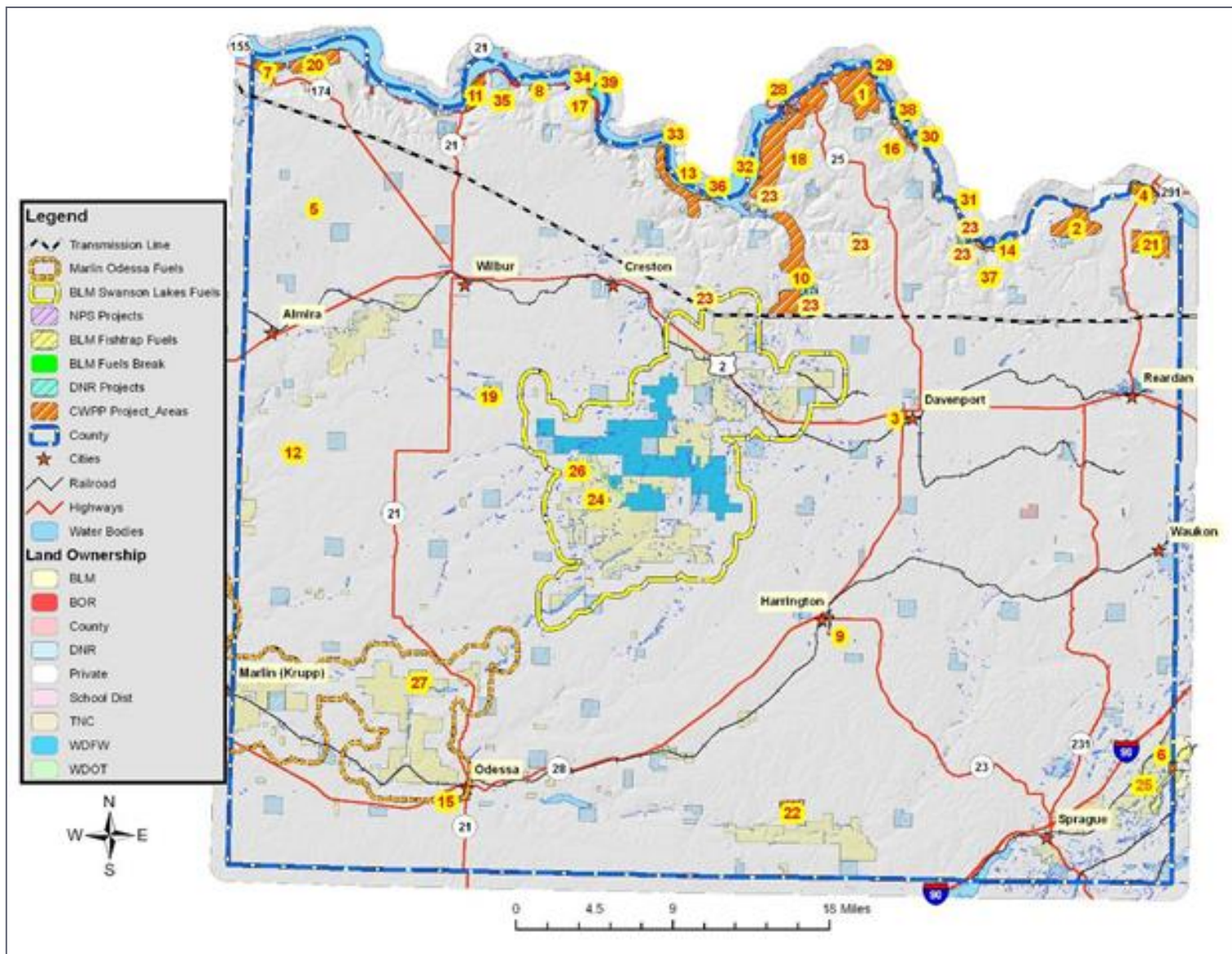
The Washington Department of Natural Resources, Bureau of Land Management, Conservation District, and/or individual Fire Protection Agencies may take the lead on implementation of many of these projects; however, project boundaries were purposely drawn without regard to land ownership to capture the full breadth of the potential wildland fire risk. Coordination and participation by numerous landowners will be required for the successful implementation of the identified projects. A map of the Proposed Project Areas is included after table 6.16.

Table 6.17. Proposed 5- Year Project Areas

Map Id#	Project Name	Project Type	Jurisdiction	Acres	Priority Ranking	2019 Status
6	Fishtrap	Defensible Space, Access Improvement	1	157.2	High	Renewed for 2019
15	Odessa Fuel Break	CRP Fuel Break	3	214.0	High	Renewed for 2019
2	Cougar Ridge	Defensible Space, Access Improvement	4	2,058.0	High	Renewed for 2019
4	Devil's Gap	Defensible Space, Access Improvement	4	705.7	High	Renewed for 2019
14	Moccasin Bay	Defensible Space, Access Improvement	4	458.7	High	Renewed for 2019
21	Townsend Estates	Defensible Space, Access Improvement	4	1,907.4	High	Renewed for 2019
1	Chrystal Cove	Access Improvement	5	3,393.4	High	Renewed for 2019
3	Davenport Fuel Break	CRP Fuel Break	5	87.5	High	Renewed for 2019
10	Hawk Creek	Defensible Space, Fuels Reduction	5	4,809.2	High	Renewed for 2019
16	Porcupine Bay	Defensible Space, Access Improvement	5	475.5	High	Renewed for 2019
18	Seven Bays/Deer Meadows	Defensible Space, Access Improvement	5	5,934.6	High	In-progress
9	Harrington Fuel Break	CRP Fuel Break	6	108.7	High	Omitted
22	Walter/Smith Road Access	Access Improvement, Bridge Replacement	6		High	Continue
8	Hanson Harbor	Defensible Space, Access Improvement	7	255.9	High	Renewed for 2019
11	Keller Ferry	Defensible Space, Access Improvement	7	769.4	High	Renewed for 2019
13	Lincoln Area	Defensible Space, Access Improvement	7	1,841.5	High	Renewed for 2019
17	Rantz Marina	Defensible Space, Access Improvement	7	132.5	High	Renewed for 2019
19	Smith Prather Road North Bridge	Partial Bridge Replacement	7		High	Omitted
5	Douglas/Sorensen Road Water Supply	Well Installation	8	~1.0	High	Renewed for 2019
12	Kiner/Monson Road Well	Well Installation	8	~1.0	High	Renewed for 2019
7	Geo Star/FDR Estates	Defensible Space, Access Improvement	9	660.2	High	Renewed for 2019
20	Sunny Hills	Defensible Space, Access Improvement	9	1,502.4	High	Renewed for 2019
23	Thinkin Lincoln	Multiple Fuels Reduction Projects	DNR	1,166.0	High	Omitted
26	Swanson Lake	Development of Fuels Strategy and Projects	WDFW	116,935.0	High	Renewed for 2019
24	Twin Lakes/Seven Springs Dairy Road	Fuel Break	WDFW	75.0	High	In-progress
27	Odessa	Development of Fuels Strategy and Projects	BLM	83,016.0	High	Renewed for 2019
26	Swanson Lake	Development of Fuels Strategy and Projects	BLM	116,935.0	High	Renewed for 2019
25	Fishtrap/Hog Lake	Fuels Reduction	BLM	1,014.0	High	Omitted
24	Twin Lakes/Seven Springs Dairy Road	Fuel Break	BLM	75	High	Renewed for 2019
28	Fort Spokane	Fuels Reduction	NPS	380.0	High	In-progress

29	Detillion	Fuels Reduction	NPS	11.0	High	Renewed for 2019
30	Laughon/Porcupine	Fuels Reduction	NPS	31.0	High	Renewed for 2019
31	Cayuse Cove	Fuels Reduction	NPS	6.0	High	Renewed for 2019
32	Seven Bays	Bitterbrush Fuels Reduction	NPS	16.0	High	Renewed for 2019
33	SterlingValley	Fuels Reduction	NPS	24.0	High	Renewed for 2019
34	Jones Bay	Understory Burning	NPS	11.0	High	Renewed for 2019
35	Keller Ferry	Propose Future Project Area	NPS	9.0	High	Renewed for 2019
36	Lincoln Mill	Proposed Future Project Area	NPS	14.0	High	Renewed for 2019
37	Mill Canyon	Proposed Future Project Area	NPS	37.0	High	Renewed for 2019
38	Porcupine CG	Fuels Reduction	NPS	48.0	High	Renewed for 2019
39	Rantz Marine	Proposed Future Project Area	NPS	9.0	High	Renewed for 2019
	Firewise Fuel Reduction	Defensible Space	NPS		High	Renewed for 2019
	Seven Springs Dairy Road	Fuel Break	6			New Project

Figure 6.1. Map of Proposed Projects.



Regional Land Management Recommendations

Wildfires will continue to ignite and burn depending on the weather conditions and other factors enumerated earlier. However, active land management that modifies fuels, promotes healthy shrubland and grassland conditions, and promotes the use of natural resources (consumptive and non-consumptive) will ensure that these lands have value to society and the local region. The Washington DNR, Washington Department of Fish and Wildlife Service, BLM, USFS, private forest landowners, and all other landowners in the region should be encouraged to actively manage their wildland-urban interface lands in a manner consistent with reducing fuels and wildfire risks.

Control Invasive Weeds

Non-native or invasive plants have been spreading across the western United States since Euro-Americans began settling the region. With the aid of grazing livestock and human disturbance, some non-native species have spread over vast areas and can out-compete many native species. This change in vegetation regime often comes with secondary impacts such as an increase fire frequency or fire intensity, as well as many other impacts.

There are many methods that can be utilized to control non-native species from spreading. The size of the outbreak and the species involved will determine the most effective method to control the outbreak. Small outbreaks of non-native plants can often be pulled by hand and disposed of before the plant goes to seed. Mowing, spraying, and even biological (insect) methods can be employed to control larger outbreaks. Regardless of the method, timing is often very important and a quality plan will ensure the treatment is successful.

Control Insects and Disease

Insects and diseases have been a common occurrence within forests and shrublands throughout the western U.S. for millennia. In the past, these impacts generally occurred in specific locations and would eventually 'run their course', often times benefiting the ecosystem by creating natural openings in the forest. Currently, our forests are unhealthy due to a variety of reasons and are subject to outbreaks of insect and/or disease over much larger areas than historically normal. These large outbreaks lead to severe impacts because it leaves the forest susceptible to stand replacing wildland fires.

Having a healthy forest or shrubland is the first, and most effective, step in combating the effect of insect or disease outbreaks. Insecticide can be sprayed over affected areas to eradicate harmful insects. Pheromones can be used, on a smaller scale, to deter certain species of insects from attacking an individual tree.

Thin Shrublands

Many of the shrublands throughout the western U.S. have become overstocked and stagnant. There are numerous reasons to explain why this is, but regardless of the reason, it is widely accepted that some management is required. Overstocking leads to numerous other health issues including susceptibility to insects, disease, and drought.

A suitable spacing for shrubs is selected to reduce the ability of fire to spread between shrubs. The shrubs are cut by hand or with a machine and mulched or piled for burning. The result is a stand of shrubs that is less dense which allows the remaining shrubs to have access to more resources (water, sunlight, and nutrients) than there was pre-thinning, creating a healthier ecosystem that is more resistant to insect and disease outbreaks.

Reintroduce Fire to the Ecosystem

Fire has been removed from the system for several decades because it was once seen as destroyer of our nation's natural resources.¹¹⁵ This exclusion has resulted in an unnatural build-up of fuel that, when fire does occur, has higher potential to be a stand replacing event.¹¹⁶ The lack of wildland fires has also changed the species composition that historically occurred in many areas by allowing fire intolerant species to dominate or co-dominate the canopy.

Reintroducing wildland fire can be accomplished in multiple ways. The first and most obvious is to simply conduct prescribed burns. Another way is to manually collect downed woody debris and either removing it from the site or to pile it for burning. Chipping or mulching is yet another method that mimics the effects of fire by reducing large amounts of fuel into small chips that decompose more rapidly than a large diameter log would. These are just a few suggestions of how to reintroduce fire or mimic the effects of fire.

Targeted Livestock Grazing

Livestock grazing, particularly cattle, has been a long-standing tradition in the rangelands of central Washington. Historically, ranchers were able to make agreements with state and federal land managers to expand their grazing operations on public ground for mutual benefit. In the last 30 years, this practice has been limited due to liability issues, environmental concerns, and litigation. Additionally, where federal grazing allotments are still available, the restrictions on timing are often inappropriate and/or too inflexible for the objectives of reducing fuel loads (i.e. wildfire risk), eradicating noxious and invasive species, and restoring native grass and sagebrush communities.

¹¹⁵ Pyne SJ (1982) *Fire in America: A cultural History of Wildland and Rural Fire (Cycle of Fire)*. Seattle: University of Washington Press.

¹¹⁶ Dennis C. Odion, Et. Al. 2014. Examining Historical and Current Mixed-Severity Fire Regimes in Ponderosa Pine and Mixed-Conifer Forests of Western North America. DOI: 10.1371/journal.pone.0087852.

“Today, livestock grazing is being rediscovered and honed as a viable and effective tool to address contemporary vegetation management challenges, like controlling invasive exotic weeds, reducing fire risk in the wildland-urban interface, and finding chemical-free ways to control weeds in organic agriculture.”⁴³

Most rangeland ecologists agree that in *site-specific* situations, livestock can be used as a tool to lower fire risk by reducing the amount, height, and distribution of fuel. Livestock can also be used to manage invasive weeds in some cases and even to improve wildlife habitat.

Targeted grazing can indeed reduce the amount, height, and distribution of fuel on a specific rangeland area, potentially decreasing the spread and size of wildfires under normal burning conditions. By definition, “Targeted grazing is the application of a specific kind of livestock at a determined season, duration, and intensity to accomplish defined vegetation or landscape goals.”¹¹⁷

There are many factors to consider regarding the use of livestock for reducing the amount, height, and continuity of herbaceous cover (especially cheatgrass) in site-specific situations:

- During the spring, cheatgrass is palatable and high in nutritional value before the seed hardens. Repeated intensive grazing (two or three times) at select locations during early growth can reduce the seed crop that year, as well as the standing biomass. In areas where desirable perennial species are also present, the intensive grazing of cheatgrass must be balanced with the growth needs of desired plants that

managers and producers want to increase.

- Late fall or winter grazing of cheatgrass-dominated areas, complemented with protein supplement for livestock, should also be considered. After the unpalatable seeds have all dropped, cheatgrass is a suitable source of energy, but low in protein. Strategic intensive grazing of key areas can reduce carry-over biomass that would provide fuel during the next fire season. Late fall grazing can also target any fall-germinating cheatgrass before winter dormancy, thus reducing the vigor of these plants the following spring. Fall/winter grazing when desirable perennial grasses are dormant and their seeds have already dropped, results in minimal impact to these species and therefore can be conducted with minimal adverse impact to rangeland health in many areas.

¹¹⁷ Karen Launchbaugh, Walker, J. Targeted Grazing – A New Paradigm for Livestock Management. University of Idaho. Accessed online October, 2014 at: http://www.webpages.uidaho.edu/rx-grazing/handbook/Chapter_1_Targeted_Grazing.pdf.

- The Bureau of Land Management (BLM) in some locations has an active “green-strip” program designed to reduce fire size and spread in key areas. Obviously, livestock can be used to maintain such green-strips to reduce the fine fuels (grasses) and control the spread of fire.
- The concept of “brown-strips” refers to areas where one or more treatments (prescribed fire, mechanical thinning, herbicide, and/or grazing) are used to reduce shrub cover, releasing the native perennial grasses. These grassy areas are preferred by cattle, which can then be grazed to reduce herbaceous fuels. This method leaves “brown-strips” when the stubble dries out in mid-summer, serving as fuel breaks to control the spread of wildfire. Where appropriate, protein-supplemented cows or sheep could be used to intensively graze and create brown-strips (e.g. along fences) to reduce the spread of fires during or after years of excess fuel build-up.
- Targeted grazing for the management of herbaceous fuels often requires a high level of livestock management, especially appropriate timing, as well as grazing intensity and frequency. In order to meet prescription specifications, operators often use herders, portable fencing, and/or dogs to ensure pastures are grazed to specification before the livestock are moved. Other expenses may include feed supplements, guardian dogs and/or night enclosures for protection from predators, water supply portability, mobile living quarters, and grazing animal transport. Targeted grazing is a business whose providers must earn a profit. Therefore, land management agencies need the option of contracting such jobs to willing producers and paying them for the ecosystem service rendered. This payment approach is already being implemented in some private and agency-managed areas to a limited extent, primarily for control of invasive perennial weeds. The use of and payment for prescription livestock grazing as a tool has substantial potential in the immediate and foreseeable future for managing vegetation in site-specific situations.
- In general, and less intensively, livestock can be used strategically by controlling the timing and duration of grazing in prioritized pastures where reduction of desirable perennial grass cover is needed for fire reduction purposes. Strategic locations could be grazed annually to reduce fuel loads and continuity at specific locations. Rotation of locations across years prevents overgrazing of any one area but confers the benefits of fuel load reductions to much larger landscapes. Even moderate grazing and trampling can reduce fuels and slow fire spread.¹¹⁸

¹¹⁸ McAdoo, Kent, et al. “Northeastern Nevada Wildfires 2006: Part 2 – Can Livestock Grazing be Used to Reduce Wildfires?” University of Nevada Cooperative Extension. Fact Sheet-07-21. Available online at <http://www.unce.unr.edu/publications/files/nr/2007/fs0721.pdf>. Accessed June 2011.

Dormant season grazing of perennial grasses has also been reported to aid in seedling recruitment. Some seeds require scarification before they will germinate. That can be accomplished by passage through the digestive tract or by hoof action on the seed. Hoof action can also press the seed into the ground and compress the soil around it, i.e. preparing a beneficial seed bed. These processes can also reasonably be expected to provide some benefit to the exotic annual grasses. These grasses; however, appear to succeed very well without that assistance. One can speculate that the perennial grasses would demonstrate a greater response to these effects and thus would gain some edge in the struggle for dominance with the exotic annuals. If those annuals were also grazed in the early spring before the perennials started or during fall germination events, or both, it is likely the annuals would have less vigor and produce less seed which would detract from their ability to out compete the perennials.¹¹⁹ While the exact details of how the perennials benefit from dormant season grazing are not fully understood, Agricultural Research Service research in Nevada has reported success in decreasing annual grass dominance.

“The role of grazing as a tool for fuel management is generally supported, but it should be cautiously evaluated on a case-by-case basis because fire potential is influenced by interactions among several ecosystem variables.”¹²⁰ Targeted grazing can reduce wildfire risk in specific areas. The targeted grazing strategies discussed above all require a very flexible adaptive management approach by both land management agencies and targeted grazing providers. Managers must determine objectives, then select and implement the appropriate livestock grazing prescription, monitor accomplishments, and make adjustments as needed.¹²¹

Livestock grazing is a more desirable tool for managing wildland fire risk on both private and public lands because it poses less risk than prescribed burning, is less expensive than chemical applications, can be managed effectively for the long-term, and it benefits a large sector of the local economy.

“The role of grazing as a tool for fuel management is generally supported, but it should be cautiously evaluated on a case-by-case basis because fire potential is influenced by interactions among

¹¹⁹ Schmelzer, L., Perryman, B. L., Conley, K., Wuliji, T., Bruce, L. B., Piper, K. 2008. “Fall grazing to reduce cheatgrass fuel loads”. Society for Range Management 2008.

¹²⁰ Fuhlendorf, S. D., D. D. Briske, and F. E. Smeins. 2001. Herbaceous vegetation change in variable rangeland environments: the relative contribution of grazing and climatic variability. Applied Vegetation Science 4: 177-188.

¹²¹ McAdoo, Kent, et al. “Northeastern Nevada Wildfires 2006: Part 2 – Can Livestock Grazing be Used to Reduce Wildfires?” University of Nevada Cooperative Extension. Fact Sheet-07-21. Available online at <http://www.unce.unr.edu/publications/files/nr/2007/fs0721.pdf>. Accessed June 2011.

Chapter 7

Appendices

IN THIS SECTION:

- List of Tables
- List of Figures
- Record of Local Adoption
- Planning Committee Minutes
- Record of Meeting Attendance
- Capability Assessments
- Record of Published Articles
- Potential Funding Sources

Chapter 7
Appendices

Supporting Information

List of Tables

Table 2.1. List of Initial Planning Committee Invitees.	19
Table 3.1. Vegetative Cover Types in Lincoln County.....	34
Table 3.2. Population trend in Lincoln County	36
Table 3.4. Selected Economic Characteristics for 2016.....	37
Table 3.5. Ownership Categories in Lincoln County.....	38
Table 4.1. Second-Order Hazards Related to Flood Events.....	46
Table 4.2. Largest Known Earthquakes Felt in Washington.	50
Table 4.3. Second-Order Hazards Related to Earthquake Events.	53
Table 4.4. Second-Order Hazards Related to Landslide Events.....	57
Table 4.5. Second-Order Hazards Related to Severe Weather Events.....	61
Table 4.6. Assessment of Historic Fire Regimes in Lincoln County, Washington.	65
Table 4.7. Assessment of Vegetation Condition Class in Lincoln County, Washington.	67
Table 4.8. Second-Order Hazards Related to Wildland Fire Events.	72
Table 4.9. Second-Order Hazards Related to Avalanche Events.	75
Table 4.10. Second-Order Hazards Related to Seiche Events.	78
Table 4.11. Second-Order Hazards Related to Volcanic Events.	83
Table 4.12. Second-Order Hazards Related to Drought Events.....	88
Table 5.1. NFIP Policy Statistics as of 6/14/2018 in Lincoln County.....	95
Table 5.2. Landslide Impact Zones in Lincoln County.....	105
Table 5.3. Summary of ignitions in Lincoln County from state and federal databases 1973-2015.....	114
Table 5.4. NFIP Policy Statistics as of 6/14/2018 in Lincoln County Conservation District.	212
Table 5.5. Landslide Impact Zones in Lincoln County Conservation District.	223
Table 5.6. Summary of ignitions in Lincoln County Conservation District from state and federal databases 1973-2015.....	233
Table 6.1. Lincoln County Mitigation Strategies.....	251
Table 6.2. City of Davenport Mitigation Strategies.	257
Table 6.3. City of Sprague Mitigation Strategies.	261
Table 6.4. Town of Almira Mitigation Strategies.	265
Table 6.5. Town of Creston Mitigation Strategies.	269
Table 6.6. Town of Harrington Mitigation Strategies.	273
Table 6.7. Town of Odessa Mitigation Strategies.....	275
Table 6.8. Town of Reardan Mitigation Strategies.	279
Table 6.9. Town of Wilbur Mitigation Strategies.....	283
Table 6.10. Lincoln Hospital District Mitigation Strategies.	287

Table 6.11. Odessa Memorial Healthcare Center Mitigation Strategies.....	289
Table 6.12. Lincoln County Conservation District Mitigation Strategies.....	291
Table 6.13. Action Items in Safety and Policy.....	293
Table 6.14. Action Items for Fire Prevention, Education, and Mitigation.....	295
Table 6.15. Action Items for Fire Prevention, Education, and Mitigation.....	298
Table 6.16. Action Items for Fire Prevention, Education, and Mitigation.....	299
Table 6.17. Proposed 5- Year Project Areas	303
Table 7.1. Lincoln County Capability Assessment	339
Table 7.3. Town of Odessa Capability Assessment.....	343
Table 7.4. Town of Wilbur Capability Assessment.	345
Table 7.5. Lincoln County Conservation District Capability Assessment.....	347

List of Figures

Figure 2.1. Press Release #1 – Planning Process Announcement.	23
Figure 4.1. Cascadia Earthquake Sources.	47
Figure 4.2. Seismicity of Washington 1990-2006.	49
Figure 4.3. Washington Peak Acceleration Map.	51
Figure 4.4. Washington Geological Survey Landslide Database.	56
Figure 4.5. Annual Precipitation Map for Washington.	60
Figure 4.6. Historic Fire Regime in Lincoln County, Washington.	66
Figure 4.7. Vegetation Condition Class in Lincoln County, Washington.	68
Figure 4.8. Wildland-Urban Interface Map for Lincoln County, Washington.	71
Figure 4.9. Photo of Loose Snow Avalanche.	73
Figure 4.10. Photo of Slab Avalanche.	74
Figure 4.11. Illustration of a Two-Node Seiche.	77
Figure 4.12. Record of Cascade Range Volcanic Eruptions.	81
Figure 4.13. Volcanic Hazard.	81
Figure 4.14. U.S. Drought Monitor Map for Washington.	85
Figure 4.15. Precipitation Record 1890 – Present.	87
Figure 4.16. Palmer Drought Severity Index Map.	88
Figure 5.1. FEMA 100 Year Riverine Flood Hazard Areas in Eastern Washington.	91
Figure 5.2. FEMA Floodplains in Lincoln County, Washington.	92
Figure 5.3. Critical Transportation Facilities Crossing Designated Floodplains.	93
Figure 5.4. FEMA Floodplain in Unincorporated Community of Edwall.	94
Figure 5.5. Regional Earthquake Probability Map.	98
Figure 5.6. Summary of Utility System Pipeline Damage from HAZUS.	100
Figure 5.7. Seven Bays Landslide Impact Zone.	100
Figure 5.8. Sterling Valley Landslide Impact Zone.	101
Figure 5.9. Porcupine Bay Landslide Impact Zone.	101
Figure 5.10. Redwine Canyon Landslide Impact Zone.	102
Figure 5.11. Critical Transportation Facilities in Higher Potential Landslide Areas.	104
Figure 5.12. Porcupine Bay Road.	104
Figure 5.13. Lincoln County Road in Winter 2009.	106
Figure 5.14. Counties Most Vulnerable to High Winds.	107
Figure 5.15. Picture of Lincoln County Haboob.	108
Figure 5.16. Critical Transportation Facilities in Lincoln County.	110
Figure 5.17. Summary of Lincoln County Ignitions by Cause (2008 - 2018).	114
Figure 5.18. Summary of Lincoln County Acres by Cause (2008-2018).	114
Figure 5.19. Community Seiche Profiles.	117

Figure 5.20. August 2009 Seiche Damage	120
Figure 5.21. Annual Probability of 10cm or more of Tephra Accumulation.....	121
Figure 5.22. Palmer Drought Severity Index for September 2018.	123
Figure 5.23. Counties Most Vulnerable to Drought	124
Figure 5.24. City of Davenport FEMA Flood Insurance Rate Map.	128
Figure 5.25. City of Sprague FEMA Flood Insurance Rate Map.	136
Figure 5.26. Town of Almira FEMA Flood Insurance Rate Map.....	146
Figure 5.27. Town of Creston FEMA Flood Insurance Rate Map.....	156
Figure 5.28. Town of Harrington FEMA Flood Insurance Rate Map*.....	164
Figure 5.29. Town of Odessa FEMA Flood Insurance Rate Map.....	174
Figure 5.30. Town of Reardan FEMA Flood Insurance Rate Map.....	183
Figure 5.31. Town of Wilbur FEMA Flood Insurance Rate Map.	192
Figure 5.32. FEMA 100 Year Riverine Flood Hazard Areas in Eastern Washington.....	208
Figure 5.33. FEMA Floodplains in Lincoln County Conservation District, Washington.	209
Figure 5.34. Critical Transportation Facilities Crossing Designated Floodplains.	210
Figure 5.35. FEMA Floodplain in Unincorporated Community of Edwall.....	211
Figure 5.36. Regional Earthquake Probability Map.	215
Figure 5.37. Summary of Utility System Pipeline Damage from HAZUS.	217
Figure 5.38. Seven Bays Landslide Impact Zone.	218
Figure 5.39. Sterling Valley Landslide Impact Zone.....	218
Figure 5.40. Porcupine Bay Landslide Impact Zone.....	219
Figure 5.41. Redwine Canyon Landslide Impact Zone.....	220
Figure 5.42. Critical Transportation Facilities in Higher Potential Landslide Areas.....	222
Figure 5.43. Porcupine Bay Road.....	222
Figure 5.44. Lincoln County Road in Winter 2009	224
Figure 5.45. Counties Most Vulnerable to High Winds	225
Figure 5.46. Picture of Lincoln County Haboob.	226
Figure 5.47. Critical Transportation Facilities in Lincoln County Conservation District.	229
Figure 5.48. Summary of Lincoln County Conservation District Ignitions by Cause (2008-2018).	234
Figure 5.49. Summary of Lincoln County Conservation District Acres by Cause (2008-2018).	234
Figure 5.50. Community Seiche Profiles.....	237
Figure 5.51. August 2009 Seiche Damage	240
Figure 5.52. Annual Probability of 10cm or more of Tephra Accumulation.....	241
Figure 5.53. Palmer Drought Severity Index for September 2018.	243
Figure 5.54. Counties Most Vulnerable to Drought	244
Figure 6.1. Map of Proposed Projects.	305
Figure 7.1. Committee Meeting Sign-in Sheet for February 1 st , 2018.....	349
Figure 7.2. Committee Meeting Sign-in Sheet for March 27 th , 2018.	350

Figure 7.3. Committee Meeting Sign-in Sheet for June 5th, 2018.350
Figure 7.4. Reardan Public Meeting Sign-in Sheet on August 28th, 2018.351
Figure 7.5. Odessa Record – March 15th, 2018.....352
Figure 7.6. Odessa Record – August 9th, 2018.....353

Record of Local Adoption

Each participating jurisdiction formally adopted the Lincoln County Multi-Hazard Mitigation Plan by resolution in an open public hearing. The following is a record of the resolutions passed by the governing body in each represented jurisdiction.

Lincoln County Resolution of Adoption

BEFORE THE BOARD OF COUNTY COMMISSIONERS LINCOLN COUNTY, WASHINGTON

**ADOPTION OF THE LINCOLN)
COUNTY HAZARD) RESOLUTION NO. 19-20
MITIGATION PLAN)**

WHEREAS, the Board of County Commissioners of Lincoln County having convened in Regular Session, in their office at the Lincoln County Courthouse this 3rd day of September, 2019, and

WHEREAS, ALL OF Lincoln County has exposure to natural hazards that increase the risk to life, property, environment and County's economy, and

WHEREAS, pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property, and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established requirements for pre and post disaster hazard mitigation programs requiring that "local and tribal government applicants for sub-grants must have an approved local mitigation plan in accordance with 44 CFR 201.6 prior to receipt of a Hazard Mitigation Grant Program sub-grant funding." The purpose of such local mitigation plan is to represent the jurisdiction's commitment to reduce risks from natural and man-made hazards, and

WHEREAS, the planning process has been completed that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy, and

WHEREAS, pursuant to 44 CFR 201.6, the Lincoln County Hazard Mitigation Plan has been reviewed and found to meet the regulatory criteria, and following adoption by participating jurisdictions, will be approved by FEMA, making all adopting jurisdictions eligible for mitigation project grants.

NOW THEREFORE, BE IT RESOLVED by the Lincoln County Board of Commissioners that the attached Lincoln County Hazard Mitigation Plan, representing each planning partner's commitment to reduce risks from natural and man-made hazards, is hereby adopted in its entirety; and that said Plan shall be posted for public viewing on the County website at <http://www.co.lincoln.wa.us>.

DATED at Davenport, Lincoln County, Washington, this 3rd day of September, 2019.

ATTEST:

Clerk of the Board - Shelly
By Tara Holden
Deputy Clerk of the Board
Tara Holden



**BOARD OF COUNTY COMMISSIONERS
LINCOLN COUNTY, WASHINGTON**

Rob Coffman
Chairman - Rob Coffman
Mark Stedman
Commissioner - Mark Stedman
Scott Hutsell
Commissioner - Scott Hutsell

Lincoln County Conservation District

**RESOLUTION OF ADOPTION BY THE
Lincoln County Conservation District
RESOLUTION NO. 19-03**

A resolution of the Lincoln County Conservation District declaring support and adoption of the Lincoln County Hazard Mitigation Plan.

WHEREAS, the Lincoln County Conservation District has participated in the development of and supports the Lincoln County Hazard Mitigation Plan, and

WHEREAS, the Lincoln County Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the Lincoln County Conservation District, and

THEREFORE, be it resolved, that the Lincoln County Conservation District, does hereby adopt and will facilitate the implementation of the Lincoln County Hazard Mitigation Plan as deemed appropriate.

Passed and approved this 6th Day of September 2019, by the

Lincoln County Conservation District located in Lincoln County, Washington.



By:

Elsa Bowen

Printed Name



Attested by:

Valerie Vissia

Printed Name

City of Davenport Resolution of Adoption

RESOLUTION OF ADOPTION BY THE

CITY/TOWN OF Davenport

RESOLUTION NO. 2019-15

A resolution of the CITY/TOWN of Davenport **declaring support and adoption of the Lincoln County Hazard Mitigation Plan.**

WHEREAS, the CITY/TOWN Council of Davenport has participated in the development of and supports the Lincoln County Hazard Mitigation Plan, and

WHEREAS, the Lincoln County Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the CITY/TOWN Council of Davenport, and

THEREFORE, be it resolved, that the CITY/TOWN Council of Davenport, does hereby adopt and will facilitate the implementation of the Lincoln County Hazard Mitigation Plan as deemed appropriate.

Passed and approved this 14th Day of August, 2019, by the CITY/TOWN Council of Davenport located in Lincoln County, Washington.



By:
Mayor
City/Town of DAVENPORT



Attested by:
Clerk
City/Town of Davenport

City of Sprague Resolution of Adoption

Resolution No. 327

A resolution of the City of Sprague declaring support and adoption of the Lincoln County Hazard Mitigation Plan.

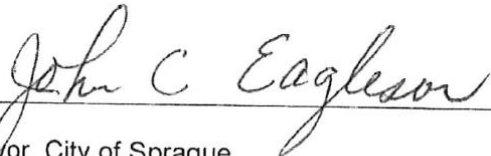
Whereas, the City Council of Sprague has participated in the development of and supports the Lincoln County Multi-Hazard Mitigation Plan, and

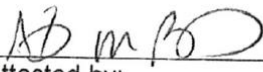
Whereas, the Lincoln County Multi-Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the City Council of Sprague, and

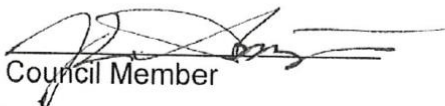
Therefore, be it resolved, that the City Council of Sprague does hereby adopt and will facilitate the implementation of the Lincoln County Multi-Hazard Mitigation Plan as deemed appropriate.

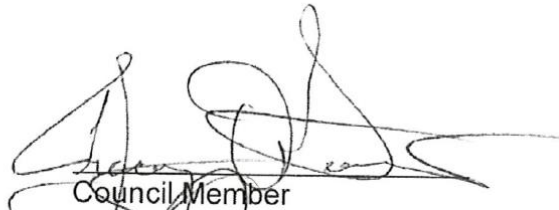
Passed and approved this 14th Day of August 2019

by the City Council of Sprague located in Lincoln County, Washington.

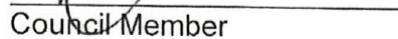

By: _____
Mayor, City of Sprague

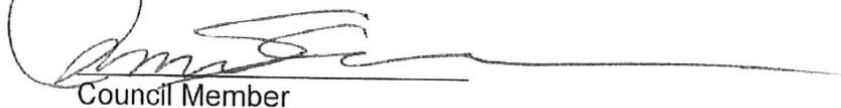

Attested by: _____
Clerk, City of Sprague


Council Member


Council Member


Rocky Henson
Council Member


Council Member


Council Member

Town of Almira Resolution of Adoption

RESOLUTION OF ADOPTION BY THE

CITY/TOWN OF ALMIRA

RESOLUTION NO. 2019-117

A resolution of the CITY/TOWN of ALMIRA declaring support and adoption of the Lincoln County Hazard Mitigation Plan.

WHEREAS, the CITY/TOWN Council of ALMIRA has participated in the development of and supports the Lincoln County Hazard Mitigation Plan, and

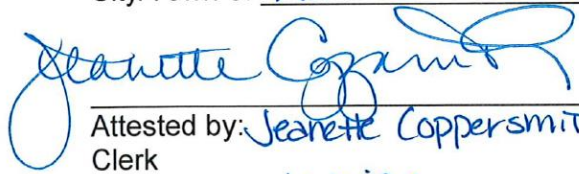
WHEREAS, the Lincoln County Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the CITY/TOWN Council of ALMIRA, and

THEREFORE, be it resolved, that the CITY/TOWN Council of ALMIRA, does hereby adopt and will facilitate the implementation of the Lincoln County Hazard Mitigation Plan as deemed appropriate.

Passed and approved this 13th Day of August, 2019, by the CITY/TOWN Council of ALMIRA located in Lincoln County, Washington.



By: Einar Larson
Mayor
City/Town of ALMIRA



Attested by: Jeannette Coppersmith
Clerk
City/Town of ALMIRA

Town of Harrington Resolution of Adoption

RESOLUTION OF ADOPTION BY THE

CITY/TOWN OF HARRINGTON

RESOLUTION NO. 213 - 2019

A resolution of the CITY/TOWN of HARRINGTON declaring support and adoption of the Lincoln County Hazard Mitigation Plan.

WHEREAS, the CITY/TOWN Council of HARRINGTON has participated in the development of and supports the Lincoln County Hazard Mitigation Plan, and

WHEREAS, the Lincoln County Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the CITY/TOWN Council of _____, and

THEREFORE, be it resolved, that the CITY/TOWN Council of HARRINGTON, does hereby adopt and will facilitate the implementation of the Lincoln County Hazard Mitigation Plan as deemed appropriate.

Passed and approved this 7th Day of August, 2019, by the CITY/TOWN

Council of HARRINGTON located in Lincoln County, Washington.



By:
Mayor
City/Town of HARRINGTON


Attested by:
Clerk
City/Town of HARRINGTON

Town of Creston Resolution of Adoption

**RESOLUTION OF ADOPTION BY THE
CITY/TOWN OF Creston
RESOLUTION NO. 2019-04**

A resolution of the CITY/TOWN of Creston declaring support and adoption of the Lincoln County Hazard Mitigation Plan.

WHEREAS, the CITY/TOWN Council of Creston has participated in the development of and supports the Lincoln County Hazard Mitigation Plan, and

WHEREAS, the Lincoln County Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the CITY/TOWN Council of Creston, and

THEREFORE, be it resolved, that the CITY/TOWN Council of Creston, does hereby adopt and will facilitate the implementation of the Lincoln County Hazard Mitigation Plan as deemed appropriate.

Passed and approved this 31 Day of July, 2019, by the CITY/TOWN Council of Creston located in Lincoln County, Washington.

Robert R. Felice

By:
Mayor
City/Town of Creston

Kimberly J. Wagner

Attested by:
Clerk
City/Town of Creston

Town of Odessa Resolution of Adoption

RESOLUTION OF ADOPTION BY THE

CITY/TOWN OF Odessa

RESOLUTION NO. 2019-08

A resolution of the CITY/TOWN of Odessa declaring support and adoption of the Lincoln County Hazard Mitigation Plan.

WHEREAS, the CITY/TOWN Council of Odessa has participated in the development of and supports the Lincoln County Hazard Mitigation Plan, and

WHEREAS, the Lincoln County Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the CITY/TOWN Council of Odessa, and

THEREFORE, be it resolved, that the CITY/TOWN Council of Odessa, does hereby adopt and will facilitate the implementation of the Lincoln County Hazard Mitigation Plan as deemed appropriate.

Passed and approved this 12th Day of August, 2019, by the CITY/TOWN Council of Odessa located in Lincoln County, Washington.

Wini Crush
By:
Mayor
City/Town of Odessa

Denise Smead
Attested by:
Clerk
City/Town of Odessa

Town of Reardan Resolution of Adoption

RESOLUTION OF ADOPTION BY THE

CITY/TOWN OF Reardan

RESOLUTION NO. _____

A resolution of the CITY/TOWN of Reardan declaring support and adoption of the Lincoln County Hazard Mitigation Plan.

WHEREAS, the CITY/TOWN Council of Reardan has participated in the development of and supports the Lincoln County Hazard Mitigation Plan, and

WHEREAS, the Lincoln County Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the CITY/TOWN Council of Reardan, and

THEREFORE, be it resolved, that the CITY/TOWN Council of Reardan, does hereby adopt and will facilitate the implementation of the Lincoln County Hazard Mitigation Plan as deemed appropriate.

Passed and approved this 15 Day of August, 2019, by the CITY/TOWN Council of Reardan located in Lincoln County, Washington.

Maif E. Daniels
By:
Mayor
City/Town of Reardan

Kristy J.
Attested by:
Clerk
City/Town of Reardan

Town of Wilbur Resolution of Adoption

RESOLUTION OF ADOPTION BY THE

CITY/TOWN OF WILBUR

RESOLUTION NO. 479

A resolution of the CITY/TOWN of WILBUR **declaring support and adoption of the Lincoln County Hazard Mitigation Plan.**

WHEREAS, the CITY/TOWN Council of WILBUR has participated in the development of and supports the Lincoln County Hazard Mitigation Plan, and

WHEREAS, the Lincoln County Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the CITY/TOWN Council of WILBUR, and

THEREFORE, be it resolved, that the CITY/TOWN Council of WILBUR, does hereby adopt and will facilitate the implementation of the Lincoln County Hazard Mitigation Plan as deemed appropriate.

Passed and approved this 7 Day of AUGUST, 2019, by the CITY/TOWN Council of WILBUR located in Lincoln County, Washington.



By:
Mayor
City/Town of WILBUR



Attested by:
Clerk
City/Town of WILBUR

Lincoln Hospital District Resolution of Adoption

RESOLUTION OF ADOPTION BY THE

Lincoln County Public Hospital Dist. #3

RESOLUTION NO. 19-08

A resolution of the Lincoln County Hospital Dist. #3 declaring support and adoption of the Lincoln County Hazard Mitigation Plan.

WHEREAS, the Lincoln County Hospital Dist. #3 has participated in the development of and supports the Lincoln County Hazard Mitigation Plan, and

WHEREAS, the Lincoln County Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the Lincoln County Hospital Dist. #3 and

THEREFORE, be it resolved, that the Lincoln County Hospital Dist. #3, does hereby adopt and will facilitate the implementation of the Lincoln County Hazard Mitigation Plan as deemed appropriate.

Passed and approved this 19 Day of September, 2019, by the

Lincoln County Hospital Dist. #3 located in Lincoln County, Washington.

RoxAnn Sherwood
By:

RoxAnn Sherwood
Printed Name

Laura Riendeau
Attested by:

Laura Riendeau
Printed Name

Odessa Memorial Healthcare Center Resolution of Adoption

RESOLUTION OF ADOPTION BY THE

Lincoln County Public Hospital Dist. #3

RESOLUTION NO. 19-08

A resolution of the Lincoln County Hospital Dist. #3 declaring support and adoption of the Lincoln County Hazard Mitigation Plan.

WHEREAS, the Lincoln County Hospital Dist. #3 has participated in the development of and supports the Lincoln County Hazard Mitigation Plan, and

WHEREAS, the Lincoln County Hazard Mitigation Plan will be utilized as a guide for planning as related to the FEMA Pre-Disaster Mitigation program as well as other purposes as deemed appropriate by the Lincoln County Hospital Dist. #3 and

THEREFORE, be it resolved, that the Lincoln County Hospital Dist. #3, does hereby adopt and will facilitate the implementation of the Lincoln County Hazard Mitigation Plan as deemed appropriate.

Passed and approved this 19 Day of September, 2019, by the

Lincoln County Hospital Dist. #3 located in Lincoln County, Washington.

RoxAnn Sherwood
By:

RoxAnn Sherwood
Printed Name

Laura Riendeau
Attested by:

Laura Riendeau
Printed Name

Fire District/Agency Signatures

Mitch Lowry, Chief

Lincoln County F. P. D. #1




Date

8/10/16

Roger Sebesta, Chief

Lincoln County F. P. D. #3



Date

9-27-16

Ryan Rettkowsky, Chief

Lincoln County F. P. D. #4

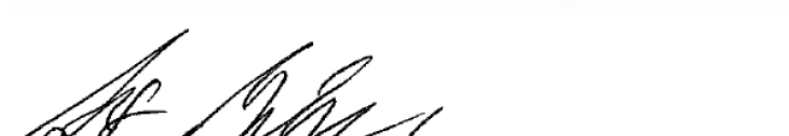


Date

7-25-16

Craig Sweet, Chief

Lincoln County F. P. D. #5



Date

9/30/16

Scott McGowan, Chief

Lincoln County F. P. D. #6



Date



Kevin Coffman, Chief
Wilbur Station, Lincoln County F. P. D. #7

8-1-16

Date



Pat Rosman, Chief
Creston Station, Lincoln County F. P. D. #7

7/22/16

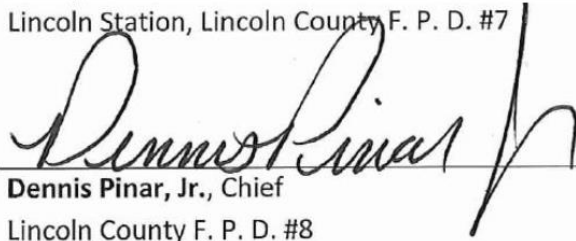
Date



Jim Derrer, Chief
Lincoln Station, Lincoln County F. P. D. #7

9/27/16

Date



Dennis Pinar, Jr., Chief
Lincoln County F. P. D. #8

9-5-16

Date



C. Ronald Rosendy, Commissioner
Lincoln County F. P. D. #9

9-30-16

Date

Elsa Bowen

Elsa Bowen, District Manager
Lincoln County Conservation District

8.26.2016

Date

Wade W. Magers

Wade W. Magers, Sheriff
Lincoln County Sheriff's Office

8-26-16

Date

Lindsey Babcock

Lindsey Babcock, Border Resource Manager
Spokane District Bureau of Land Management

9/20/2016

Date

Aaron Everett

Aaron Everett, Deputy Supervisor,
Forest Practices and Federal Relations, State Forester,
Washington State Department of Natural Resources

1/4/17

Date

Planning Committee Minutes

February 1, 2018 – Lincoln County Courthouse

- Meeting called by Sheriff Wade Magers, Lincoln County, WA, and facilitated by Bill Matthews and Tera King, of Northwest Management, Inc.

Agenda Item #1 – Introductions

Wade Magers, Lincoln County Emergency Manager/Sheriff, opened the meeting with a brief introduction to the status of the Lincoln County HMP and FEMA standing. He then asked each person in attendance to introduce themselves.

Agenda Item #2 – NMI Presentation: Project Purpose and Scope

Bill Matthews of NMI gave a presentation explaining the purpose of the HMP, the process of updating it, and some of the things the county and each jurisdiction would need to do to adopt the update. Some aspects of the existing plan were discussed, such as the Phase 1 Hazard Assessment.

Throughout the presentation, questions and comments were raised by different people in attendance:

- It was brought to the attention of the planning team that Courtney at Public Works has updated GIS information and maps that will be useful in the updating process for this plan, including utility layers.
- Questions were raised as to how this plan and possible subsequent funding could help with natural disaster emergencies in the future. Two primary examples were discussed, including:
 - The recent flooding in the town of Sprague
 - The landslides on Porcupine Bay Road that washed out parts of the road
- There are areas, such as Baldrige, where there is only one evacuation route possible for residents. Residents of Baldrige have gathered and discussed evacuation planning on their own.
- Due to recent events, concerns were raised regarding landslides and roads. Representatives from Public Works expressed interested in seeing details added to hazard planning maps that examine landslide vulnerability.
- The most recent disaster declarations in Lincoln County were discussed.

Agenda Item #3 – Future Meetings and Involvement

The committee discussed the format for future meetings. This meeting was open to the public and it was agreed to continue to invite the public to each planning meeting. Possible ways to better promote the meetings were discussed. This meeting was well-advertised, but some people present at the meeting agreed to help spread the word about future meetings.

Sheriff Magers emphasized that each adopting jurisdiction needed a presence at the planning meetings. Some people in attendance thought it might be valuable to vary meeting locations and spread them out across the county. Survey Monkey was brought up as another possible way to give either the public or the various jurisdictions more opportunities to contribute.

Agenda Item #4 – Draft Review

The next meeting date was not yet established, but the format was agreed upon. NMI will provide an updated, working draft of the HMP for each member of the committee to review. This draft will include

updates to community profiles, time-sensitive data and information, updated references, and any other necessary updates added to the existing plan. Sheriff Magers will compile a list of community/agency representatives and stakeholders who should be presented with a copy of the working draft for review.

The committee will then convene for a workshop-style planning session where the working draft will be reviewed, discussed and amended. Representatives from the adopting jurisdictions will be expected to attend and contribute to mitigation goals, possible future projects, and feedback from past experiences. This will not be part of the formal public-comment period, however, this meeting will be open to the public.

Agenda Item #5 – Timeline

The next planning meeting date was not established but is expected to take place in late February or early March. This meeting will use the workshop-style format, led by NMI. A representative of Lincoln County Public Works will plan to take NMI consultants on a tour of the landslide-affected areas in Porcupine Bay before the next meeting.

Based on expected continuity from the existing plan to the update, the planning committee expects to have a completed draft ready for proposal in the fall of 2018.

March 27th, 2018 – Lincoln County Courthouse

- Meeting called by Sheriff Wade Magers, Lincoln County, WA. Sheriff Magers opened the meeting with a brief summary of the Hazard Mitigation Plan update process. He then asked everyone in attendance to introduce themselves before turning the meeting over to Brad Tucker of Northwest Management, Inc (NMI).

Agenda Item #1 – Old Business

Brad Tucker began by explaining that he will be taking over as the lead on this project. He reviewed where Lincoln County stands in the update process and discussed how the recently-updated Community Wildfire Protection Plan will be integrated into this HMP. Brad also talked about the role that the committee members can play throughout the process and mentioned some ways that adopting jurisdictions will be asked to contribute.

Agenda Item #2 – Workshop

Adam Herrenbruck of NMI handed out draft copies of chapters 3-6 of the HMP. The draft copies were largely made up of content from the last update. Some areas had already been updated with current census data, event history, climatic data, and other information that has changed since the last update of the HMP. Below is a detail for the chapter reviews.

Chapter 3: Lincoln County Characteristics

- Adam explained how much of this information (especially history, geography, etc.) has not changed since the last HMP update. Changes to this draft were made for clarity of language, layout, document flow, etc.
- Updated data and information was applied where applicable.
 - Population and demographics
 - Income and employment
 - Economic Characteristics
- Adam discussed how the *Development Trends* section of chapter 3 is critical to understanding vulnerability and risk, and that feedback is very helpful.

Chapter 4: Regional and Local Hazard Profiles

- This chapter was covered very briefly as much of the information is still applicable today.
- Most of the changes made to this chapter are related to dates and past events.
- A question was raised on the possibility of adding hazards to this plan that go beyond the scope of “natural” hazards, such as technological hazards. The idea was briefly discussed but no action was made to include any more hazards at this time.

Chapter 5: Jurisdictional Risk and Vulnerability Assessment

- Changes already applied to this chapter were highlighted for the committee to review. Some of these changes include:
 - Language specific to the 2018 five-year update
 - Recent significant events highlighted in the *Local Event History* section
- The committee members were asked to review sections within this chapter applicable to their own jurisdiction to provide feedback that could be very important to updating any changes to the vulnerability assessment. Some of this feedback might include:
 - GIS data and mapping information

- Critical or susceptible areas to higher impacts from hazards
- Details of recent significant hazard events (dates, losses, impacts, etc.)
- Current property values and other updates to the *Value of Resources at Risk* section

Chapter 6: Jurisdictional Mitigation Strategies

- The mitigation strategies section of chapter 6 was introduced to the committee with the intention of encouraging them to think about:
 - Past projects that have been completed or are no longer needed
 - Current projects that are ongoing or are still needing implementation
 - Future projects or new mitigation strategy ideas that can be addressed in this plan
- The committee reviewed the mitigation strategies for Lincoln County from the last HMP update as a group and discussed several changes to this section.
- The committee members were asked to review the rest of the mitigation strategies, especially those applicable to each member's jurisdiction and provide feedback.

Agenda Item #3 – Committee Review and Homework

Each member was asked to review the chapters discussed at this meeting and provide feedback wherever applicable to the planning team by April 13, 2018. Some members of the committee stated they will need to consult with colleagues who are also involved in the planning process and they will provide detailed feedback.

Agenda Item #4 – New Business

- Courtney Thompson of Lincoln County Land Services was identified as someone who will provide GIS data and mapping information for the HMP update, especially regarding vulnerability.
- Ed Dzedzy of the Lincoln County Health Department discussed a strategy to include the recently updated hospital plans into the HMP update. He will work on the details with hospital officials.
- Jason Schumacher of Public Works will review the information in chapters 5-6 with his department so that the most current figures and information is used.
- Elsa Bowen of the Lincoln County Conservation District will discuss annual updates to the CWPP with the planning committee for that plan. This will ensure the most recent updates are applied when the CWPP is implemented into the HMP update.
- Some members of the planning committee, specifically individuals from NMI and Lincoln County Public Works, still plan to make a field visit to the site of the landslide at Porcupine Bay. No specific date and time were set, but the field visit might take place around the time of the next planning-committee meeting.

Agenda Item #5 -- Timeline

The next meeting is scheduled for Tuesday, May 22 at 10:00 a.m. in the Lincoln County Commissioner Chambers in Davenport.

June 5th, 2018 – Lincoln County Courthouse

Opening: Sheriff Wade Magers opened the meeting with a brief summary of the Hazard Mitigation Plan update process and where in that process Lincoln County currently sits. He then asked everyone in attendance to introduce themselves before turning the meeting over to Brad Tucker of Northwest Management, Inc.

Agenda Item #1 – Old Business

Brad reviewed the items discussed at the previous meeting beginning with chapters 3-5 of the HMP. He asked if there were any questions, additional comments, or any kind of feedback regarding chapters 3 through 5.

Brad then handed out copies of the Mitigation Strategies from the HMP and led a review of all the currently-stated action items in the HMP. Because Lincoln County mitigation strategies were discussed in detail at the previous meeting, the discussion was primarily focused on the other jurisdictions, beginning with Davenport. Because no representatives from the hospital district or the health center were present at this meeting, those action items were not discussed.

The review of each jurisdiction's mitigation strategies led to a discussion regarding the sharing of resources throughout the county. This discussion was initiated by Jeff Evers from the town of Reardan but there was significant input among all planning-team members. The idea was that each jurisdiction could be more proactive in pre-disaster planning.

Agenda Item #2 – Hazard Summary

Brad presented the planning team with a worksheet that examines each hazard and rates the hazards based on frequency of occurrence and magnitude of impact. The purpose of this worksheet is to ensure that the hazards addressed in the HMP update are still viewed under the same lens today as they were when the last HMP draft was written. Brad asked the planning team to consider whether or not the frequency and magnitude ratings of each hazard have changed in the last five years for Lincoln County.

After some discussion, the consensus of the planning team was that the hazards addressed, and the ratings of frequency and magnitude have not changed significantly. It is more important to the planning team to update the recent events and describe the impacts felt from those events.

Agenda Item #3 -- Homework

Brad reminded the group that he needs comments on previous chapters, action items and capability assessments from each adopting jurisdiction.

Agenda Item #4 – Timeframe moving forward

It was decided that the next meeting should be held in August. Phil from Lincoln County Public Works suggested that the meeting be held on a day other than Tuesday so that some individuals who do not work on Tuesdays or are already committed on Tuesdays would be able to attend. The plan for the August meeting is to have draft completed for the planning team to provide feedback on.

August 28th, 2018 – Lincoln County Courthouse

Opening: Sheriff Wade Magers opened the meeting with a brief summary of the Hazard Mitigation Plan update process and where in that process Lincoln County currently sits. He then asked everyone in attendance to introduce themselves before turning the meeting over to Brad Tucker of Northwest Management, Inc.

Agenda Item #1 – Old Business

Brad reviewed the items discussed at the previous meeting beginning with the Action Items. He asked if there were any questions, additional comments, or any new items that jurisdictions want to add.

Brad also reminded the group that adopting jurisdictions need to complete their capability assessments and turn them into Brad by September 12th.

Agenda Item #2 – Conservation District

The group discussed adding the Lincoln County Conservation District to the Plan as an adopting jurisdiction. The Conservation District turned in their capability assessment and MOA at the meeting. Brad said that he could add this new jurisdiction before the Final Draft of the Plan was ready for review. The planning team agreed to add them.

Agenda Item #3 -- Final Draft

Brad explained the review process for the Final Draft. Once the final draft is ready, Brad will send it to the Planning Team for review. When the Planning Team is finished reviewing the plan it will then be opened to the public for review. Next it is sent to the Washington Emergency Management Division for review. Finally, it is sent to FEMA for review and approval pending local adoption. Brad explained this entire review process could take 2-3 months depending on how busy the state and FEMA are with reviewing other plans.

The group discussed the time that they wanted to review the Final Draft and then the time that they wanted to allow for the public to review the Plan. It was decided that the Planning Team would take two weeks and allow the public to have two weeks for comment.

Agenda Item #4 – Homework

Brad asked for the adopting jurisdictions to turn in any outstanding information (MOAs, capability assessments and action items) to him before September 12th.

Agenda Item #5 -- Schedule

Brad would try to have the Final Draft ready for the Planning Team to review on September 28th. The Planning Team would then have until October 12th to review the draft. The public review phase would start on October 18th and end on November 1st.

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Capability Assessments

Table 7.1. Lincoln County Capability Assessment

PLANNING and REGULATORY		
PLANS	Yes/No Year	Does the plan address hazards? Does the plan ID projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Capital Improvements Plan		
Community Wildfire Protection Plan	Yes/2016	The Plan addresses wildfire and identifies prioritized projects to mitigate wildfire. The plan is designed to be used as implementation guide.
Comprehensive /Master Plan	Yes/2018	Comprehensive Land Use Plan
Continuity of Operations Plan		
Economic Development Strategy	Yes/2012	No, No, No
Comprehensive Emergency Management Plan	Yes/2013	The plan addresses emergency response. The plan does not identify projects nor is it able to be used to implement mitigation actions.
Stormwater Management Plan	No	No Countywide. Each formal project we do has a SMP to cover construction only
Transportation Plan	No	Does not address potential hazards
BUILDING CODES, PERMITTING, INSPECTIONS	Yes/No	What type of codes? Are codes adequately enforced?
Building Codes	Yes	IBC/IRC etc.
Site plan review requirements	Yes	The process is being fine –tuned...
LAND USE PLANNING & ORDINANCES	Yes/No	Is the ordinance effective for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Floodplain ordinance	Yes	Min standards
Subdivision ordinance	Yes	Yes, Yes
Zoning ordinance	Yes	Yes, Yes (no dedicated code enforcement...)
ADMINISTRATIVE and TECHNICAL		
ADMINISTRATION	Yes/No	Describe capability. Is coordination effective?
Mutual aid agreements		
Planning Commission	Yes	Review plan & code updates (hearing examiner does CUP's, Plats etc)
TECHNICAL STAFF	Yes/No FT/PT	Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective? Have skills/expertise been used to assess/mitigate risk in the past?

Building Official	Yes/FT	No official training on hazards & mitigation
Community Planner	Yes/PT	No official training on hazards & mitigation
Emergency Manager	Yes/FT	The County Sheriff serves as the Emergency Manager, highly trained and experienced individual about emergency response and education.
Engineer	Yes/PT	
Floodplain Manager/Administrator		
GIS/HAZUS Coordinator	Yes/FT	The GIS Data and Maps Division falls under the County Building & Land Services Department
Grant Writer		
FINANCIAL		
FINANCIAL	Yes/No	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding		Doubtful
Community Development Block Grant		
Authority to levy taxes for specific purposes		
Impact fees for new development	No	Have talked about implementing this
Incur debt through special tax bond		
Incur debt through general obligation bonds		
EDUCATION and OUTREACH		
PROGRAM / ORGANIZATION	Access / Eligibility (Yes/No)	Describe program/organization and how it relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Firewise Communities certification		
Storm Ready certification		
Citizens group focused on emergency preparedness, environmental protection, etc.		
Public education/information programs (fire safety, household preparedness, responsible water use, etc)		
Public-private partnership initiatives addressing disaster-related issues		

Table 7.2. Town of Creston Capability Assessment.

PLANNING and REGULATORY		
PLANS	Yes/No Year	Does the plan address hazards? Does the plan ID projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Capital Improvements Plan	yes	Mayor of Creston, WA.
Community Wildfire Protection Plan	Yes	Fire Chief
Comprehensive /Master Plan	Yes	Mayor
Continuity of Operations Plan	Yes	Mayor
Economic Development Plan	Yes	Mayor
Emergency Operations Plan	Yes	Mayor & Fire chief
Stormwater Management Plan	No	
Transportation Plan	No	
BUILDING CODES, PERMITTING, INSPECTIONS	Yes/No	What type of codes? Are codes adequately enforced?
Building Codes	Yes 2002	Washington State
Site plan review requirements	No	
LAND USE PLANNING & ORDINANCES	Yes/No	Is the ordinance effective for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Floodplain ordinance	Yes	
Subdivision ordinance	No	
Zoning ordinance	Yes	
ADMINISTRATIVE and TECHNICAL		
ADMINISTRATION	Yes/No	Describe capability. Is coordination effective?
Mutual aid agreements	Yes	
Planning Commission	Yes	Mayor & 2 Council board
TECHNICAL STAFF	Yes/No FT/PT	Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective? Have skills/expertise been used to assess/mitigate risk in the past?
Building Official	Yes	Mayor
Community Planner	No	
Emergency Manager	No	
Engineer	Yes	Varella & Assc. Jesse Cowger

Floodplain Manager/Administrator	No	
GIS/HAZUS Coordinator	No	
Grant Writer	No	
FINANCIAL		
FINANCIAL	Yes/No	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	No	
Community Development Block Grant	Yes	Planning Infrastructure
Authority to levy taxes for specific purposes	Yes	Town council
Impact fees for new development	No	
Incur debt through special tax bond	No	
Incur debt through general obligation bonds	Yes	Non Voted bonds, Sewer, Water
EDUCATION and OUTREACH		
PROGRAM / ORGANIZATION	Access / Eligibility (Yes/No)	Describe program/organization and how it relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Firewise Communities certification	No	
Storm Ready certification	No	
Citizens group focused on emergency preparedness, environmental protection, etc.	No	
Public education/information programs (fire safety, household preparedness, responsible water use, etc)	No	
Public-private partnership initiatives addressing disaster-related issues	No	

Table 7.3. Town of Odessa Capability Assessment.

PLANNING and REGULATORY		
PLANS	Yes/No Year	Does the plan address hazards? Does the plan ID projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Capital Improvements Plan	Yes/1998	No, no, yes
Community Wildfire Protection Plan	Yes,2015	Yes, yes, yes
Comprehensive /Master Plan	Yes 1998	Yes, No, No
Continuity of Operations Plan	Yes,2010	Yes, No, No
Economic Development Plan	Yes,2010	No, No, No
Emergency Operations Plan	Yes,2010	Yes, No, No
Stormwater Management Plan	Yes,2010	Yes, No, No
Transportation Plan	Yes,2010	No, No, Maybe
BUILDING CODES, PERMITTING, INSPECTIONS	Yes/No	What type of codes? Are codes adequately enforced?
Building Codes	Yes	2015 WA State Bldg. Code, No, Not sure
Site plan review requirements	Yes	Zoning Codes
LAND USE PLANNING & ORDINANCES	Yes/No	Is the ordinance effective for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Floodplain ordinance	Yes	Yes, Yes
Subdivision ordinance	Yes	Yes, Yes
Zoning ordinance	Yes	Yes, Yes
ADMINISTRATIVE and TECHNICAL		
ADMINISTRATION	Yes/No	Describe capability. Is coordination effective?
Mutual aid agreements	Yes	Fire Dept, Police Dept, Hospital, Yes
Planning Commission	Yes	Recommendation to Town Council, Yes
TECHNICAL STAFF	Yes/No FT/PT	Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective? Have skills/expertise been used to assess/mitigate risk in the past?
Building Official	Yes, PT	No, Yes, No
Community Planner	No	
Emergency Manager	No	
Engineer	Yes, FT	Contract Engineering Services – Century West

Floodplain Manager/Administrator	No	
GIS/HAZUS Coordinator	No	
Grant Writer	No	
FINANCIAL		
FINANCIAL	Yes/No	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Yes	Yes
Community Development Block Grant	Yes	Yes
Authority to levy taxes for specific purposes	Yes	General Fund
Impact fees for new development		
Incur debt through special tax bond	Yes	Yes, No
Incur debt through general obligation bonds	Yes	Yes, Yes
EDUCATION and OUTREACH		
PROGRAM / ORGANIZATION	Access / Eligibility (Yes/No)	Describe program/organization and how it relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Firewise Communities certification	No	
Storm Ready certification	No	
Citizens group focused on emergency preparedness, environmental protection, etc.	Yes	Volunteer Fire Fighters -Fire Emergency / Yes EMTs take care of medical emergencies / Yes
Public education/information programs (fire safety, household preparedness, responsible water use, etc)	Yes	The Town notes on Utility Bills, occasionally, for water conservation / NO
Public-private partnership initiatives addressing disaster-related issues	Yes	Lincoln Emergency Services Operation

Table 7.4. Town of Wilbur Capability Assessment.

PLANNING and REGULATORY		
PLANS	Yes/No Year	Does the plan address hazards? Does the plan ID projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Capital Improvements Plan	Yes/2018	No, No, Yes
Community Wildfire Protection Plan	No	
Comprehensive /Master Plan	Yes/2017	No
Continuity of Operations Plan	No	
Economic Development Plan	No	
Emergency Operations Plan	Yes/2004	Yes, Lincoln County Emergency Plan
Stormwater Management Plan	No	
Transportation Plan	No	
BUILDING CODES, PERMITTING, INSPECTIONS	Yes/No	What type of codes? Are codes adequately enforced?
Building Codes	Yes	ICBO, Uniform Building Code, Yes
Site plan review requirements	Yes	Zoning Codes, Yes
LAND USE PLANNING & ORDINANCES	Yes/No	Is the ordinance effective for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Floodplain ordinance	Yes/2000	Yes, Yes
Subdivision ordinance	Yes/1982	Yes, Yes
Zoning ordinance	Yes/1980	Yes, Yes
ADMINISTRATIVE and TECHNICAL		
ADMINISTRATION	Yes/No	Describe capability. Is coordination effective?
Mutual aid agreements	Yes	
Planning Commission	Yes	Recommendations
TECHNICAL STAFF	Yes/No FT/PT	Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective? Have skills/expertise been used to assess/mitigate risk in the past?
Building Official	Yes/PT	No, Yes
Community Planner	No	
Emergency Manager	No	
Engineer	Yes	Contract Engineering Service, Belsby Engineering

Floodplain Manager/Administrator	No	
GIS/HAZUS Coordinator	No	
Grant Writer	No	Department Heads and Mayor
FINANCIAL		
FINANCIAL	Yes/No	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Yes	?, Yes
Community Development Block Grant	Yes	Yes, Yes
Authority to levy taxes for specific purposes	Yes	
Impact fees for new development	No	
Incur debt through special tax bond	?	
Incur debt through general obligation bonds	?	
EDUCATION and OUTREACH		
PROGRAM / ORGANIZATION	Access / Eligibility (Yes/No)	Describe program/organization and how it relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Firewise Communities certification	No	
Storm Ready certification	No	
Citizens group focused on emergency preparedness, environmental protection, etc.	No	
Public education/information programs (fire safety, household preparedness, responsible water use, etc)	No	
Public-private partnership initiatives addressing disaster-related issues	No	

Table 7.5. Lincoln County Conservation District Capability Assessment.

PLANNING and REGULATORY		
PLANS	Yes/No Year	Does the plan address hazards? Does the plan ID projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Capital Improvements Plan	NO	
Community Wildfire Protection Plan	YES	LCCD Chairman of CWPP
Comprehensive /Master Plan	NO	
Continuity of Operations Plan	NO	
Economic Development Plan	NO	
Emergency Operations Plan	NO	
Stormwater Management Plan	NO	
Transportation Plan	NO	
BUILDING CODES, PERMITTING, INSPECTIONS	Yes/No	What type of codes? Are codes adequately enforced?
Building Codes	NO	
Site plan review requirements	NO	
LAND USE PLANNING & ORDINANCES	Yes/No	Is the ordinance effective for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Floodplain ordinance	NO	
Subdivision ordinance	NO	
Zoning ordinance	NO	
ADMINISTRATIVE and TECHNICAL		
ADMINISTRATION	Yes/No	Describe capability. Is coordination effective?
Mutual aid agreements	NO	
Planning Commission	NO	
TECHNICAL STAFF	Yes/No FT/PT	Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective? Have skills/expertise been used to assess/mitigate risk in the past?
Building Official	NO	
Community Planner	NO	
Emergency Manager	NO	
Engineer	NO	

Floodplain Manager/Administrator	NO	
GIS/HAZUS Coordinator	NO	
Grant Writer	YES	LCCD Staff
FINANCIAL		
FINANCIAL	Yes/No	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	NO	
Community Development Block Grant	NO	
Authority to levy taxes for specific purposes	NO	
Impact fees for new development	NO	
Incur debt through special tax bond	NO	
Incur debt through general obligation bonds	NO	
EDUCATION and OUTREACH		
PROGRAM / ORGANIZATION	Access / Eligibility (Yes/No)	Describe program/organization and how it relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Firewise Communities certification	YES	LCCD works with DNR and WA FAC
Storm Ready certification	NO	
Citizens group focused on emergency preparedness, environmental protection, etc.	YES	LCCD works with DNR, Conservation Commission, BLM, WA FAC & Fire Districts
Public education/information programs (fire safety, household preparedness, responsible water use, etc)	YES	Year round and as grants become available
Public-private partnership initiatives addressing disaster-related issues	YES	LCCD partners with numerous agencies/districts

Record of Meeting Attendance

The following is a record of the attendance taken at each of the committee and public meetings held during the Multi-Hazard Mitigation Planning process.

Figure 7.1. Committee Meeting Sign-in Sheet for February 1st, 2018.

LINCOLN COUNTY HAZARD MITIGATION MEETING				
Project: Hazard Mitigation Plan Update			Meeting Date: 2/1/2018	
Facilitator: Northwest Management			Place/Room: County Commissioner's Chambers	
Name	Title	Company / Department	Phone	E-Mail
Bill Mathews	Analyst	NMI	208-941-6409	Mathews@NMI2.com
Ryan Rutkowski	Dist Chief	Lincoln 4	509-979-3371	LCfire4@centurytel.net
CASEY NOWNENMACHY	Com	Lincoln 4	509 796-3776	CASEY.NOWNENMACHY@GMAIL.COM
Wade Magers		DEM		
Jeffrey Adams	Assistant	Reardan	509 796 3921	
Jason Schumacher	Emergency Services	Lincoln County	509 725 7041	jschumacher@co.lincoln.or.us
Dick Meyer	Operations/Security	" "	509-725-7041	dmeyer@co.lincoln.or.us
Steve Guemmel	City Admin	City of Reardan	509 725-4352	sjguemmel@centurytel.net
Adam Herrenbruch	Resource Prof.	NMI	(509) 330 0240	herrenbruch@nmi2.com
Jim MITCHELL	CITIZEN		509 993-3235	CAPTJIM70@HOTMAIL.COM

Figure 7.2. Committee Meeting Sign-in Sheet for March 27th, 2018.
Lincoln County MHMP Update Meeting
 March 27th, 2018

Name	Jurisdiction/Agency	Phone	Email
Brad Tucker	Northwest Management	208-310-0320	tucker@nmi2.com
Colonia Kuchenbuch	Town of Willbur	509-641-0146	gdkook28@gmail.com
Christie Swicior	City of Sprague	509-257-2662	cityhall@sprague-wa.us
Steve Goemmel	City of Davenport	509-725-4352	s.jgoemmel@centurytel.net
Ross Felice	MAYOR OF CRESTON	509 710 9945	CRESTONMAN@YAHOO.COM
Jim MITCHELL	CITIZEN, DAVENPORT	509 725 0428	CAPTJIM70@HOTMAIL.COM
Elsa Bowen	LC Conservation District	509-725-4181	ebowen@wadistrict.net
Rob Reinbold	LCFPD #5	509-348-0253	reinbold@gmail.com reinbold@li.com
Jason Schumacher	Lincoln County P. Work	509 725 7041	j.schumacher@co.lincoln.wa.us
Scott McGowan	CITY OF HARRINGTON/LCFD #6	509 721 0200	SMCGOWAN2456@YAHOO.COM
Peter B. Davenport	Harrington City Council	(509) 348-0080 c	<davenport@nwlink.com>
Ed Dzedzy	Lincoln County Health Dept	509 725- ¹⁰⁶¹ 2000	edzedzy@co.lincoln.wa.us
Jeff Evers	Town of Reardan	796-3921	townofreardan@gmail.com
Wade Magers	Shear - EMD LSSO	509 721 0271	WMagers@co.lincoln.wa.us
Adam Herrenbruck	Northwest Management, Inc	(509) 330-0240	herrenbruck@nmi.com

Figure 7.3. Committee Meeting Sign-in Sheet for June 5th, 2018.

Lincoln County MHMP Update Meeting

June 5th, 2018

Name	Jurisdiction/Agency	Phone	Email
Brad Tucker	Northwest Management	208-310-0320	tucker@northwestmanagement.com
Adam Herrenbruck	Northwest Management	(509) 330-0290	herrenbruck@northwestmanagement.com
Elsa Bowen			
Dianna			
Ross Felice	CRESTON MAYOR	509 710 9945	CRESTONMAYOR@YAHOO.COM
Jim Mitchell	CITIZEN	509 993-3235	CAPTJIM70@HOTMAIL.COM
Steve Goemmel	Davenport	509 725-4352	sjgoemmel@Centurytel.net
Jeff Evers	Reardan	509 796-3721	townofreardan@gmail.com
Denise Smad	Odessa	509-982-2401	clerk@odessaoffice.com
TIMOTHY TIPTON	HARRINGTON	509-844-1794	timothytipton01@gmail.com
Colia Kuchenbuch	Wilbur	509-641-0146	gdkook28@gmail.com
Carol Paul	FPD #4	509-336-2207	Cvendla@hotmail.com
Lexi Behrens	City of Sprague	509-257-2662	cityhall@sprague-wa.us
OSCAR FRANCIS	TOWN OF OLANA	509-657-2662	
Scott McGowan	CITY OF HARRINGTON	509 721 2200	SMCGOWAN2456@YAHOO.COM
Wade Magers	Lincoln County DEM	509 255 9263	Wmagers@co.lincoln.wa.us

Figure 7.4. Reardan Public Meeting Sign-in Sheet on August 28th, 2018.
 Lincoln County MHMP Update Meeting
 August 28, 2018

Name	Jurisdiction/Agency	Phone	Email
Brad Tucker	Northwest Management	208-310-0320	tucker@nmi2.com
Colia Kuchenbuch	Mayor, Town of Wilbur	509-641-0146	gdkook28@gmail.com
Steve Goemmel	City of Davenport	725-4352	sjgoemmel@Centurytel.net
Lance Strite	Davenport Ambulance	721-0417	stritel@LHD3.org
MARIL STEDMAN	LINCOLN Co.	721-1829	mstedman@co.lincoln.wa.us
OSCAR W FRANCIS	TOWN OF OLANA	509-657-2662	TOWN OF OLANA
Scott McGowan	CITY OF HARRINGTON	509-721-0200	SMCGOWAN2456@YAHOO.COM
Shawn Coombs	CITY OF SPRAGUE	(509) 257-8494	cityhall@sprague-wa.us
Lexi Behrens	City of Sprague	509 257 2662	cityhall@sprague-wa.us
Ross Felice	TOWN OF CRESTON Mayor	509 710 9945	CRESTONMAYOR@YAHOO.COM
Jim MITCHELL	CITIZEN - DAVENPORT	509 993-3235	CAPTJIM70@HOTMAIL.COM
KEELY WATKINS	TOWN OF ODESSA	509-982-2401	COUNCILMEN9@ODESSAOFFICE.COM
Elsa Bowen	Lincoln County Conservation District	509-725-4151	ejebowen@wadistrict.com
Wade Magers	L.C.S.O.F.E.M.D	509 255 9263	Wmagers@co.lincoln.wa.us
Keith R Green	Parkcupine home	509-255-6808	kbzgreen1@gmail.com
Barbara Green	" "	" "	" "
Ed Dredzy	LC Health Dept	509 215 1023	edzedzy@co.lincoln.wa.us

Record of Published Articles

The following is a subset of Multi-Hazard Mitigation-related articles published in local newspapers during the planning process. A total of three specific press releases were sent at critical stages of the process; one to introduce the project and invite interested parties, one to announce the public meetings, and one to announce the availability of the document for public comment. Additionally, during the local adoption phase of the process, Lincoln County and city jurisdictions advertised the formal adoption of the Plan by resolution at a public hearing. The agendas for these meetings are published by the jurisdiction in the most appropriate local media outlet.

Figure 7.5. Odessa Record – March 15th, 2018

DAVENPORT (March 12, 2018) – Lincoln County has launched a project to update the Hazard Mitigation Plan. The next planning meeting is open to the public and will take place on March 27, 2018, at 10 a.m. at the chambers of the Lincoln County Commissioners.

This update will include integration of the existing Lincoln County Community Wildfire Protection Plan. Local agencies and organizations in Lincoln County have created a committee to complete the required five-year update of the document as part of the FEMA Pre-Disaster Mitigation program. The project is being funded through a grant from FEMA.

Northwest Management, Inc. has been retained by Lincoln County to provide risk assessments, hazard mapping, field inspections, interviews, and to collaborate with the planning committee to update the Plan. The committee includes representatives from local communities/municipalities, rural and wildland fire districts, Lincoln County Sheriff's Department, Washington Department of Natural Resources, conservation districts, Bureau of Land Management, highway districts, private landowners, area businesses, various Lincoln County departments, and others.

The public is encouraged to attend the upcoming meeting and learn about the hazard assessment process for flood, landslide, earthquake, severe weather, wildland fire, and others. Maps will be present to highlight potential risks at specific locations throughout the county. Based on these maps, potential mitigation activities will be created with the intent to reduce hazard-exposure and disaster-vulnerability of Lincoln County residents and communities.

For more information, or for those interested in attending, please contact Sheriff Wade Magers at 509-725-9264 or wmagers@co.lincoln.wa.us

The meeting will be held at 10 a.m. on Tuesday, March 27, 2018 at the chambers of the Lincoln County Commissioners at 450 Logan St. in Davenport.

Figure 7.6. Odessa Record – August 9th, 2018.

Davenport, Wash. (August 2, 2018) – Lincoln County launched a project to update the Hazard Mitigation Plan. The next planning meeting is open to the public and will take place on August 28, 2018, at 10 a.m. at the Board of County Commissioners Chambers.

This update will include integration of the existing Lincoln County Community Wildfire Protection Plan. Local agencies and organizations in Lincoln County have created a committee to complete the required five-year update of the document as part of FEMA's Pre-Disaster Mitigation program. The project is being funded through a grant from FEMA.

The public is encouraged to attend the upcoming meeting to express concerns or possible solutions for flood, landslide, earthquake, severe weather, wildland fire and others.

For more information or for those interested in attending, please contact:

Sheriff Wade Magers

509-725-9264

wmagers@co.lincoln.wa.us

Meeting date: 10 a.m., Tuesday, August 28, 2018

Meeting location: Board of County Commissioners Chambers, 450 Logan St., Davenport.

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Potential Funding Sources

Common Eligible Projects / Mitigation Programs	Points of Contact Federal / State	Fuels Reduction	Defensible Space	Property Elevation	Utility Undergrounding	Critical Facility Generator	Structural Retrofit	Other Infrastructure Retrofit ¹²²	Water Source Protection or Aquifer Recharge	Slope or Bank Stabilization	Feasibility Study, Mapping, and Design	Planning (Hazard Mitigation or Other)	Flood Risk Reduction Project	Other
BUILD Grants <i>Description: Grants support investments in surface transportation infrastructure and are to be awarded on a competitive basis for projects that will have a significant local/regional impact.</i>	U.S. Department of Transportation (USDOT)						✓	✓					✓	Stormwater Reduction
Building Blocks for Sustainable Communities <i>Description: This EPA program provides targeted, technical assistance to communities to develop resilience plans, development plans, sustainability strategies, etc.</i>	U.S. Environmental Protection Agency (EPA)										✓	✓		
Community Development Block Grants <i>Description: CDBG funds comprehensive plans, limited infrastructure planning/construction, feasibility studies, community action plans. Income and population restrictions apply.</i>	U.S. HUD / WA Department of Commerce						✓	✓			✓	✓		Low-Income Housing
Community Economic Revitalization Board <i>Description: CERB provides loan funding to local jurisdictions for public infrastructure to support private business growth and expansion.</i>	WA Department of Commerce						✓	✓						Public-Private Partnerships
Cooperating Technical Partnership Program <i>Description: The program creates partnerships between FEMA and qualified local and state partners to create, maintain, and publicize up-to-date flood and other hazard maps and data.</i>	Federal Emergency Management Agency (FEMA)										✓	✓		Outreach Data Collection and Analysis
Drinking Water State Revolving Fund <i>Description: The Drinking Water State Revolving Fund (DWSRF) provides loans to drinking water systems to pay for infrastructure improvements. In some cases, partial loan forgiveness is offered.</i>	WA Department of Health / WA Department of Commerce							✓	✓		✓			Drinking Water System Improvements
Emergency Watershed Protection Program <i>Description: Emergency recovery measures for runoff retardation and erosion prevention to</i>	Natural Resource Conservation Service (NRCS)							✓	✓	✓			✓	Erosion Prevention and Restoration

¹²² Other Infrastructure Retrofit includes many projects, such as water system seismic upgrades, bridge retrofits, and roadway retrofits.

Common Eligible Projects / Mitigation Programs	Points of Contact Federal / State	Fuels Reduction	Defensible Space	Property Elevation	Utility Undergrounding	Critical Facility Generator	Structural Retrofit	Other Infrastructure Retrofit ^{1,22}	Water Source Protection or Aquifer Recharge	Slope or Bank Stabilization	Feasibility Study, Mapping, and Design	Planning (Hazard Mitigation or Other)	Flood Risk Reduction Project	Other
relieve imminent hazards created by a natural disaster.														
Estuary and Salmon Restoration Program <i>Description:</i> ESRP provides funding restoration and protection efforts in Puget Sound, including projects such as flood storage, erosion control, and climate resilience measures.	Department of Fish and Wildlife (WA DFW)									✓			✓	Salmon Recovery Ecosystem Restoration
Firewise Fuel Mitigation Grant Program <i>Description:</i> The Fuel Mitigation Grant provides a cost share for communities engaged in defensible space and fuels reduction projects.	WA Department of Natural Resources	✓	✓											
Floodplains by Design <i>Description:</i> Floodplains by Design is the primary grant program for projects that reduce flood hazards while restoring the natural functions that Washington rivers and floodplains provide.	WA Department of Ecology							✓	✓	✓	✓	✓	✓	
Flood Mitigation Assistance Grant Program <i>Description:</i> FMA provides funding to local jurisdictions and states for projects and planning that reduces or eliminates long-term risk of flood damage to structures insured under the NFIP.	FEMA / WA Emergency Management			✓			✓	✓		✓	Advanced Assistance Only	✓	✓	
Hazard Mitigation Grant Program <i>Description:</i> HMGP is authorized statewide after a disaster declaration and is the most flexible of FEMA's three mitigation programs. Jurisdictions must have an approved hazard mitigation plan and projects must be cost effective.	FEMA / WA Emergency Management	✓	✓	✓	✓	✓	✓	✓	5% Initiative Only	✓	✓	✓	✓	Miscellaneous
Combined Water Quality Funding Program <i>Description:</i> Fund sources for projects associated with publicly-owned wastewater and stormwater facilities. The integrated program also funds nonpoint source pollution control activities.	U.S. EPA / WA Department of Ecology							✓	✓		✓			Drinking Water and Wastewater System Improvements

Common Eligible Projects / Mitigation Programs	Points of Contact Federal / State	Fuels Reduction	Defensible Space	Property Elevation	Utility Undergrounding	Critical Facility Generator	Structural Retrofit	Other Infrastructure Retrofit ^{1,22}	Water Source Protection or Aquifer Recharge	Slope or Bank Stabilization	Feasibility Study, Mapping, and Design	Planning (Hazard Mitigation or Other)	Flood Risk Reduction Project	Other
Post-Fire Hazard Mitigation Grant Program <i>Description:</i> Program authorized following a Fire Management Assistance Grant (FMAG) declaration. Program focuses on wildfire risk and post-fire risk mitigation, including fuels reduction and post-fire flood control projects. Program prioritizes the county receiving the FMAG declaration.	FEMA / WA Emergency Management	✓	✓			✓	✓	✓		✓	✓	✓		Post-Fire Ecological Restoration Culvert Upsizing Rain Gauges
Pre-Disaster Mitigation Grant Program <i>Description:</i> Annual program for cost-effective mitigation projects and plans. Jurisdiction must have a current mitigation plan to be eligible.	FEMA / WA Emergency Management	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	Miscellaneous
Public Works Board <i>Description:</i> Low-interest loans for pre-construction or new construction for replacement/repair of infrastructure for stormwater, solid waste, road, or bridge projects. Emergency loans are available for public projects made necessary by a disaster or imminent threat to public health and safety.	WA Department of Commerce				✓	✓	✓	✓		✓				
Rural Community Assistance Corporation <i>Description:</i> Water, wastewater, stormwater, and solid waste planning; environmental work; to assist in developing an application for infrastructure improvements for small, rural communities.	Rural Community Assistance Corporation										✓	✓		
Rural Water Revolving Loan Fund <i>Description:</i> The RWLF provides low-cost loans for short-term repair costs, small capital projects, or pre-development costs associated with larger projects to small, rural communities.	National Rural Water Association							✓	✓					Drinking Water and Wastewater System Improvements
Source Water Protection Grant Program <i>Description:</i> Projects and studies to identify solutions to source water protection problems, implement protection plans, or update data that directly benefits source water protection.	WA Department of Health / WA Department of Commerce							✓	✓		✓			
Washington Transportation Improvement Board	Transportation Improvement Board							✓					✓	

Common Eligible Projects / Mitigation Programs	Points of Contact Federal / State	Fuels Reduction	Defensible Space	Property Elevation	Utility Undergrounding	Critical Facility Generator	Structural Retrofit	Other Infrastructure Retrofit ^{1,22}	Water Source Protection or Aquifer Recharge	Slope or Bank Stabilization	Feasibility Study, Mapping, and Design	Planning (Hazard Mitigation or Other)	Flood Risk Reduction Project	Other
<i>Description:</i> TIB makes and manages street construction and maintenance grants to 320 cities and urban counties.														
Urban and Community Forest Program <i>Description:</i> Program provides technical, financial, research and educational services to local jurisdictions and organizations for the preservation, protection, and restoration of forestlands.	U.S. Department of Agriculture / WA Department of Natural Resources													Natural Resource Protection Public Information and Education

List of Acronyms

DOH	Washington Department of Health
EMD	Washington Military Department Emergency Management Division
FAA	Federal Aviation Administration
USDA	United States Department of Agriculture
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
NOAA	National Oceanic and Atmospheric Administration
FEMA	Federal Emergency Management Agency
DOT	Washington Department of Transportation
ARES	Amateur Radio Emergency Services
WSP	Washington State Police
WSU	Washington State University
ECY	Washington Department of Ecology
DNR	Washington Department of Natural Resources
BLM	Bureau of Land Management
NPS	National Park Service
USFS	United States Forest Service
ROS	Rate of Spread
WUI	Wildland Urban Interface
WFI	Wildland Fire Intensity
HFR	Historic Fire Regime
VCC	Vegetation Condition Class
NMI	Northwest Management, Incorporated

This plan was developed by Northwest Management, Inc. under contract with Lincoln County Emergency Management.

Copies of this Plan can be obtained by contacting:

Lincoln County Emergency Management Director
Lincoln County Emergency Management Department
PO Box 367 or 404 Sinclair
Davenport, Washington 99122
Phone: 509-725-9264

Citation of this work:

Tucker, Brad and A. Herrenbruck. *Lead Authors*. Lincoln County, Washington Hazard Mitigation Plan. Northwest Management, Inc., Moscow, Idaho. October 2019. Pp 360.



Northwest Management, Inc.
233 East Palouse River Drive
PO Box 9748
Moscow ID 83843

208-883-4488 Telephone

208-883-1098 Fax

NWManage@consulting-foresters.com

<http://www.NorthwestManagementInc.com/>