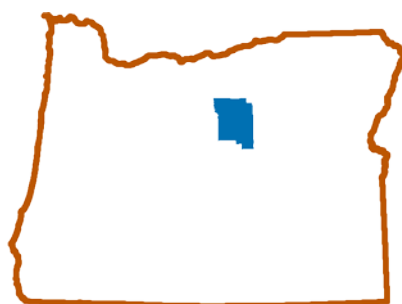




Wheeler County

MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

- Wheeler County
- City of Fossil



- City of Mitchell
- City of Spray



FEMA

December 13, 2019 through December 12, 2024

Prepared for:

Wheeler County Emergency Management Department

Prepared by:

Oregon Department of Land Conservation and Development

The *2019 Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan* is a living document that will be reviewed and updated periodically.

Comments, suggestions, corrections, and additions are enthusiastically encouraged to be submitted from all interested parties.

For further information and to provide comments, contact:

Mike Smith, Emergency Management Director

Wheeler County

701 Adams St.

P.O. Box 447

Fossil, OR 97830

Phone: (541) 763-4101

msmith@co.wheeler.or.us



OREGON
Department of
Land Conservation
& Development

SPECIAL THANKS & ACKNOWLEDGEMENTS

Wheeler County developed this Multi-Jurisdictional Natural Hazards Mitigation Plan through a regional partnership funded by the Federal Emergency Management Agency's Pre-Disaster Mitigation Grant Program (PDMC-PL-10-OR-2016-005). This project would also not have been possible without technical and financial support provided by the Oregon Department of Land Conservation and Development (DLCD).

Regional partners include:

- Oregon Department of Land Conservation and Development
- Oregon Military Department, Office of Emergency Management
- FEMA Region X

Project Steering Committee:

Valerie Howell, Mayor, City of Spray

Glenn Raber, Fire Chief, City of Mitchell Volunteer Fire Department

Matt Davis, Planner, Wheeler County Planning Department

Jeremiah Holmes, Fire Chief, City of Spray

Mike Smith, Sheriff, Wheeler County

Mitch Elliott, Coordinator, Wheeler County Emergency Management

Pat Farrell, Mayor, City of Mitchell

Carrol MacInnis, Mayor, City of Fossil

Lynn Morley, Judge, Wheeler County

Bill Potter, Public Works, City of Fossil

Rick Shaffer, Wheeler County Fire Defense Board Chief and Fire Chief, City of Fossil Volunteer Fire Department

Tom Spier, City of Spray

Mick Wright, Wheeler County Fire & Rescue

Project Manager:

Jason Gately, Oregon Department of Land Conservation and Development

Geographic Information Systems (GIS) Maps:

Randy Dana, Oregon Land Conservation and Development

Plan Template Disclaimer

This Natural Hazards Mitigation Plan update is based in part on a plan template developed by the University of Oregon's Institute for Policy Research and Engagement (IPRE) - Oregon Partnership for Disaster Resilience (OPDR) and used in the 2014 Wheeler County NHMP. OPDR provided copies of the plan templates to communities for use in developing or updating their natural hazards mitigation plans at that time. OPDR hereby authorizes the use of all content and language provided to Wheeler County in the plan template. The template is structured to address the requirements contained in 44 CFR 201.6; where language is applicable to communities throughout Oregon, OPDR encourages the use of standardized language. However, emphasis is placed on identifying and describing the unique attributes of the counties and cities for each plan. The basic format of the 2014 NHMP has been retained for this 2019 NHMP update.

About the Department of Land Conservation and Development

Oregon's statewide land use planning program — originated in 1973 under Senate Bill 100 — provides protection of farm and forest lands, conservation of natural resources, orderly and efficient development, coordination among local governments, and citizen involvement. The program affords all Oregonians predictability and sustainability to the development process by allocating land for industrial, commercial and housing development, as well as transportation and agriculture. The Department of Land Conservation and Development (DLCD) administers the program. A seven-member volunteer citizen board known as the Land Conservation and Development Commission (LCDC) guides DLCD. Under the program, all cities and counties have adopted comprehensive plans that meet mandatory state standards that address land use, development, housing, transportation, and conservation of natural resources. Periodic review of plans and technical assistance in the form of grants to local jurisdictions are key elements of the program.¹

¹ http://www.oregon.gov/LCD/Pages/about_us.aspx

**WHEELER COUNTY
MULTI-JURISDICTION
NATURAL HAZARDS MITIGATION PLAN**

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Executive Summary

Wheeler County developed this multi-jurisdictional Natural Hazards Mitigation Plan in an effort to prepare for the long term effects resulting from natural hazards. This plan was developed with and for the following jurisdictions: Wheeler County, the City of Fossil, the City of Mitchell, and the City of Spray. It is impossible to predict exactly when these hazards will occur, or the extent to which they will affect the community. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to create a resilient community that will benefit from long-term recovery planning efforts.

The Federal Emergency Management Agency (FEMA) defines mitigation as “the effort to reduce loss of life and property by lessening the impact of disasters through risk analysis, which results in information that provides a foundation for mitigation activities that reduce risk.” Said another way, natural

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

Relevant Federal Law (Code of Federal Regulations)

44 CFR 201.6 –

The local mitigation plan is the representation of the jurisdiction’s commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding.

Why Develop this Mitigation Plan?

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201 require that jurisdictions maintain an approved NHMP in order to receive federal funds for mitigation projects. Local and federal approval of this plan ensures that the county and listed cities will remain eligible for pre- and post-disaster mitigation project grants.

Relevant Federal Law (Code of Federal Regulations)

44 CFR 201.6(a)(1) –

A local government must have a mitigation plan approved pursuant to this section in order to receive HMGP project grants...

Who Participated in Developing the Plan?

The Wheeler County Natural Hazards Mitigation Plan is the result of a collaborative effort between the County, cities, special districts, citizens, public agencies, non-profit organizations, the private sector, and regional organizations. A project steering committee guided the plan development process. The project steering committee included representatives from the following organizations.

- City of Fossil
- City of Mitchell
- City of Spray
- Wheeler County Commissioner
- Wheeler County Emergency Management Department
- Wheeler County Fire & Rescue
- Wheeler County Judge
- Wheeler County Planning Department
- Wheeler County Public Works
- Wheeler County Sheriff's Office

Relevant Federal Law (Code of Federal Regulations)

44 CFR 201.6(c)(1) –

Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Wheeler County Emergency Management convened the planning process and will take the lead in implementing, maintaining, and updating the plan. Public participation played a key role in the development of goals and action items.

Public outreach began early on and in the spring of 2017 with a public kick off meeting of all the PDM 16 jurisdictions in The Dalles, OR. Public participation was also incorporated into every stage of the plan update process. All meetings were open to the public. Other forms of public involvement during the update process included:

Posting the official project flyer on Wheeler County social media and local city and county websites.

Staff from the Oregon Department of Land Conservation and Development (DLCD) attended the counties signature annual public event, the Wheeler County Fair and Rodeo, on August 2018. Staff talked informally with locals and distributed information about the project.

Draft chapters of the plan were posted on the Wheeler County Planning Department Website for comment.

How Does this Mitigation Plan Reduce Risk?

This natural hazard mitigation plan is intended to assist Wheeler County, the City of Fossil, the City of Mitchell, and the City of Spray reduce the risk from natural hazards by identifying resources, information, and strategies for risk reduction. It is also intended to guide and coordinate mitigation activities throughout the County. A risk assessment consists of three phases: hazard identification, vulnerability assessment, and risk analysis, as illustrated in the following graphic.

Relevant Federal Law (Code of Federal Regulations)
44 CFR 201.6(c)(2) – A Risk Assessment that provides the factual basis for activities proposed in the strategy.

Figure ES.1



Source: FEMA Local Mitigation Planning Handbook 2013.

By identifying and understanding the relationship between natural hazards, vulnerable systems, and existing capacity, communities in Wheeler County are better equipped to identify and implement actions aimed at reducing the overall risk to natural hazards.

What is the County’s Overall Risk to Hazards?

Wheeler County, the City of Fossil, the City of Mitchell, and the City of Spray jointly conducted a risk assessment to evaluate the probability of each hazard as well as the vulnerability of the community to that hazard. The Steering Committee identified eight natural hazards that could potentially have an impact on the county. These hazards include: drought, earthquake, flood, landslide/debris flow, volcanic event, wildfire, windstorm, and winter storm. As determined by the Steering Committee, Table ES.1 below summarizes the probability of a particular hazard impacting the county.

Table ES.1: Natural Hazard Probability Assessment Summary – Wheeler County

Threat Event/Hazard	Severity	Weight Factor	Subtotal	Probability
Drought	10	7	70	High
Earthquake	1	7	7	Low
Flood - Riverine	10	7	70	High
Landslide/Debris Flow	5	7	35	Medium
Severe Weather	10	7	70	High
Volcanic Event	1	7	7	Low
Wildfire (WUI)	10	7	70	High
Windstorm	5	7	35	Medium
Winter Storm	10	7	70	High

Source: Wheeler County NHMP Steering Committee, Updated March 29, 2018.

Vulnerability is a measure of the exposure of the built environment to hazards. The exposure of community assets to hazards are critical in the assessment of the degree of risk a community has to each hazard. Identifying the facilities and infrastructure at risk from various hazards can assist the county in prioritizing resources for mitigation, and can assist in directing damage assessment efforts after a hazard event has occurred. The exposure of county assets to each hazard and potential implications are explained in each hazard section.

Vulnerability is the percentage of population and property likely to be affected under an “average” occurrence of the hazard. Wheeler County evaluated the best available vulnerability data to develop the vulnerability scores presented below. For the purposes of this plan, the county utilized the Oregon Military Department, Office of Emergency Management Hazard Analysis methodology vulnerability definitions to determine hazard probability. The definitions are:

LOW = less than 1-percent affected scores between 0 and 3 points

MEDIUM = between 1 and 10-percent affected scores between 4 and 7 points

HIGH = more than 10-percent affected scores between 8 and 10 points

Table ES.2 presents the vulnerability scores for each of the natural hazards present in Wheeler County. As shown in the table, the county is highly vulnerable to the following hazards: drought, earthquake, flood, severe weather, volcanic events, wildfire, and winter storm.

Table ES.2: Community Vulnerability Assessment Summary – Wheeler County

Threat Event/Hazard	Severity	Weight Factor	Subtotal	Vulnerability
Drought	10	5	50	High
Earthquake	8	5	40	High
Flood - Riverine	10	5	50	High
Landslide/Debris Flow	5	5	25	Medium
Severe Weather	10	5	50	High
Volcanic Event	10	5	50	High
Wildfire (WUI)	10	5	50	High
Windstorm	5	5	25	Medium
Winter Storm	10	5	50	High

Source: Wheeler County NHMP Steering Committee, March, 2018.

Table E3 presents the entire hazard analysis matrix for Wheeler County. The hazards are listed in rank order from high to low. With considerations for past historical events, the probability or likelihood of a particular hazard event occurring, the vulnerability to the community, and the maximum threat or worst case scenario, wildfire and drought are tied as the two highest ranked hazards in Wheeler County. Winter storm, flood riverine, and severe weather make-up the next three highest ranked hazards, while landslide/debris flow, windstorm, earthquake and volcanic event make-up the four lowest ranked hazards in the matrix.

Table ES.3: Hazard Analysis Matrix – Wheeler County

Hazard	History			Probability			Vulnerability			Maximum Threat			Total Threat Score	Hazard Rank
	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal		
Wildfire (WUI)	10	2	20	10	7	70	10	5	50	10	10	100	240	1
Drought	10	2	20	10	7	70	10	5	50	10	10	100	240	1
Severe Weather	9	2	18	10	7	70	10	5	50	10	10	100	238	2
Winter Storm	8	2	16	10	7	70	10	5	50	10	10	100	236	3
Flood - Riverine	5	2	10	10	7	70	10	5	50	10	10	100	230	4
Volcanic Event	0	2	0	1	7	7	10	5	50	10	10	100	157	5
Earthquake	0	2	0	1	7	7	8	5	40	9	10	90	137	6
Landslide/Debris Flow	5	2	10	5	7	35	5	5	25	5	10	50	120	7
Windstorm	5	2	10	5	7	35	5	5	25	5	10	50	120	7

Source: Wheeler County NHMP Steering Committee, March 2018.

What are the Plan Goals?

The plan goals describe the overall direction that the participating jurisdiction’s agencies, organizations, and citizens can take toward mitigating risk from natural hazards.

1. Safety of life and property.
2. Increased cooperation and collaboration between groups and agencies.
3. Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education.

Relevant Federal Law (Code of Federal Regulations)

44 CFR 201.6(c)(3)(i) –

A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

How are the Action Items Organized?

The action items are organized within an action matrix (located at the end of this Summary), which lists all the multi-hazard and hazard-specific action items included in the mitigation plan. The three incorporated cities – Fossil, Mitchell and Spray – have limited resources and rely on the county for certain services and public facilities. Because the cities

rely upon the county to provide services most of the action items benefit both the county and the participating cities. Data collection, research and the public participation process resulted in the development of the action items. The Action Item Matrix portrays the overall plan framework and identifies linkages between the plan goals, and actions. The matrix documents the title of each action along with, the coordinating organization, timeline, and the plan goals addressed.

Relevant Federal Law (Code of Federal Regulations)

44 CFR 201.6(c)(3)(ii) –

A section that identifies and analyzes a comprehensive range of specific mitigation actions.

How will the plan be implemented?

The plan maintenance section of this plan details the formal process that will ensure that the Wheeler County Natural Hazards Mitigation Plan remains an active and relevant

document. The plan will be implemented, maintained and updated by a designated convener. The convener is responsible for overseeing annual review processes. Cities and special districts developing jurisdiction specific information to the county plan will also designate a convener and

Relevant Federal Law (Code of Federal Regulations)

44 CFR 201.6(c)(3)(iii) –

An action plan describing how the actions will be prioritized, implemented and administered.

44 CFR 201.6(c)(4) –

A plan maintenance process.

will work closely with the county convener to maintain coordination. The plan maintenance process includes a schedule for monitoring and evaluating the plan annually and producing a plan revision every five years. This section describes how the communities will integrate public participation throughout the plan maintenance process.

Plan Adoption

After the plan is locally reviewed and deemed complete the Oregon Department of Land Conservation and Development will submit it to the State Hazard Mitigation Officer at Oregon Military Department, Office of Emergency Management. Oregon Military Department, Office of Emergency Management reviews the plan and submits it to the Federal Emergency Management Agency (FEMA – Region X) for review. This review will address the federal criteria outlined in FEMA Interim Final Rule 44 CFR Part 201.6. Once the plan is pre-approved by FEMA, the county formally adopts the plan via

resolution. The individual jurisdiction’s conveners will be responsible for ensuring local adoption of the Wheeler County multi-jurisdictional Natural Hazards Mitigation Plan and providing the support necessary to ensure plan implementation. Once the resolution is executed at the

Relevant Federal Law (Code of Federal Regulations)
44 CFR 201.6(c)(5) – Documentation that the plan has been formally adopted by the governing body of the jurisdiction.
44 CFR 201.6(d) – Plan review [process].

local level and documentation is provided to FEMA, the plan is formally acknowledged by FEMA and the county gains (or maintains) eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and the Flood Mitigation Assistance program funds.

The accomplishment of the Natural Hazards Mitigation Plan goals and actions depends upon the maintenance of a competent Steering Committee and adequate support from the county and city departments reflected in the plan in incorporating the outlined action items into existing county plans and procedures. It is hereby directed that the appropriate county departments and programs implement and maintain the concepts in this plan. Thorough familiarity with this Plan will result in the efficient and effective implementation of appropriate mitigation activities and a reduction in the risk and the potential for loss from future natural hazard events.

Wheeler County adopted the plan on **December 4, 2019**.

The City of Fossil adopted the plan on **December 10, 2019**.

The City of Mitchell adopted the plan on **December 17, 2019**.

The City of Spray adopted the plan on **January 22, 2020**.

FEMA Region X approved the Wheeler County Multi-jurisdictional NHMP on **December 13, 2019**. With approval of this plan, the entities listed above are now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act’s hazard mitigation project grants through **December 12, 2024**.



FEMA

January 27, 2020

The Honorable N. Lynn Morley
Judge, Wheeler County Court
701 Adam St.
PO Box 447
Fossil, Oregon 97830

Dear Judge Morley:

On December 13, 2019, the United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Wheeler County Multi-Jurisdictional Natural Hazards 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 through December 12th, 2024, through your state.

Wheeler County	City of Mitchell	City of Fossil
City of Spray		

The updated list of approved jurisdictions includes the City of Spray which recently adopted the Wheeler County Multi-Jurisdictional Natural Hazards 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, please contact Joseph Murray, State Hazard Mitigation Planner with the Oregon Military Department, Office of Emergency Management, at 503-378-3929, who coordinates and administers these efforts for local entities. If you have questions regarding FEMA's mitigation grant programs, please contact Amie Bashant, State Hazard Mitigation Officer with the Oregon Military Department, Office of Emergency Management, at 503-378-4660.

Sincerely,

Mark Carey, Director
Mitigation Division

Enclosure

JG:vl

FEMA REGION 10 LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in [44 CFR §201.6](#) and offers States and FEMA Mitigation Planners an opportunity to provide feedback to participating jurisdictions.

1. The Multi-Jurisdiction Summary Sheet is used to document how each jurisdiction met the requirements in the Plan.
2. The Regulation Checklist provides a summary of FEMA’s evaluation of whether the Plan has addressed all requirements.
3. The Plan Assessment identifies the plan’s strengths as well as documents areas for future improvement.

The FEMA Mitigation Planner must reference the [Local Mitigation Plan Review Guide](#) when completing this *Local Mitigation Plan Review Tool*.

Jurisdiction: Wheeler County	Title of Plan: Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan	Date of Plan: July 2019
Local Point of Contact: Mitch Elliott	Address: 701 Adams St. PO Box 447 Fossil, Oregon 97830	E-Mail: melliott@co.wheeler.or.us
Title: Emergency Management Coordinator		
Agency: Wheeler County Emergency Management		
Phone Number: (541) 763-2371		

State Reviewer: Joseph A. Murray	Title: Planner	Date: September 23, 2019
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FEMA Reviewer: Jake Grabowsky	Title: Hazard Mitigation Planning	Date: 11/13/2019
Date Received in FEMA Region 10	09/23/2019	
Plan Not Approved	11/13/2019	
Plan Approvable Pending Adoption	11/22/2019	
Plan Approved	12/13/2019	

SECTION 1: MULTI-JURISDICTION SUMMARY SHEET (used only for multi-jurisdictional plans)

INSTRUCTIONS: The Multi-Jurisdiction Summary Spreadsheet is completed by listing each participating jurisdiction and which required Elements for each jurisdiction were ‘Met’ or ‘Not Met,’ and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it is used to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

MULTI-JURISDICTION SUMMARY SHEET (Add additional pages if necessary)										
#	Jurisdiction Name	Jurisdiction Type (city, district, etc.)	POC	Required Revisions / Comments	Requirements Met (Y/N)					
					A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Requirements
1	Wheeler County	County	Mitch Elliott		Y	Y	Y	Y	Y	N/A
2	Fossil	City	Bill Potter		Y	Y	Y	Y	Y	N/A
3	Mitchell	City	Pat Farrell		Y	Y	Y	Y	Y	N/A
4	Spray	City	Valerie Howell		Y	Y	Y	Y	Y	N/A
5										
6										
7										
8										
9										
10										

SECTION 2: REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist is completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been ‘Met’ or ‘Not Met.’ The ‘Required Revisions’ summary at the bottom of each Element is completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions are explained for each plan sub-element that is ‘Not Met.’ Sub-elements are referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable.

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
ELEMENT A. PLANNING PROCESS				
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Acknowledgements, Executive Summary pg.-ii, Introduction pg. 1-3 to 1-6, pg. FS-2 -3, FS-13, pg. MI-1-2, MI-12, pg. SP-1-2, SP-12, Appendix C pg. C-7 to C-26.	X		
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Executive Summary pg.-ii, Introduction pg. 1-1; pg. 1-3 to 1-6, pg. FS -2-3, pg. MI -1-2, SP -1-2, Appendix C, pg. C-7 to C-26.	x		
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Introduction pg. 1-3 to 1-6; Appendix C pg. C-7 to C-26.	x		
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Footnotes throughout plan; Chapter 2: Community Profile pg. 2-42 to 2-45; throughout the Appendix A: Mitigation Action Commentaries.	x		
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Chapter 5: Plan Implementation & Maintenance.	X		

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Chapter 5: Plan Implementation & Maintenance. City Addenda, FS-5 to FS-9; MI-4 to MI-8; and SP-4 to SP-8.	x		
<u>ELEMENT A: REQUIRED REVISIONS</u>				
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT				
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Executive Summary pg. iii to v; Chapter 3 Risk Assessment pg. 3-2 to 3-31, 3-43; City Addenda pg. FS-13, MI-12, and SP-12.	x		
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Risk Assessment pg. 3-2 to 3-31; City Addenda pg. FS-13, MI-12, and SP-12.	x		
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Risk Assessment pg. 3-2 to 3-31, 3-34 to 3-43; City Addenda pg. FS-13, MI-12, and SP-12.	x		
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Risk Assessment pg. 3-38 to 3-39.	x		
<u>ELEMENT B: REQUIRED REVISIONS</u>				

ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction’s existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Chapter 2: Community Profile pg. 2-42 to 2-45; City Addenda FS-6 to FS-9; MI-5 to MI-8; SP-5 to SP-8.	x	
C2. Does the Plan address each jurisdiction’s participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Risk Assessment pg. 3-38 to 3-42.	x	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Executive Summary pg. vi.; Chapter 4 Mitigation Strategy pg. 4-1.	x	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Chapter 4: Mitigation Strategy; and Appendix A: Mitigation Action Commentaries.	x	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Mitigation Strategy pg. 4-3 to 4-4; Chapter 5 Plan Implementation & Maintenance; and each mitigation action in Appendix A: Action Item Commentaries discusses this.	x	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Chapter 2: Community Profile pg. 2-42 to 2-45; Mitigation Strategy pg. 4-2 to 4-4 and throughout the mitigation actions in Appendix A: Mitigation Action Commentaries.	x	
<u>ELEMENT C: REQUIRED REVISIONS</u>			

ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Chapter 2: Community Profile pg. 2-28 to 2-31. Note: Wheeler County has had virtually no new development of critical infrastructure since the 2014 plan was completed.	x	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Progress is described in the Status and Explanation column of Table 4.1 in Chapter 4; also described throughout the mitigation actions in Appendix A: Mitigation Action Commentaries.	x	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	The Risk Assessment Hazard Analysis Matrix on page 3-43 reflects the most current community opinions and analysis of natural hazard risks in the County. The mitigation action priorities reflect this. Executive Summary page v; Chapter 4, Table 4.1. Each mitigation action in Appendix A: Mitigation Action Commentaries indicates the priority for each action.	x	
<u>ELEMENT D: REQUIRED REVISIONS</u>			

ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	To be completed pending FEMA APA.	Y	
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	To be completed pending FEMA APA.	Y	
<u>ELEMENT E: REQUIRED REVISIONS</u>			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			

SECTION 3: PLAN ASSESSMENT

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

Plan Strengths

- Public outreach can be difficult in a large sparsely populated county such as Wheeler. This plan did a great job overcoming that difficulty by employing an online survey and doing outreach at the county fair and rodeo.
- It was great to see so many elected officials involved in the planning process.
- The exerts from other plans and how they were incorporated into the plan was done well in this plan.

Opportunities for Improvement

- Several of the hazards that affect Wheeler County cross county lines. For the next update, please consider inviting the surrounding counties to comment and be involved in the planning process.
- There are large tracks of national forest and BLM land in and around Wheeler county, consider including those agencies and their state equivalents in the future.

Element B: Hazard Identification and Risk Assessment

Plan Strengths

- The details descriptions of past flood events and the inclusion of photos of previous damage was great addition over simply listing a date and location.
- Considering vulnerable populations and including them in the hazards assessment is an excellent best practice. Hopefully this will continue to be included in future DLCD submissions.

Opportunities for Improvement

- Including more maps would be helpful for lay persons reading the plan such as maps of the floodplain and floodway in Wheeler county outside the cities. Also, city specific maps would be helpful for hazards other than the firm maps included.

Element C: Mitigation Strategy

Plan Strengths

- The table listing the local plans and providing examples of ways the mitigation plan can be incorporated is an excellent way to meet the requirements.

Opportunities for Improvement

- Including a measure of the cost/benefits analysis in the action item table or work sheet would be beneficial to the public and elected officials and help them identify the most impactful projects.

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

Plan Strengths

- The plan includes a comprehensive inclusion of previous action items with comments on the status of each action and the progress that was accomplished under the previous plan.

Opportunities for Improvement

- The plan includes new, retained, and canceled action items. It would be better to have some completed actions as well. Consider setting more accomplishable goals or breaking some actions up into smaller pieces that can be accomplished in the 5-year time frame.

A Resolution Adopting the County of Wheeler Representation in the Updates to the Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan

Whereas, the County of Wheeler recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

Whereas, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the County of Wheeler has fully participated in the FEMA prescribed mitigation planning process to prepare the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

Whereas, the County of Wheeler has identified natural hazard risks and prioritized several proposed actions and programs needed to mitigate the vulnerabilities of the County of Wheeler to the impacts of future disasters within the *Wheeler County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

Whereas, these proposed projects and programs have been incorporated into the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities of Wheeler County; and

Whereas, the Oregon Military Department's Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *Wheeler County, Multi-Jurisdictional Natural Hazards Mitigation Plan* and pre-approved it on November 22nd, 2019 contingent upon this official adoption of the participating governments and entities;

Whereas, the NHMP is comprised of two sections: Section I: Basic Mitigation Plan and Section II: Mitigation Resources, collectively referred to herein as the NHMP; and

Whereas, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and

Whereas, the County of Wheeler adopts the NHMP and directs the Wheeler County Emergency Management Department to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP.

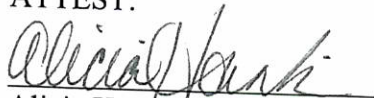
Now, therefore, be it resolved, that the County of Wheeler adopts the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and

Be it further resolved, that the County of Wheeler will submit this Adoption Resolution to the Oregon Military Department's Office of Emergency Management and Federal

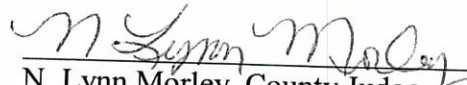
Emergency Management Agency, Region X officials to enable final approval of the
Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan.

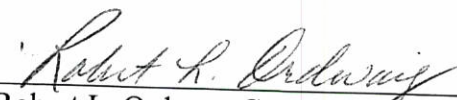
Adopted this 4th day of December, 2019

ATTEST:


Alicia Hankins, County Clerk

WHEELER COUNTY COURT


N. Lynn Morley, County Judge


Robert L. Ordway, County Commissioner


Rick Shaffer, County Commissioner

Resolution # 427

A Resolution Adopting the City of Fossil Representation in the Updates to the Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan

Whereas, the City of Fossil recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

Whereas, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the City of Fossil has fully participated in the FEMA prescribed mitigation planning process to prepare the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

Whereas, the City of Fossil has identified natural hazard risks and prioritized several proposed actions and programs needed to mitigate the vulnerabilities of the City of Fossil to the impacts of future disasters within the *Wheeler County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

Whereas, these proposed projects and programs have been incorporated into the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities of Wheeler County; and

Whereas, the Oregon Military Department's Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *Wheeler County, Multi-Jurisdictional Natural Hazards Mitigation Plan* and pre-approved it on November 22nd, 2019 contingent upon this official adoption of the participating governments and entities;

Whereas, the NHMP is comprised of two sections: Section I: Basic Mitigation Plan and Section II: Mitigation Resources, collectively referred to herein as the NHMP; and

Whereas, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and

Whereas, City of Fossil adopts the NHMP and directs the Public Works Director to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP.

Now, therefore, be it resolved, that the City of Fossil adopts *the Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and

Be it further resolved, that the City of Fossil will submit this Adoption Resolution to the Oregon Military Department's Office of Emergency Management and Federal Emergency

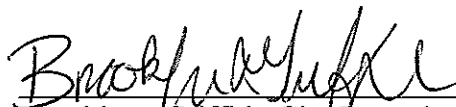
Management Agency, Region X officials to enable final approval of the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan*.

Adopted this 10th day of December , 2019



Carol MacInnes, Mayor

Attest:



Brooklynn Griffith, City Recorder

Resolution No. 2019-12-17 #6

A Resolution Adopting the City of Mitchell Representation in the Updates to the Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan

Whereas, the City of Mitchell recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

Whereas, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the City of Mitchell has fully participated in the FEMA prescribed mitigation planning process to prepare the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

Whereas, the City of Mitchell has identified natural hazard risks and prioritized several proposed actions and programs needed to mitigate the vulnerabilities of the City of Mitchell to the impacts of future disasters within the *Wheeler County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

Whereas, these proposed projects and programs have been incorporated into the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities of Wheeler County; and

Whereas, the Oregon Military Department's Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *Wheeler County, Multi-Jurisdictional Natural Hazards Mitigation Plan* and pre-approved it on November 22nd, 2019 contingent upon this official adoption of the participating governments and entities;

Whereas, the NHMP is comprised of two sections: Section I: Basic Mitigation Plan and Section II: Mitigation Resources, collectively referred to herein as the NHMP; and

Whereas, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and

Whereas, City of Mitchell adopts the NHMP and directs the Mayor and Clerk to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP.

Now, therefore, be it resolved, that the City of Mitchell adopts the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and

Be it further resolved, that the City of Mitchell will submit this Adoption Resolution to the Oregon Military Department's Office of Emergency Management and Federal Emergency

Management Agency, Region X officials to enable final approval of the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan*.

Adopted this 17th day of December, 2019

A handwritten signature in cursive script, appearing to read "P. Farrell", written in black ink.

Patrick Farrell, Mayor

Attest:

A handwritten signature in cursive script, appearing to read "Shane Grandlund", written in black ink.

Shane Grandlund, Clerk

Resolution 2019 #9

A Resolution Adopting the City of Spray Representation in the Updates to the Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan

Whereas, the City of Spray recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

Whereas, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the City of Spray has fully participated in the FEMA prescribed mitigation planning process to prepare the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

Whereas, the City of Spray has identified natural hazard risks and prioritized several proposed actions and programs needed to mitigate the vulnerabilities of the City of Spray to the impacts of future disasters within the *Wheeler County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

Whereas, these proposed projects and programs have been incorporated into the *Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities of Wheeler County; and

Whereas, the Oregon Military Department's Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *Wheeler County, Multi-Jurisdictional Natural Hazards Mitigation Plan* and pre-approved it on November 22nd, 2019 contingent upon this official adoption of the participating governments and entities;

Whereas, the NHMP is comprised of two sections: Section I: Basic Mitigation Plan and Section II: Mitigation Resources, collectively referred to herein as the NHMP; and

Whereas, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and

Whereas, City of Spray adopts the NHMP and directs the Spray Volunteer Fire Chief to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP.

Now, therefore, be it resolved, that the City of Spray adopts *the Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and

Be it further resolved, that the City of Spray will submit this Adoption Resolution to the Oregon Military Department's Office of Emergency Management and Federal

Emergency Management Agency, Region X officials to enable final approval of the
Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan.

Adopted this 22nd day of January 2020

City of Spray

ATTEST

BY: Valerie Howell
Valerie Howell, Mayor

BY: Crystal Rey
Crystal Rey, City Recorder

Table ES.4: 2019 Action Items: Wheeler County, Cities of Fossil, Mitchell and Spray

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
Multi-Hazard													
MH#1	Complete an inventory of public buildings that may be particularly vulnerable to natural hazards in Wheeler County.	Wheeler County Emergency Management	Wheeler County, County NHMP Steering Committee, DOGAMI, OEM, FEMA, Cities of Fossil, Mitchell and Spray	Short Term / High Priority	X	X		X	X	X	X	No Action	Retain
MH#2	Seek funding for the implementation of priority projects that reduce the vulnerability of critical public facilities in Wheeler County.	Wheeler County Emergency Management	Wheeler County, County NHMP Steering Committee, DOGAMI, OEM, FEMA, Cities of Fossil, Mitchell and Spray	Short Term / High Priority	X	X		X	X	X	X	No Action. Timeline has been changed from Long Term to Short Term	Retain
MH#3	Work with utilities operating in Wheeler County to establish ongoing tree-pruning programs around transmission lines and trunk distribution lines.	Columbia Basin Cooperative, Columbia Power Cooperative	Wheeler County, County Emergency Management, Cities of Fossil, Mitchell and Spray	Routine / High Priority	X	X		X	X	X	X	This is a routine task that is done on a regular basis.	Retain
MH#4	Reduce the effects of natural hazards on existing utility lines.	Columbia Basin Cooperative, Columbia Power Cooperative	Wheeler County, Cities of Fossil, Mitchell and Spray	Routine / High Priority	X	X		X	X	X	X	This is a routine task that is done on a regular basis.	Retain
MH#5	Develop and maintain a comprehensive impact database on severe natural hazard events in Wheeler County.	Wheeler County	County Planning Department, GIS, Cities of Fossil, Mitchell and Spray, National Weather Service, National Oceanic and Atmospheric Administration, ODOT, Oregon Climate Service, Overhead Utilities	Routine / Medium Priority	X	X	X	X	X	X	X	No Action	Retain

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
MH#6	Seek funding for generators and satellite telephones for critical facilities.	Wheeler County Emergency Management	Cities of Fossil, Mitchell and Spray	Short Term / Medium Priority	X	X	X	X	X	X	X	No Action	Retain
MH#7	Identify opportunities to reduce existing barriers to interagency cooperation and work together to reduce risk and loss from natural hazards.	Wheeler County Emergency Management	Cities of Fossil, Mitchell and Spray, Surrounding Counties	Routine / Medium Priority	X	X		X	X	X	X	This is a routine task that is done on a regular basis.	Retain
MH#8	Secure funding to improve infrastructure that will increase the capacity and availability of water in order to protect the City of Fossil from the natural hazards (i.e. drought, wildfire, etc.) that occur on an annual basis.	City of Fossil	County Emergency Management, DEQ, Water Master Office District 21, Engineers, Contractors, OEM, Army Corp of Engineers, FEMA	Long Term / Medium Priority	X	X			X			No Action.	Retain
MH#9	Develop a multi-faceted educational program to educate residents about this plan and the natural hazards identified within. This effort may utilize print and electronic media, including but not limited to: newsletters, social media platforms such as Facebook, radio, television, internet blogs, videos, podcasts, and presentations to local civic and business groups.	Wheeler County Emergency Management	Wheeler County, Cities of Fossil, Mitchell and Spray and other stakeholders as appropriate for each hazard (example: ODF and Fire Districts for fire, DOGAMI for landslides, etc.)	Short Term / High Priority	X	X	X	X	X	X	X	New Action for the 2019 Plan Update. Lots of educational resources are available from FEMA, ODF, OEM, etc. Contact OEM for guidance.	
MH#10	Increase by 25% the number of people in Wheeler County signed up for the Everbridge Frontier Regional Emergency Notification System.	Wheeler County Emergency Management	Wheeler County, Cities of Fossil, Mitchell and Spray	Short Term / High Priority	X		X	X	X	X	X	New Action for the 2019 Plan Update	
MH#11	Obtain financial assistance and/or regulatory support for low-income residents and renters who are vulnerable to extreme heat and/or	Wheeler County	Wheeler County Emergency Management, Cities of Fossil, Mitchell and	Short Term / Low	X			X	X	X	X	New Action for the 2019 Plan Update	

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
	diminished air quality to install air conditioning systems.		Spray.										
MH#12	Invest in and promote rainwater collection systems in public, residential, and commercial properties.	Wheeler County Extension Service	County Emergency Management, Cities of Fossil, Mitchell and Spray.	Short Term / Low	X		X	X	X	X	X	New Action for the 2019 Plan Update	
MH#13	Invest in and promote community gardens and local food production.	Wheeler County Extension Service	Cities of Fossil, Mitchell, and Spray	Short Term / Low	X	X	X	X	X	X	X	New Action for the 2019 Plan Update	
MH#14	Consider requiring new development to include onsite rainwater storage and/or emergency drinking water storage tanks. Include water storage solutions in seismic retrofit projects for schools and other public buildings.	Wheeler County Planning Department	County Emergency Management, Cities of Fossil, Mitchell and Spray.	Medium Term / Low	X			X	X	X	X	New Action for the 2019 Plan Update	
MH#15	Invest in and promote solar and other alternative energy in public, residential, and commercial properties.	Wheeler County	County Planning Department, County Emergency Management, Cities of Fossil, Mitchell and Spray, Oregon Department of Energy, Energy Trust of Oregon.	Long Term / Low	X		X	X	X	X	X	New Action for the 2019 Plan Update	
MH#16	Develop hazard-specific evacuation plans that consider likely impacts to bridges, other key transportation infrastructure and lifelines.	Wheeler County Emergency Management	Wheeler County Road Department, ODOT, Oregon Military Department, Office of Emergency Management	Medium Term / Medium	X	X	X	X	X	X	X	New Action for the 2019 Plan Update	

Drought													
DR#1	Make available to county residents and the public information regarding droughts.	Wheeler County Emergency Management	County Court, Public Works, Cities of Fossil, Mitchell, and Spray, Oregon Department of Agriculture, OSU Extension, Cattle Association, Soil and Water Conservation District, Oregon Dept. of Forestry, Watermaster, Oregon Dept. of Fish and Wildlife	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified
DR#2	Promote the planting of native and drought-resistant plants that require less water during drier months.	Wheeler County Extension Service	County Emergency Management, Cities of fossil, Mitchell, and Spray.	Short Term / Low Priority	X		X	X	X	X	X	New Action for the 2019 Plan Update	
DR#3	Provide water conservation education to kids in schools.	Wheeler County Emergency Management	County Schools (Fossil Charter, Mitchell Schools, and Spray Schools), Wheeler Soil and Water Conservation District.	Short Term / Moderate Priority			X	X	X	X	X	New Action for the 2019 Plan Update	
DR#4	Develop a Drought Emergency Plan	Wheeler County Emergency Management	County Planning Department.	Long Term / Low Priority	X	X	X	X				New Action for the 2019 Plan Update	
DR#5	Consider require water conservation during drought conditions.	Wheeler County	County Emergency Management, Cities of Fossil, Mitchell and Spray.	Medium Term / Low Priority	X			X	X	X	X	New Action for the 2019 Plan Update	
Earthquake													
EQ#1	Make available to county residents and the public information regarding earthquakes.	Wheeler County Emergency Management	County Court, Fire Departments, Cities of Fossil, Mitchell and Spray, American Red Cross	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified

EQ#2	Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency (FEMA) to seismically retrofit critical facilities with a high collapse potential rate by the Department of Geology and Mineral Industries (DOGAMI).	Wheeler County Emergency Management	County Court, School Districts, Oregon Military Department, Office of Emergency Management, Federal Emergency Management Agency, Oregon Department of Transportation	Long Term / Moderate	X			X				New Action	
Flood													
FL#1	Make available to county residents and the public information regarding floods and their potential impact on Wheeler County.	Wheeler County Emergency Management	County Court, Fire Departments, Cities of Fossil, Mitchell and Spray, American Red Cross	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified
FL#2	Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances. Update the County Flooding Ordinance by adopting DLCD's model floodplain development code when available.	Wheeler County Planning Department	County Court, County Planning Department, Cities of Fossil, Mitchell, and Spray, OEM, DLCD, FEMA	Short Term / High Priority	X	X		X	X	X	X	Coordinating organization shifted to the Wheeler County Planning Department	Modified
FL#3	Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency (FEMA) to construct, install, and maintain a "Flash Flood Warning System" that has been designed to protect lives and property in the City of Mitchell.	City of Mitchell	County Emergency Management, CenturyTel, OEM, FEMA, US Postal Service	Short Term / High Priority	X	X				X		Not completed. Timeline and priority shifted to Short Term / High Priority	Retain
FL#4	Secure funding to implement proposed solutions from a drainage study to improve the three drainage basins and facilities that are currently inadequate, undersized, and poorly maintained in the City of Spray.	City of Spray	County Emergency Management, Ferguson Surveying and Engineering, OEM, ODOT, FEMA, US Army Corp of Engineers	Short Term / High Priority	X	X					X	Not completed. Timeline and priority shifted to Short Term / High Priority	Retain

FL#5	Coordinate with the State Floodplain Coordinator and the Department of Land Conservation and Development (DLCD) to update the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for Wheeler County and the incorporated cities participating in the Nation Flood Insurance Program (NFIP) and Risk Map.	Wheeler County Planning Department	County Emergency Management, Cities of Fossil, Mitchell and Spray, Oregon Department of Land Conservation and Development, Oregon Military Department, Office of Emergency Management, Federal Emergency Management Agency.	Routine / High Priority	X			X				Wheeler County, the City of Fossil, and the City of Mitchell participate in the Nation Flood Insurance Program (NFIP). Flood Insurance Rate Maps (FIRMs) for Wheeler County are current as of July 17, 1989; FIRMs for the City of Fossil are current as of May 4, 1989; FIRMs for the City of Mitchell are current of April 17, 1989; and FIRMS for the City of Spray are current as of August 16, 1989.	Retain
Landslide/Debris Flow													
LS#1	Make available to county residents and the public information regarding landslides/debris flows.	Wheeler County Emergency Management	County Court, County Public Works, County Road Dept., Cities of Fossil, Mitchell, and Spray, ODOT, School Districts, Medical Clinic, DOGAMI, American Red Cross	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified

LS#2	Develop education and public outreach to engage adjacent landowners to improve slope management practices.	Wheeler County Emergency Management	County Court, County Public Works, County Road Dept., Cities of Fossil, Mitchell, and Spray, ODOT, School Districts, Medical Clinic, DOGAMI, American Red Cross	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified
LS#3	Explore low-cost mitigation options, such as maintenance of slide fences, ditches and other drainage facilities.	Wheeler County Emergency Management	County Public Works, County Road Dept., Cities of Fossil, Mitchell, and Spray, ODOT	Medium Term / Moderate Priority	X	X		X	X	X	X	New Action	
Volcanic Event													
VE#1	Make available to county residents and the public information regarding volcanic events.	Wheeler County Emergency Management	County Court, Public Health, Cities of Fossil, Mitchell, and Spray, Medical Clinic, Media, School Districts, OEM, DEQ, American Red Cross, USGS, DOGAMI	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified
VE#2	Evaluate the county's Emergency Operations Plan with regard to preparing for a volcanic event	Wheeler County Emergency Management	County Court, County Planning Department, Cities of Fossil, Mitchell, and Spray, OEM, USGS, DOGAMI	Long Term / Low Priority	X			X				New Action. If an eruption occurred, ash fallout from Cascade volcanoes could potentially affect the entire county. However, there is virtually no risk from lahars, debris, or pyroclastic flows in Wheeler County.	

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
Wildfire¹													
WF#1	Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to reduce wildland fire risk in Wheeler County.	Wheeler County, County Wildfire Protection Plan (CWPP) Local Coordinating Group	County Court, County Road Dept., Wheeler County Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Community and County leaders, Cities of Fossil, Mitchell, and Spray and Citizens	Routine		X	X	X	X	X	X	While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy	Retained
WF#2	Conduct risk assessment activities with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to assess areas in the county at risk to wildland fires.	County Wildfire Protection Plan (CWPP) Local Coordinating Group	Wheeler County, County Court, Wheeler County Fire Defense Board, Sheriff, ODF, USFS Umatilla and Ochoco, NPS, Community and County leaders, Cities of Fossil, Mitchell and Spray	Routine		X	X	X	X	X	X	While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy	Retained
WF#3	Coordinate information and outreach activities with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to promote fire prevention and risk reduction.	County Wildfire Protection Plan (CWPP) Local Coordinating Group	Wheeler County, County Court, Wheeler County Fire Defense Board, Sheriff, ODF, USFS Umatilla and Ochoco, NPS, Community and County leaders, Cities of Fossil, Mitchell and Spray	Routine		X	X	X	X	X	X	While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy	Retained

¹ The wildfire mitigation actions in this plan are consistent with the goals, objectives and action items described in the current Wheeler County Wildfire Protection Plan.

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
WF#4	Work with the Community Wildfire Protection Plan (CWPP) Local Coordinating Group to implement fuel reduction strategies to reduce the risk to wildland fires.	County Wildfire Protection Plan (CWPP) Local Coordinating Group	Wheeler County, County Court, Wheeler County Fire Defense Board, Sheriff, ODF, USFS Umatilla and Ochoco, NPS, Community and County leaders, Cities of Fossil, Mitchell and Spray	Routine		X	X	X	X	X	X	While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy	Retained
WF#5	Make available to county residents and the public information regarding wildfires.	Wheeler County Emergency Management	Sheriff, Cities of Fossil, Mitchell and Spray, Fire Districts, County Public Works, ODF, American Red Cross, Humane Society, Utilities, BLM, USFS, State Fire Marshall, ODF&W, FEMA	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified
WF#6	Provide Wheeler County Road Department with fire-fighting training and equipment.	Wheeler County Road Dept.	Wheeler County, CWPP Local Coordinating Group, ODF, Fire Districts, State Fire Marshall, BLM, USFS	Short term / High Priority		X	X	X	X	X	X	No Action	Retained
WF#7	Work with ODF, USFS, BLM, and local fire districts to develop a "lessons learned" assessment of the 2018 wildfire season.	CWPP Local Coordinating Group	County Emergency Management, Wheeler County, County Court, Wheeler County Fire Defense Board, Sheriff, ODF, USFS Umatilla and Ochoco, NPS, Community and County leaders, Cities of Fossil, Mitchell and Spray	Routine	X	X	X	X				New Action. 2018 was the largest wildfire season on record in Wheeler County. Assess if existing wildfire protection practices worked. What did and what didn't?	

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
												What types of pre-disaster efforts would have made a difference?	
WF#8	Develop seasonal paid county firefighter positions which would provide wildfire Initial Attack in the summer months within the county.	Wheeler County Emergency Management	Wheeler County Commission, the Cities of Fossil, Mitchell and Spray, CWPP Local Coordinating Group	Medium Term / Moderate Priority	X	X		X				New Action. Perhaps collaborate with adjacent counties on this to create economies of scale.	
WF#9	Assist Rural Fire Protection Districts and City Fire Departments in upgrading their firefighting equipment, facilities and training as needed.	Wheeler County Emergency Management	Rural Fire Districts, City Fire Departments, CWPP Local Coordinating Group ODF, BLM, USFS	Medium Term / Moderate Priority	X	X		X				New Action	
WF#10	Distribute fire prevention literature and material to home owners and visitors.	Wheeler County Emergency Management	Rural Fire Districts, City Fire Departments, CWPP Local Coordinating Group ODF, BLM, USFS	Short Term / High Priority	X		X	X	X	X		New Action. ODF has some of these materials and others are available from other sources.	

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
WF#11	Conduct fire prevention programs in schools.	Wheeler County Emergency Management	County Schools, Gilliam County, Mid-Columbia Fire Prevention Co-op	Medium Term / High Priority	X	X	X	X	X	X	X	New Action	
WF#12	Provide information about what type of fire resistive plants to use for landscaping.	Wheeler County Emergency Management	OSU Extension Service	Short Term / Medium Priority	X			X				New Action. Dovetails with Drought (DR) Mitigation Action #1	
Windstorm													
WDS#1	Make available to county residents and the public information regarding windstorms.	Wheeler County Emergency Management	County Court, Cities of Fossil, Mitchell and Spray, Utilities, Media, ODOT, and American Red Cross	Ongoing		X	X	X	X	X	X	No Action	Retained
Winter Storm													
WTS#1	Educate farmers about ways to protect livestock from the effects of winter storms.	Wheeler County	OSU Extension, Oregon Dept. of Agriculture	Ongoing	X		X	X	X	X	X	No Action	Retained
WTS#2	Make available to county residents and the public information regarding winter storms.	Wheeler County Emergency Management	County Court, County Road Dept., ODOT, American Red Cross, FEMA, National Weather Service, Cities of Fossil, Mitchell, and	Ongoing		X	X	X	X	X	X	No Action	Retained

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
			Spray and Citizens										
WTS#3	Identify county resident and families with home weatherization needs (LMI) and seek funding assistance for repairs.	Wheeler County Planning Department	Wheeler County Emergency Management, Cities.	Short Term	X			X				New Action	

Notes

Section I: Basic Mitigation Plan

Chapter 1: Introduction

This section provides a general introduction to natural hazards mitigation planning in Wheeler County. In addition, Section I: Introduction addresses the planning process requirements contained in 44 CFR 201.6(b) thereby meeting the planning process documentation requirement contained in 44 CFR 201.6(c)(1). The section concludes with a general description of how the plan is organized.

Natural Hazard Mitigation Planning

The Federal Emergency Management Agency (FEMA) defines mitigation as “the effort to reduce loss of life and property by lessening the impact of disasters...through risk analysis, which results in information that provides a foundation for mitigation activities that reduce risk.” Said another way, natural hazard mitigation is a method of permanently reducing or alleviating the losses of life, property, and injuries resulting from natural hazards through long and short-term strategies. Example strategies include policy changes, such as updated ordinances; projects, such as seismic retrofits to critical facilities; and education and outreach to targeted audiences, such as the elderly. Natural hazard mitigation is the responsibility of the “whole community” - individuals, private businesses and industries, state and local governments, and the federal government.

Engaging in mitigation activities provides jurisdictions with a number of benefits, including:

- Reduced loss of life, property, essential services, critical facilities, and economic hardship;
- Reduced short-term and long-term recovery and reconstruction costs;
- Increased cooperation and communication within the community through the planning process; and
- Increased potential for state and federal funding for recovery and reconstruction projects.

Wheeler County developed this multi-jurisdictional Natural Hazards Mitigation Plan in an effort to reduce future loss of life and damage to property resulting from natural hazards. This plan was developed with and for the following jurisdictions: Wheeler County, the City of Fossil, the City of Mitchell, and the City of Spray. It is impossible to predict exactly when natural hazard events will occur, or the extent to which they will affect community assets. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from natural hazards.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA 2K) and the regulations contained in 44 CFR 201 require that jurisdictions maintain an approved NHMP in order to receive federal funds for mitigation projects. Local and federal approval of this plan ensures that the county and listed cities will remain eligible for pre- and post-disaster mitigation project grants.

The DMA 2K is the latest federal legislation addressing mitigation planning. It reinforces the importance of mitigation planning and emphasizes planning for natural hazards before they occur. As such, this Act established the Pre-Disaster Mitigation (PDM) grant program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP). Section 322 of the Act specifically addresses mitigation planning at the state and local levels. State and local jurisdictions must have approved mitigation plans in place in order to qualify to receive post-disaster HMGP funds. Mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to the individual and their capabilities.

Development of the local mitigation plan update process was pursued in compliance with subsections from 44 CFR 201.6 guidelines. These four subsections address plan requirements, the planning process, plan content, and plan review.

- Subsection (a) provides an outline of the overall plan requirements, including an overview of general plan components, exceptions to requirements, and multi-jurisdictional participation.
- Subsection (b) outlines the requirements of the planning process, with particular focus on public involvement in the update process, as well as the role of local agencies, organizations and other relevant entities in the development process, as well as standards for adequate levels of review and incorporation of existing plans and policies.
- Subsection (c) outlines requirements concerning the plan update's content, including an overview of necessary components for the update's planning process, risk assessment, mitigation strategy, plan maintenance, and overall process documentation.

Subsection (d) outlines the steps and agencies required for proper review of the plan before finished plans are adopted by their respective communities.

The Policy Framework for Natural Hazards Planning in Oregon

Planning for natural hazards is an integral element of Oregon's statewide land use planning program, which began in 1973. All Oregon cities and counties have comprehensive plans and implementing ordinances that are required to comply with the statewide planning goals. The challenge faced by state and local governments is to keep this network of local plans coordinated in response to the changing conditions and needs of Oregon communities.

Statewide land use planning Goal 7: Areas Subject to Natural Hazards calls for local plans to include inventories, policies and ordinances to guide development in or away from hazard areas. Goal 7, along with other land use planning goals, has helped to reduce losses from natural hazards. Through risk identification and the recommendation of risk-reduction actions, this plan aligns with the goals of the jurisdiction's Comprehensive Plan, and helps each jurisdiction meet the requirements of statewide land use planning Goal 7.

The primary responsibility for the development and implementation of risk reduction strategies and policies lies with local jurisdictions. However, resources exist at the state and federal levels. Some of the key agencies in this area include Oregon Military Department, Office of Emergency Management (OEM), Oregon Building Codes Division (BCD), Oregon Department of Forestry (ODF), Oregon Department of Geology and Mineral Industries (DOGAMI), and the Department of Land Conservation and Development (DLCD).

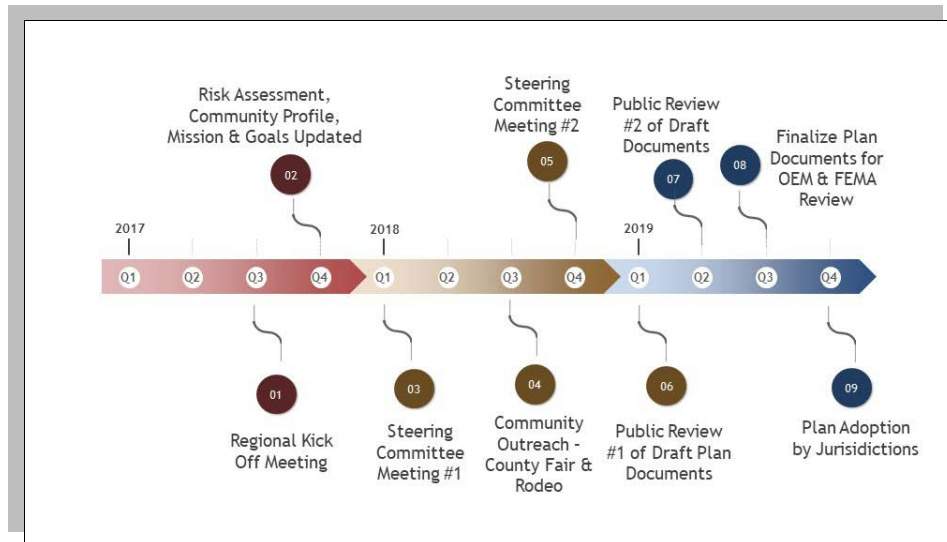
Plan Development

The first Wheeler County Natural Hazards Mitigation Plan was developed and approved in 2008. The 2018/2019 NHMP update process marks the second update and third version of the county’s NHMP. This updated NHMP will consolidate and replace prior version of the plan.

2019 Plan Update Process

The plan was developed following a schedule provided by the Oregon Department of Land Conservation and Development (DLCD) and described by the statement of work in the county’s update and review process. The following schedule was developed to provide a timeline for completion of the plan update sections, though altered accordingly throughout the year to reflect then-current levels of progress.

Figure 1.1: Wheeler County NHMP Update Project Schedule



Source: Oregon Department of Land Conservation and Development, 2019.

The 2019 update of the Wheeler County Natural Hazards Mitigation Plan was funded through a 2016 Pre-Disaster Mitigation (PDM) Planning Grant from FEMA. The DLCD and the Oregon Military Department, Office of Emergency Management (OEM) utilized the PDM planning grant to update the natural hazards mitigation plans for eight counties (Gilliam, Harney, Hood River, Lake, Malheur, Sherman, Wasco and Wheeler) and one Native American tribe (Burns-Paiute) in Eastern Oregon.

The Wheeler County Emergency Management Department served as the convener for Wheeler County Natural Hazards Mitigation Plan update process. A steering committee established a project steering committee to review and update the mitigation plan and to

oversee the planning process. The committee included participants from the prior plan update and new partners to ensure that county departments, cities and special districts were well represented in the process.

In March 2018 and December 2018, the steering committee convened for two update meetings. Also during the update process, DLCD and Wheeler County conducted public outreach at the counties signature public event, the Wheeler County Fair and Rodeo as well as via social media and the internet. Appendix C: Planning & Public Process includes meeting materials and sign-in sheets for each of the plan update meetings and outreach events.

REGIONAL KICKOFF MEETING, ARLINGTON, OREGON, JULY 2017

On July 18, 2017, the DLCD conducted a kickoff meeting for all nine of the PDM 16 Natural Hazard Mitigation Plan Updates. The purpose of the meeting was to (1) introduce the natural hazard mitigation planning process to the participating entities, explain the purpose of a NHMP and we are updating them, (2) participant roles and responsibilities, (3) key project dates and milestones, (4) and to discuss community engagement ideas.

WHEELER COUNTY STEERING COMMITTEE MEETING #1, MARCH 29TH, 2018

On March 29th, 2018, the Wheeler County Natural Hazard Mitigation Plan (NHMP) Update Steering Committee met for their initial work session. The meeting took place at the Wheeler County Courthouse in the town of Fossil, Oregon. The purpose of the meeting was to (1) discuss the content and purpose of a natural hazard mitigation plan, (2) examine the roles and responsibilities of the steering committee (3) explain how the plan will be funded and how costs will be accounted for, (4) review the project schedule, (5) discuss the Risk MAP program and how to incorporate it into the plan, (6) learn about how the climate change work of the Oregon Climate Change Research Institute could be utilized in the plan, and 7) to complete a natural hazard vulnerability analysis for Wheeler County and determine the critical facilities, infrastructure and lifelines in the county.

At the meeting, the Steering Committee (SC) had a discussion of the hazards that impact Wheeler County. The SC agreed that having one Hazard Vulnerability Analysis (HVA) for the group was acceptable and that it would be efficient and collaborative. The SC felt that their most common and impactful hazards are droughts, floods, and wildfire. They noted that minor landslides also occur periodically.

For the discussion, DLCD provided a document called Significant Historic Hazard Events Tables. This document included tables of significant events for each of Wheeler County's natural hazards. The tables noted the dates, locations, and a description of the event, identifying if there was a disaster declaration related to it. DLCD staff invited SC members to review and comment on the information; in particular, to add events that had impacted them.

The HVA discussion was comprehensive. Results were similar to the 2014 NHMP results. Interestingly, by the end of the discussion the risk score results supported the SC's statement of what they thought were the most impactful hazards. Drought and wildfire were identified as high level hazards with risk scores of 240. These were followed by severe weather (238), winter storms (236) and floods (226) respectively.

During the discussion, the SC talked about what is at risk in the county, such as the impacts to people, property, and the environment. They noted that people can take actions to prevent situations and these are pre-event actions. The SC talked about the difficulty of meeting Benefit Cost Analysis (BCA) because of the counties small population base¹. The SC noted that they have looked at Oregon Department of Forestry and Firewise Communities information, but feel they cannot qualify.

WHEELER COUNTY STEERING COMMITTEE MEETING #2, DECEMBER 10TH, 2018

On December 10th, 2018, the Wheeler County Natural Hazard Mitigation Plan (NHMP) Update Steering Committee met for their second work session. The meeting took place via conference call. The DLCD project manager was in Salem while the Steering Committee gathered at the Wheeler County Courthouse in the town of Fossil, Oregon.

The purpose of the meeting was to 1) review and discuss the outcomes from SC Mtg. #1 and the project schedule, 2) review and discuss the status of the current mitigation actions and develop new mitigation actions.

PUBLIC OUTREACH

Wheeler County is a remote, rural county in Eastern Oregon. It is the smallest county in Oregon by population with approximately 1,360 people. Residents tend to be dispersed across the county with the main population areas being Fossil (pop.450), Spray (pop.150) and Mitchell (pop.) 124. Given these demographics, face to face citizen involvement is a challenge. Therefore, the majority of public outreach for the NHMP Update was conducted via social media, including the county's website and Facebook page. In addition, staff did attend the Wheeler County Fair and Rodeo in the summer of 2018. This is the signature annual civic event in the county. A booth was provided and information on the project was available for residents to review and ask questions.

CITY OF MITCHELL, CITY COUNCIL MEETING BRIEFING, APRIL 16, 2019

The Project Manager presented to the Mitchell City Council an update of the project findings and mitigation actions. The City Councilors were very interested to learn more about how to go about obtaining grant funding for the actions in the plan. The mayor invited the PM to a meeting the following day to discuss and brainstorm grant funding options. The meeting on the 17th was called by the Mayor and included staff from the Oregon Governor's Office Regional Solutions Team, Business Oregon, Oregon State Parks, the City Council and local businesses and residents. There is great interest in leveraging the resources of other agencies and grant opportunities with FEMA PDM grants to implement the NHMP mitigation actions.

¹ The 2016 population of Wheeler County was 1,369 which is an 11.5% decline from 2000.

PUBLIC OPINION SURVEY

Wheeler County is Oregon's least populated county. Its rural, remote and dispersed inhabitants requires the use of public engagement tools that are tailored to the community. Therefore, in order to reach out directly to the greatest number County residents, an online public opinion survey was developed and administered.

The purpose of this survey was to reach as many county residents as possible in the most effective way. It gauged residents overall perception of natural disasters, what assets are most valued, how best to prioritize mitigation actions, and what are the most effective ways of communicating with residents.

The survey was done online from February 20, 2019 through March 21, 2019. A flyer promoting the survey and a link to it were placed on the Wheeler County website, the Wheeler County Facebook page, the Facebook pages for the cities of Fossil and Mitchell, and in the online version of the Wheeler County News. Twenty (20) unique surveys were completed and received. The results of the survey are detailed in Appendix F.

PREPARATION OF FINAL DRAFT PLAN (JUNE 2019)

Project staff at the Oregon Department of Land Conservation of Development commenced preparation of a final draft plan after public review was completed in October. Comments from the Post Summer 2018 Fire Season Discussion and Preventative Measures Work Session in Moro, Oregon November 28th.

PUBLIC REVIEW OF FINAL DRAFT PLAN (JUNE-JULY 2019)

A final draft of the plan was made available to the general public and the Steering Committee for review throughout the entire month of June and early July, 2019. The final date for review was July 5, 2019.

REVIEW OF FINAL DRAFT PLAN BY THE OREGON MILITARY DEPARTMENT, OFFICE OF EMERGENCY MANAGEMENT (OEM) AND FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA). (JULY 2019)

OEM reviewed and approved the draft plan on November 22, 2019.

PLAN ADOPTION BY LOCAL JURISDICTIONS (JULY 2019) Placeholder

Local jurisdictions adopted the plan on the following dates: Wheeler County - December 4, 2019; City of Fossil - December 10, 2019; City of Mitchell - December 17, 2019; City of Spray - January 22, 2020.

Plan Organization

Each section of the mitigation plan provides specific information and resources to assist readers in understanding the hazard-specific issues facing County citizens, businesses, and the environment. Combined, the sections work in synergy to create a mitigation plan that furthers the community's effort to reduce loss of life and property by lessening the impact of disasters. This plan structure enables stakeholders to use the section(s) of interest to them.

Section I: Basic Mitigation Plan

CHAPTER 1: INTRODUCTION

The Introduction briefly describes the countywide mitigation planning efforts and the methodology used to develop the plan.

CHAPTER 2: COMMUNITY PROFILE

The Community Profile describes Wheeler County from a number of perspectives in order to help define and understand the sensitivity and resilience to natural hazards. Sensitivity and resilience indicators are identified through the examination of community attributes which include natural environment, socio-demographic capacity, regional economy, physical infrastructure, community connectivity and political capital.

Sensitivity factors can be defined as those community assets and characteristics that may be impacted by natural hazards (e.g., special populations, economic factors and historic and cultural resources). Community resilience factors can be defined as the community's ability to manage risk and adapt to hazard event impacts by way of the governmental structure, agency missions and directives, as well as through plans, policies, and programs.

The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the County when the plan was developed.

CHAPTER 3: RISK ASSESSMENT

This section of the NHMP addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards.

Assessing natural hazard risk begins with the identification of hazards that can impact the jurisdiction. Included in the hazard assessment is an evaluation of potential hazard impacts – type, location, extent, etc. The second step in the risk assessment process is the identification of important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places, and drinking water sources. The last step is to evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The hazards specifically addressed and included with this plan are the following:

- Drought;
- Earthquake;
- Flood;
- Landslide/Debris Flow
- Severe Weather
- Volcanic Event;
- Wildfire;
- Windstorm; and
- Winter Storm

This section also allows readers to gain an understanding of the County's sensitivities – those community assets and characteristics that may be impacted by natural hazards, as well as the County's resilience – the ability to manage risk and adapt to hazard event impacts.

CHAPTER 4: MITIGATION STRATEGY

This chapter outlines Wheeler County’s strategy to reduce or avoid long-term vulnerabilities to the identified hazards. Specifically, this section presents a mission and specific goals and actions thereby addressing the mitigation strategy requirements contained in 44 CFR 201.6(c). The Natural Hazard Mitigation Plan Steering Committee reviewed and updated the goals and action items documented in this plan. Additional planning process documentation is in Appendix A: Mitigation Action Commentaries.

The information provided in the Risk Assessment is to provide the basis and justification for the mitigation actions identified in this plan. This chapter describes the components that guide implementation of the identified mitigation strategies and is based on strategic planning principles. This chapter provides information on the process used to develop the mission, goals and action items. This chapter also includes an explanation of how the County intends to incorporate the mitigation strategies outlined in the plan into existing planning mechanisms and programs such as the County comprehensive land use planning process, capital improvement planning process, and building codes enforcement and implementation.

- **Goals**— Goals are designed to drive actions and they are intended to represent the general end toward which the County effort is directed. Goals identify how the County intends to work toward mitigating risk from natural hazards. The goals are guiding principles for the specific recommendations that are outlined in the action items.
- **Action Items**— Action items are detailed recommendations for activities that local departments, citizens and others could engage in to reduce risk.

CHAPTER 5: PLAN IMPLEMENTATION AND MAINTENANCE

This chapter details the formal process that will ensure that the Wheeler County multi-jurisdictional Natural Hazards Mitigation Plan remains an active and relevant document. The plan implementation and maintenance process includes a schedule for monitoring and evaluating the Plan annually, as well as producing an updated plan every five years. Finally, this section describes how the County and participating jurisdictions will integrate public participation throughout the plan maintenance and implementation process.

Section II: Mitigation Resources

The mitigation resources are designed to provide the users of the Wheeler County multi-jurisdictional Natural Hazards Mitigation Plan with additional information to assist them in understanding the contents of the mitigation plan, and provide them with potential resources to assist with plan implementation.

APPENDIX A: MITIGATION ACTION ITEM COMMENTARIES

This appendix contains more detailed information for each of the mitigation strategies identified in this plan. It includes a rationale for each action, ideas for implementation, and potential funding sources.

APPENDIX B: CITY ADDENDA

This document serves as the Addendum to the Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan (MNHMP, NHMP) for the three incorporated cities in Wheeler County. This addendum supplements information contained in Section 1: Basic Mitigation Plan of this NHMP, which serves as the foundation for this jurisdiction's addendum, and Section 2: Mitigation Resources, which provides additional information.

APPENDIX C: PLANNING AND PUBLIC PROCESS

This appendix includes documentation of all the countywide public processes utilized to develop the plan. It includes invitation lists, agendas, sign-in sheets, and summaries of Steering Committee meetings as well as any other public involvement methods.

APPENDIX D: ECONOMIC ANALYSIS OF NATURAL HAZARDS MITIGATION PROJECTS

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

APPENDIX E: GRANT PROGRAMS

This appendix lists pre-disaster and post-disaster federal grant programs, activities, and initiatives for natural hazards mitigation. This section also includes state mitigation programs and contact information.

APPENDIX F: 2019 WHEELER COUNTY PUBLIC OPINION SURVEY

An online survey was done from February 20, 2019 through March 21, 2019. A flyer promoting the survey and a link to it were placed on the Wheeler County website, the Wheeler County Facebook page, the Facebook pages for the cities of Fossil and Mitchell, and in the online version of the Wheeler County News. Twenty (20) unique surveys were completed and received. The results of the survey are detailed in **APPENDIX F**.

APPENDIX G: 2011 REGIONAL HAZARD MITIGATION PUBLIC OPINION SURVEY

This appendix includes the survey instrument and results from the regional household preparedness survey implemented by the OPDR in the previous NHMP Update. This survey was sent to a large sampling of residents across eight Oregon counties, including Wheeler County. The demographics of Wheeler County have not changed significantly since this survey was completed. It has been included to provide additional information for decision makers.

The survey aims to gauge household knowledge of mitigation tools and techniques to assist in reducing the risk and loss from natural hazards, as well as assessing household disaster preparedness.

APPENDIX H: FUTURE CLIMATE PROJECTIONS REPORT FOR WHEELER COUNTY

This appendix presents future climate projections for Wheeler County relevant to specific natural hazards for the 2020s (2010–2039 average) and 2050s (2040–2069 average) compared to the 1971–2000 average historical baseline. The projections were analyzed for a lower greenhouse gas emissions scenario as well as a higher greenhouse gas emissions scenario, using multiple global climate models. This summary lists only the projections for the 2050s under the higher emissions scenario. Projections for both time periods and both emissions scenarios can be found within relevant sections of the main report.

APPENDIX I: SURFACE TRANSPORTATION MAPS

This appendix is for reference and shows the surface transportation routes in the county. It is broken into three maps and comes from the Oregon Department of Transportation.

Chapter 2: Community Profile

The following section describes Wheeler County from a number of perspectives in order to help define and understand the sensitivity and resilience to natural hazards. Sensitivity and resilience indicators are identified through the examination of community capitals which include natural environment, socio-demographic capacity, regional economy, physical infrastructure, community connectivity and political capital.

Sensitivity factors can be defined as those community assets and characteristics that may be impacted by natural hazards (e.g., special populations, economic factors and historic and cultural resources). Community resilience factors can be defined as the community’s ability to manage risk and adapt to hazard event impacts by way of the governmental structure, agency missions and directives, as well as through plans, policies and programs.

The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the County when the plan was developed. The information documented below, along with the hazard assessments located in *Chapter 3: Risk Assessment*, should be used as the local level rationale for the risk reduction action items identified in *Appendix A*. The identification of actions that reduce the Wheeler County’s sensitivity and increase its resilience assist in reducing overall risk, or the area of overlap in Figure 2.1 below.

Figure 2.1 Understanding Risk



Source: FEMA Local Mitigation Planning Handbook, 2013.

Why Plan for Natural Hazards in Wheeler County?

Natural hazards impact citizens, property, the environment, and the economy of Wheeler County. Droughts, earthquakes, flooding, landslides, severe weather, volcanoes, wildfires, windstorms, and winter storms have exposed Wheeler County residents and businesses to the financial and emotional costs for recovering after natural disasters.

The inevitability of natural hazards and activity within the county create an urgent need to develop strategies, coordinate resources, and increase public awareness to reduce risk and prevent loss from future natural hazards events. Identifying risks posed by natural hazards and developing strategies to reduce the impact of a hazard event can assist in protecting life and property of citizens and communities. Local residents and businesses should work together with the county to keep the natural hazards mitigation plan updated. The Natural Hazards Mitigation Plan addresses the potential impacts of hazard events and allows the county to apply for certain funding from FEMA for pre and post disaster mitigation projects that would otherwise not be available if the county did not have a Natural Hazards Mitigation Plan.

Natural Environment

Geography

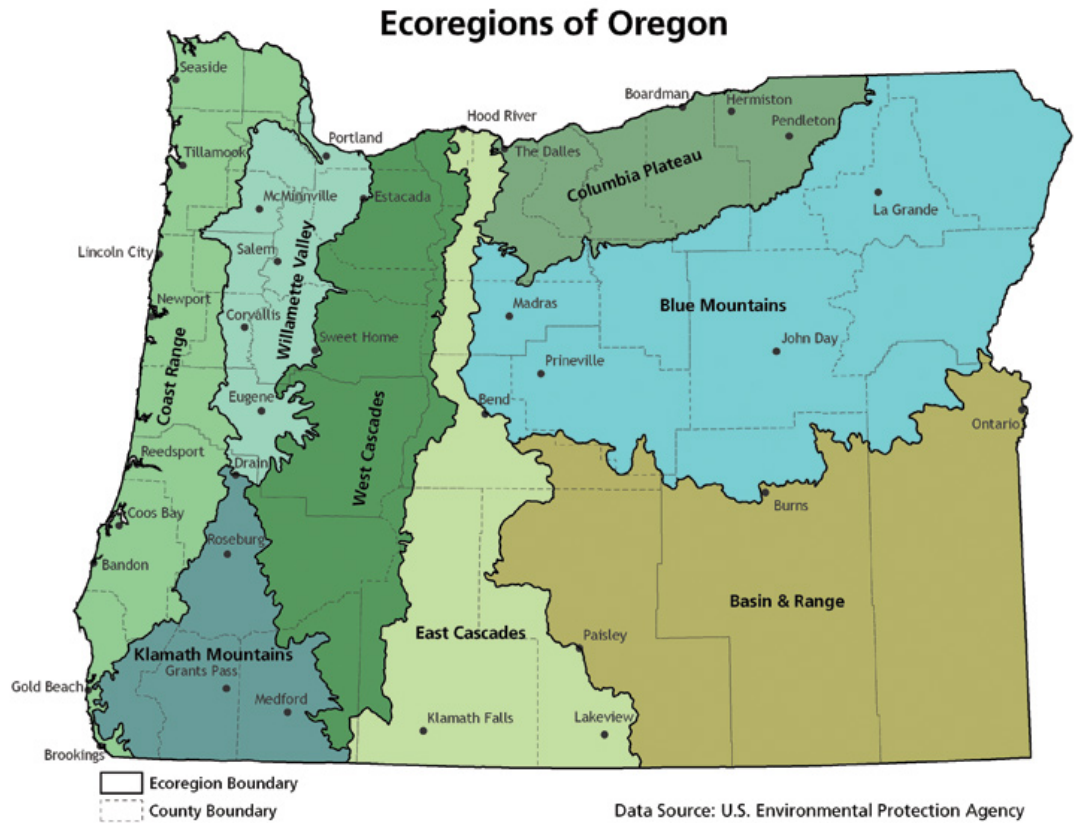
Wheeler County is located in central Oregon and has a total area of 1,715 square miles (about four times the area of Oregon's most populated county Multnomah - pop. 808,000), including one square mile of water. The county is rugged and uneven, and the terrain varies widely from deep river canyons edged in sagebrush, juniper, and rim rock to high timbered mountains covered in pine, tamarack, and fir trees.¹

Portions of both the Ochoco National Forest and Umatilla National Forest lie within the boundaries covering nearly one third of the county. The three units of the John Day Fossil Beds National Monument are also located within Wheeler County featuring painted hills, petrified mudslides and lava flows, unique geologic formations, and one of the most outstanding depositories of prehistoric plant and animal fossils in the world.² Figure 2.2 illustrates the ecoregions in Oregon. Wheeler County is located mainly in the Blue Mountain region.

¹ Wheeler County Multi-Jurisdictional Natural Hazard Mitigation Plan. Page 2-1. December 2007.

² Wheeler County Website. Welcome to Wheeler County. <http://www.wheelercounty-oregon.com/>.

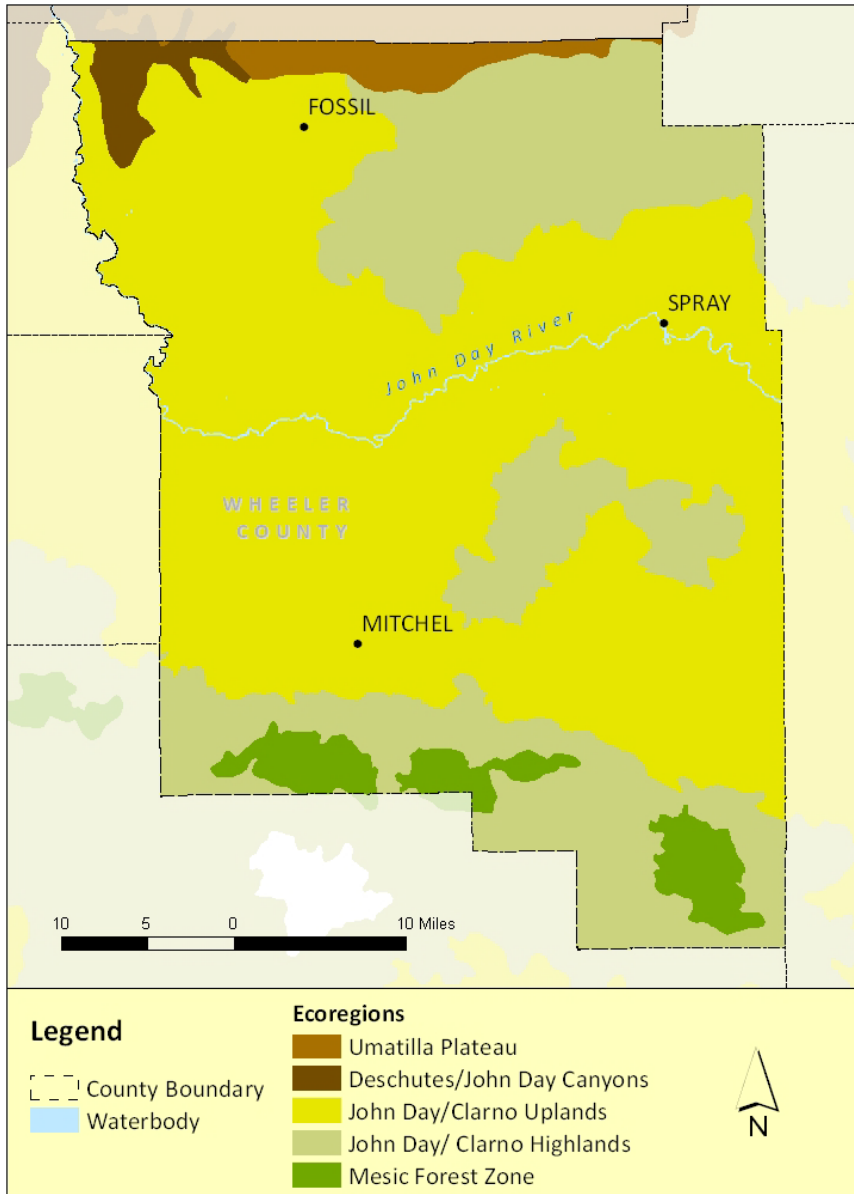
Figure 2.2.



In Wheeler County, Mollisols make up the majority of the soil except for a small portion of the southeast corner of the county where the soil consists of Andisols. Mollisols are soils formed in association with grassland vegetation and have relatively thick, dark surface horizons. The soil is rich in organic matter under which are subsoils which are either weakly developed or enriched in clay and carbonates. Andisols develop in materials of volcanic origin. The Andisols found in Wheeler County were formed in a blanket of white ash deposited by the eruption of Mount Mazama.³

³ Wheeler County Website. Welcome to Wheeler County. <http://www.wheelercounty-oregon.com/>.

Figure 2.3: Ecoregions in Wheeler County



Map Created by Garrett Jensen, Resource Assistance for Rural Environments (RARE)
 Source: Oregon Geospatial Enterprise Office, Spatial Data Library, Ecoregions
 Description: Oregon Natural Heritage Program, 1:250,000

COLUMBIA PLATEAU

The far northern part of Wheeler County is located in the Columbia Plateau physiographic province. The Columbia Plateau is predominantly a volcanic province covering approximately 63,000 square miles in Oregon, Washington, and Idaho.⁴ The plateau is surrounded on all sides by mountains, the Okanogan Highlands to the north, the Cascade Range to the west, the Blue Mountains to the south, and the Clearwater Mountains to the east. Almost 200 miles long and 100 miles wide, the Columbia Plateau merges with the Deschutes basin lying between the High Cascades and Ochoco Mountains. The province slopes gently northward toward the Columbia River with elevations up to 3,000 feet along the south and west margins down to a few hundred feet along the river.³ The two ecoregions of the Columbia Plateau within Wheeler County include the Deschutes/John Day Canyons and the Umatilla Plateau.

Deschutes/John Day Canyons⁵: deeply cut into basalt, the Deschutes/John Day Canyons fragment a lightly populated portion of the Umatilla Plateau. Canyon depths up to 2,000 feet create drier conditions than on the plateau above. In the canyons, bunchgrasses, Wyoming big sagebrush, and cheatgrass grow on rocky, colluvial soil. Riparian vegetation in narrow reaches is often limited to a band of white alder at the water line; broader floodplains and gravel bars are dominated by introduced species, such as reed canarygrass, sweetclover, and teasel. The rivers support Chinook salmon and steelhead runs.

Umatilla Plateau⁶: the nearly level to rolling, treeless Umatilla Plateau ecoregion is underlain by basalt and veneered with loess deposits. Areas with thick loess deposits are farmed for dry land winter wheat, or irrigated alfalfa and barley. In contrast, rangeland dominates more rugged areas where loess deposits are thinner or nonexistent. Mean annual precipitation is nine to 15 inches and increases with increasing elevation. In uncultivated areas, moisture levels are generally high enough to support grasslands of bluebunch wheatgrass and Idaho fescue without associated sagebrush.

BLUE MOUNTAINS

Wheeler County is predominantly located within the Blue Mountains region. This region encompasses 4,060 square miles in a southwest to northeast arc from central Oregon, near the city of Bend, into Washington and Idaho. The region includes three major mountain ranges: the Ochoco, the Blue (which peaks at 9,038 feet), and the Wallowa; it also includes two major rivers: the Snake and Columbia.⁷ The Blue Mountain ranges are lower and more open than the neighboring Cascades and Northern Rockies. Like the Cascades, but unlike the Northern Rockies, the Blue Mountains are mostly volcanic in origin. However, the core of the Blue Mountains and the highest ranges, the Wallowa and Elkhorn Mountains, are composed of granitic intrusives, deep sea sediments and metamorphosed rocks. In addition, much of the

⁴ Western Oregon University. Oregon Physiographic Provinces. "Deschutes-Columbia Plateau". 1999. http://www.wou.edu/las/phisci/taylor/eisi/orr_orr2.PDF.

⁵ Environmental Protection Agency. "Ecoregions of Oregon." ftp://ftp.epa.gov/wed/ecoregions/or/or_front.pdf.

⁶ Environmental Protection Agency. "Ecoregions of Oregon." ftp://ftp.epa.gov/wed/ecoregions/or/or_front.pdf.

⁷ Oregon Magazine. The Blue Mountains. <http://oregonmag.com/SimonGeo210.html>.

region is grazed by cattle.⁸ Three ecoregions within the Blue Mountains encompass Wheeler County that include: the John Day/Clarno Uplands, the John Day/Clarno Highlands, and the Mesic Forest Zone.

John Day/Clarno Uplands⁹: the semiarid John Day/Clarno Uplands form a ring of dry foothills surrounding the western perimeter of the Blue Mountains. Highly dissected hills, palisades, and colorful ash beds flank the valleys of the John Day River and Crooked River. This region has a continental climate moderated somewhat by marine influence. Juniper woodland has expanded markedly into the sagebrush-grassland during the 20th Century due to a combination of climatic factors, fire suppression, and grazing pressure. The three incorporated cities of Fossil, Mitchell, and Spray are all located within this ecoregion.

John Day/Clarno Highlands¹⁰: the low mountains of the John Day/Clarno Highlands are uniformly covered by ponderosa pine forest with a grass and shrub understory. The continental climate is tempered by a marine influence; it is not as dry, nor are temperature extremes as great, as in the Continental Zone Highlands. Historically, frequent low intensity fires reduced fuel loading in forests of widely spaced old-growth ponderosa pine. Today, after years of fire suppression and high grade logging, land managers attempt to emulate historical fire regimes to reverse the trend toward dense thickets of young growth that carry hot, stand-replacing fires.

Mesic Forest Zone¹¹: the disjunct Mesic Forest Zone includes the highest forested areas in the western Willows and the Blue Mountains. The region is marine-influenced with higher precipitation than other forested Blue Mountains ecoregions. The ashy soil holds moisture during the dry season and supports a productive spruce-fir forest. The boundaries of the region correspond to the distribution of true fir forest before the modern era of fire suppression and high grade logging.

JOHN DAY RIVER¹²

The John Day River basin drains nearly 8,100 square miles of central and northeast Oregon. It is one of the nation's longest free-flowing river systems. Elevations range from 265 feet at the confluence with the Columbia River to over 9,000 feet at the headwaters in the Strawberry Mountain Range. The river has no dams to control water flow; therefore flow levels fluctuate widely in relation to snow pack and rainfall. The John Day River system is under designation of two important river preservation programs: the National Wild and Scenic Rivers Act and the Oregon Scenic Waterways Act. Together, these two acts, one a federal program and one a state

⁸ Environmental Protection Agency. "Ecoregions of Oregon." ftp://ftp.epa.gov/wed/ecoregions/or/or_front.pdf.

⁹ Environmental Protection Agency. "Ecoregions of Oregon." ftp://ftp.epa.gov/wed/ecoregions/or/or_front.pdf.

¹⁰ Environmental Protection Agency. "Ecoregions of Oregon." ftp://ftp.epa.gov/wed/ecoregions/or/or_front.pdf.

¹¹ Environmental Protection Agency. "Ecoregions of Oregon." ftp://ftp.epa.gov/wed/ecoregions/or/or_front.pdf.

¹² U.S. Department of Interior. Bureau of Land Management. "John Day River". <http://www.blm.gov/or/resources/recreation/johnday/>.

program, provide protection for the natural, scenic, and recreational values of river environments.

The Bureau of Land Management (BLM), in partnership with The Confederated Tribes of the Warm Springs, Oregon Department of State Lands, Oregon Parks and Recreation Department, Oregon Department of Fish and Wildlife, and the John Day Coalition of Counties (making up the John Day River Interagency Planning Team) has responsibility for managing the 147-mile John Day Wild and Scenic River from Service Creek in Wheeler County to Tumwater Falls.¹³

John Day Scenic Waterway¹⁴ which includes:

- The John Day River from its confluence with Parrish Creek downstream to Tumwater Falls;
- The North Fork John Day River from the boundary of the North Fork John Day Wilderness (near river mile 76), as constituted on December 8, 1988, downstream to river mile 20.2 (northern boundary of the south one-half of Section 20, Township 8 South, Range 28 East, Willamette Meridian);
- The Middle Fork John Day River from its confluence with Crawford Creek (near river mile 71) downstream to the confluence of the Middle Fork John Day River with the North Fork John Day River; and
- The South Fork John Day River from the Post-Paulina road crossing (near river mile 35) downstream to the northern boundary of the Murderer’s Creek Wildlife Area, as constituted on December 8, 1988 (near river mile 6).

Climate

TEMPERATURE, PRECIPITATION AND SNOWFALL

Situated on the east side of the Cascade Mountains, Wheeler County features a hybrid climate and has four distinct seasons and low annual precipitation. Table 2.1 identifies climate averages and extremes in Fossil. July and August are the two warmest months in Fossil, with the high temperature (°F) averaging in the mid-80s with lows averaging in the mid-40s. Extreme high temperatures (°F) can sometimes reach into the 100s from May through September. January and February tend to be the coldest months, with the high temperature (°F) averaging in the low 40s with lows averaging in the mid-20s. Temperatures (°F) below zero can occur from November through February.

A majority of the precipitation in Wheeler County occurs during the winter and spring seasons. Since 1923, Fossil averages 14.02 inches of precipitation annually, most of which occurs during the months of November and December (3.4 inches total). July through September tend to be the driest months. Total precipitation in Fossil during July and August averages 0.98 inches with only a few isolated and potentially hazardous thunderstorms. Furthermore, Fossil averages a total of 15.9 inches on snow annually, most of which occurs in January (5.4 inches).

¹³ Public Announcement. John Day River Update, May 2010.
http://www.blm.gov/or/districts/prineville/plans/files/jdr_update_may2010.pdf.

¹⁴ Oregon Department of State Lands. Wetlands/Waterways Removal-Fill. John Day Scenic Waterway.
<http://www.oregon.gov/DSL/PERMITS/scenicwaterways.shtml>.

Table 2.1: Monthly Averages and Extremes, Fossil, Oregon, 1923-2018

Month	Average Maximum Temperature (deg F)	Extreme Daily Maximum (deg F)	Average Minimum Temperature (deg F)	Extreme Daily Minimum (deg F)	Average Precipitation (inches)	Average Snowfall (inches) 1923-2018
January	41.8	70	24.4	-26	1.54	5.4
February	47.1	76	27.1	-22	1.16	2.4
March	52.5	78	29.2	2	1.34	1.5
April	59.3	87	32.2	12	1.24	0.4
May	67.7	99	37.1	15	1.49	0.1
June	74.8	101	42.7	25	1.3	0
July	85.1	106	45.7	25	0.42	0
August	84.2	105	45.4	28	0.56	0
September	76.4	98	40.3	18	0.73	0
October	65.3	98	34.6	3	1.15	0.2
November	49.9	73	30.2	-16	1.69	1.3
December	43	67	26.5	-22	1.69	3
Annual	62.3	106	34.6	-26	14.02	15.9

Source: Western Regional Climate Center, NCDC Monthly Tabular Data, 1923-2018

Table 2.2 identifies climate averages and extremes in Mitchell. July and August are the two warmest months, with the high temperature (°F) averaging in the mid-80s and the lows averaging in the low 50s. Extreme high temperatures (°F) can sometimes reach into the 100s from May through September. January and February tend to be the coldest months, with the high temperature (°F) averaging in the mid-40s with lows averaging in the mid-20s.

A majority of the precipitation in Mitchell occurs during the winter and spring seasons. Since 1981, Mitchell averages 12.97 inches of precipitation annually, most of which occurs from October through January (4.75 inches total). July through September tend to be the driest months (1.6 inches total). Furthermore, Mitchell averages a total of 22.9 inches on snow annually, the most of which occurs in January (5.4 inches).

Table 2.2: Monthly Averages and Extremes, Mitchell, Oregon, 1981-2010

Month	Average Maximum Temperature (deg F)	Extreme Maximum Temperature (deg F)	Average Minimum Temperature (deg F)	Extreme Minimum Temperature (deg F)	Average Precipitation (inches)	Average Snowfall (inches)
January	42.9	64	26.7	-3	1.13	5.4
February	46.2	68	27.3	-1	0.98	3.6
March	52.1	76	30.1	15	0.94	2.9
April	56.5	82	32.7	17	1.46	2.4
May	65	92	39.7	21	1.85	0.1
June	73.3	96	45.5	31	1.37	0
July	84	103	52.5	35	0.45	0
August	82.3	103	51.2	35	0.63	0
September	74.7	98	45.4	27	0.52	0
October	62.1	88	37.5	6	1.17	1
November	50	75	31.7	-1	1.3	2.9
December	41	67	25.8	-9	1.15	4.8
Annual	60.8	103	37.2	-9	12.97	22.9

Source: National Weather Service Forecast Office, Pendleton, Oregon, NOAA Online Weather Data, Applied Climate Information System

Table 2.3 identifies climate averages and extremes in Spray. July and August are the two warmest months, with the high temperature (°F) averaging in the low 90s and the lows in the low 50s. Extreme high temperatures (°F) can sometimes reach into the 100s anywhere from May through September. January and February tend to be the coldest months. The high temperature (°F) during these two months averages in the mid-40s with lows averaging in the mid-20s.

A majority of the precipitation in Spray occurs during the winter and spring seasons. Since 1937, Spray averages 13.26 inches of precipitation annually with the most occurring in November and December (3.51 inches total). July through September tend to be the driest months. Precipitation in Spray during the three months of July, August and September averages 1.17 inches total, less than the average total for the month of December (1.87 inches). Furthermore, Spray averages a total of 8.9 inches on snow annually, the most occurring in January (4.3 inches).

Table 2.3: Monthly Averages and Extremes, Spray, Oregon, 1937-2011

Month	Average Maximum Temperature (deg F)	Extreme Maximum Temperature (deg F)	Average Minimum Temperature (deg F)	Extreme Minimum Temperature (deg F)	Average Precipitation (inches)	Average Snowfall (inches)
January	43.9	74	24.6	-28	1.42	4.3
February	51.8	73	29.5	2	1.22	0.5
March	58.6	85	31.8	11	1.22	0.3
April	64.6	96	34.7	18	0.97	0
May	75	100	41.5	23	1.13	0
June	84.5	110	48.9	30	1.02	0
July	94.7	115	53.2	35	0.55	0
August	92	116	51.5	35	0.62	0
September	83.4	103	45	24	0.62	0
October	69.9	94	36.9	12	0.98	0
November	53.8	79	31.7	2	1.64	1.1
December	46.1	70	27.4	-17	1.87	2.7
Annual	68.2	116	38.1	-28	13.26	8.9

Source: Western Regional Climate Center, NCDC Monthly Tabular Data, 1937-2011

Land Cover

Oregon, like most of the Western States, is largely owned by the federal government with a vast majority of federal lands administered by the Bureau of Land Management (BLM) and the U.S. Forest Service.¹⁵

However, in Wheeler County, only 12.5-percent of the land is owned by BLM (137,448 acres) and 14.9-percent of the land is owned by the USFS (163,469 acres).¹⁶ A majority of the land is privately owned. In fact, nearly 71.3-percent of the land in the county is privately owned (781,216 acres).

Table 2.4 describes the landownership throughout the county. Most of the land owned by the BLM is located along the John Day River in the middle of the county. Ochoco National Forest is located along southern part of the county near the boundary with Crook County. The Umatilla National Forest is located in the northeast corner of the county near neighboring Grant County and Morrow County. Both forest lands are owned by the USFS.

¹⁵ Allan, Stuart et al., Atlas of Oregon. Pg. 83.

¹⁶ Wheeler County Community Wildfire Protection Plan. November 2006. Pg. 3.

Table 2.4: Landownership

Management	Acres	Percent
Private Land (Residential, Ranches, Timber Companies, etc.)	781,216	71.3%
USDA Forest Service, Umatilla National Forest, Ochoco National Forest	163,469	14.9%
U.S. Department of Interior, Bureau of Land Management (BLM)	137,448	12.5%
State of Oregon, Division of State Lands and Department of Fish & Wildlife	5,178	0.5%
National Parks Service	4,885	0.4%
Federal Energy Regulatory Commission	3,403	0.3%
Wheeler County	502	<0.1%
Total	1,096,101	100.0%

Source: 2006 Wheeler County Community Wildfire Protection Plan

Summary

This natural environment section is composed of elements known as natural capital. Natural capital is essential in sustaining all forms of life including human life and plays an often under represented role in community resiliency to natural hazards.

Key takeaways:

- Wheeler County is a remote, rugged and sparsely populated county in Eastern Oregon.
- The county has a four season climate with warm to hot, dry summers and relatively cold winters.
- 71.3% of the county is in private ownership, while 14.9% is owned by the United States Forest Service (USFS) and 12.5% by the Bureau of Land Management (BLM).

Socio Demographic Capacity

Population

According to the U.S. Census Bureau, the population of Wheeler County declined by 11.5% from the year 2000 to 2016. In 2016, the population of the county was 1,369 making it the least populated county in the State of Oregon. The county has approximately 0.8 people per square mile and is entirely rural.

The U.S. Census Bureau classifies rural as; “All territory outside of urban areas. This places the upper limit of rural at 2,500, since urban areas must have at least 2,500 people.”¹⁷ This definition is widely recognized as the “official” Federal definition of rural. Table 2.5 describes the population changes in the region from 2000 to 2016.

Table 2.5: Population Changes, 2000-2016

County	Population (2000)	Population (2016)	Population Change (2000 - 2016)	Percentage Change (2000 - 2016)
Wheeler	1,547	1,369	-178	-11.5%
Crook	19,182	21,334	2,152	11.2%
Gilliam	1,915	1,913	-2	-0.1%
Grant	7,935	7,227	-708	-8.9%
Jefferson	19,009	22,305	3,296	17.3%
Morrow	10,995	11,207	212	1.9%
Wasco	23,791	25,657	1,866	7.8%
Oregon	3,421,399	3,982,267	560,868	16.4%

Source: U.S. Census Bureau, 2000 Census, 2016 American Community Survey.

There are three incorporated cities in Wheeler County: Fossil, Mitchell, and Spray. The population in Spray, located along the John Day River in eastern Wheeler County, increased slightly from 2000 to 2016. The population in both Mitchell, located in the John Day/Clarno Uplands in southern Wheeler County and Fossil, the county seat, decreased during the same time period. Overall, 49.3-percent of the county’s population resides in the three incorporated cities. Table 2.6 describes population changes within the cities in Wheeler County.

¹⁷ Oregon, Three rural definitions based on Census Place.
<http://www.ers.usda.gov/data/ruraldefinitions/OR.pdf>. Pg. 11.

Table 2.6: Population Changes, 2000-2016

Jurisdiction	Population (2016)	Population (2000)	Population Change (2000 - 2016)	Percentage Change (2000 - 2016)
Fossil	403	469	-66	-14.0%
Mitchell	108	170	-62	-36.5%
Spray	165	140	25	17.9%
Wheeler County	1,369	1,547	-178	-11.5%

Source: U.S. Census Bureau, 2000 Census, 2016 American Community Survey.

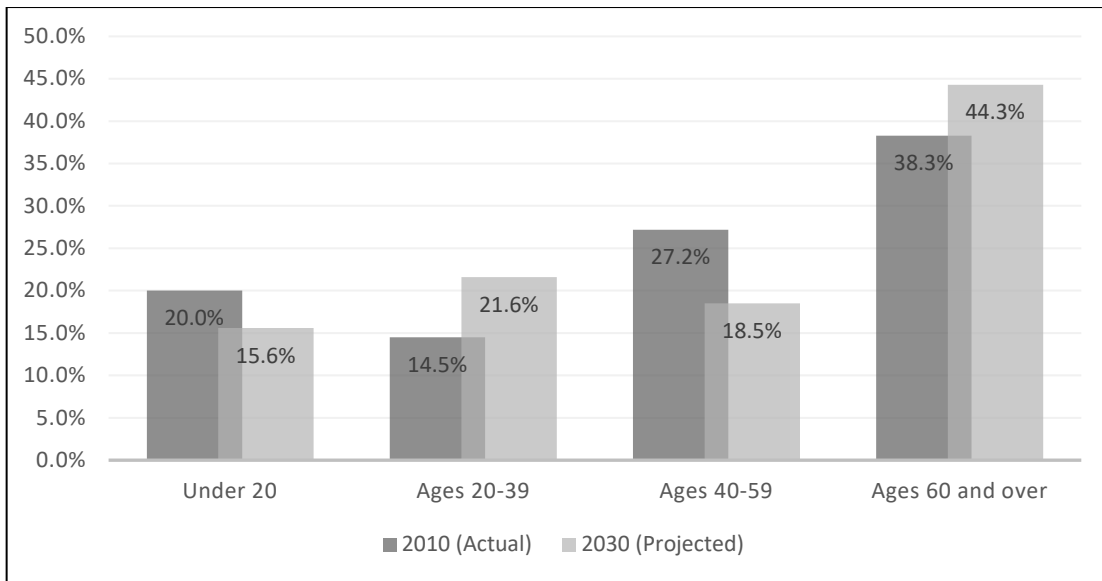
Population size itself is not an indicator of vulnerability. More important is the location, composition, and capacity of the population within the community. Research by social-scientists demonstrates that human capital indices such as age, race, education, and income can affect the integrity of a community. Therefore, these human capitals can influence community resilience to and their ability to recover from natural disasters.

Age

The age profile of an area has a direct impact both on what actions are prioritized for mitigation and how response to hazard incidents is carried out. Currently, more than a third (38.9-percent) of the population in the county is over the age of 60; that is significantly higher compared to only 22.6-percent of the population over the age of 60 in the entire state. In addition, the Office of Economic Analysis projects that from 2010 to 2030 the percent of the county's population over the age of 60 will increase.

Figure 2.4 describes the current and projected population groups by age within the county. These numbers suggest that the county may want to consider focusing mitigation techniques that are feasible for elderly populations and provide support to this segment of the population to implement these techniques.

Figure 2.4: Wheeler County Percent of Population by Age, 2010 and 2030



Source: 2010 (Actual), U.S. Census Bureau, 2010 Census

Source: 2030 (Projected), Office of Economic Analysis, Department of Administrative Services, State of Oregon, released 2013.

Older populations may also have special needs prior to, during, and after a natural disaster. The elderly population may require special consideration due to increased sensitivities to heat and cold, possible reliance upon transportation for medications, and comparative difficulty in making home modifications that reduce risk to hazards.

Older populations may also require assistance in evacuation due to limited mobility or health issues and can lack the social and economic resources needed for post-disaster recovery.¹⁸ Furthermore, while just 20-percent of the county's population is under the age of 20, it is still important to consider this segment of the population when planning mitigation strategies. School age children rarely make decisions about emergency management.

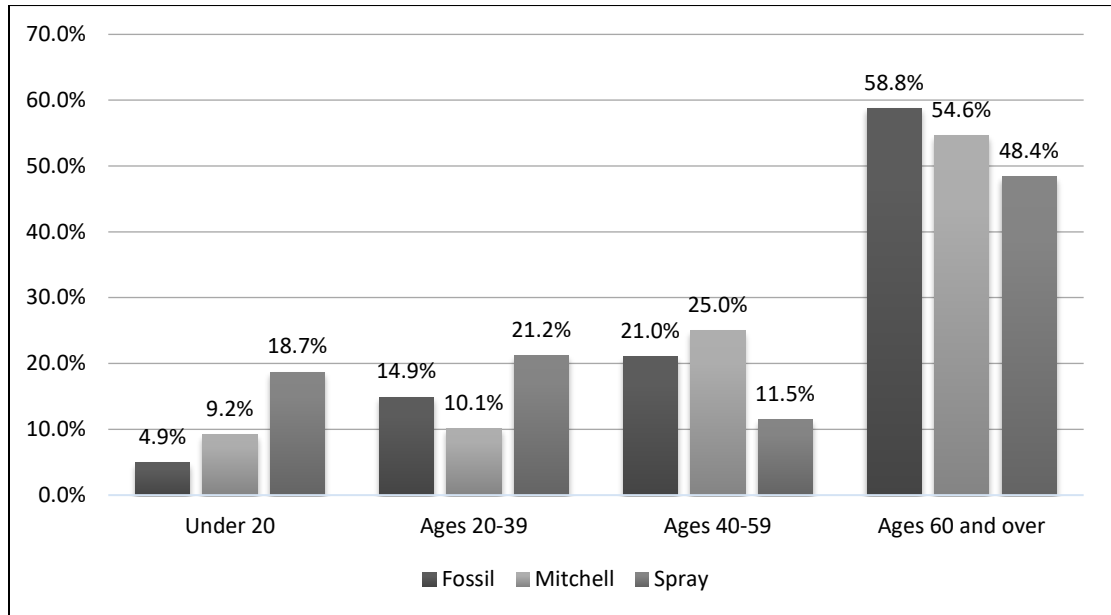
Therefore, a larger youth population in an area will increase the importance of outreach to schools and parents on effective ways to teach children about fire safety, earthquake response, and evacuation plans. Children are also more vulnerable to the heat and cold, have few transportation options and require assistance to access medical facilities.¹⁹

Age ranges also vary among the cities within the county. Figure 2.5 illustrates the percentage of population by various age groups in each city within the county.

¹⁸ Wood, Nathan. Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon. U.S. Geological Survey, Reston, VA, 2007.

¹⁹ State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

Figure 2.5: Percent of Population by Age in Incorporated Cities, 2016



Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates.

Other important considerations for high risk populations are the number of households where persons over the age of 64 live alone as well as single parent households with children under 18.

Table 2.7 describes the high risk populations in each jurisdiction within the county. Forty-five percent of the 651 households in the county have individuals living in them who are 65 or older, 16.3-percent of which live alone. In fact, nearly a quarter of the households in the City of Fossil are occupied by individuals 65 or older who live alone.

Additionally, 4.6-percent of the households in the county are occupied by single parents with children under the age of 18. The highest percentage of this population is also located in the City of Fossil (6.3-percent). These populations will likely require additional support during a disaster and could result in strains on the system if strategies to mitigate these population vulnerabilities are not implemented.

Table 2.7: High Risk Households in Wheeler County

Household Type	Wheeler County	Fossil	Mitchell	Spray
Households with individuals under 18	132 (-20.3%)	42 (-18.8%)	11 (-18.0%)	15 (-21.7%)
<i>Single householder with own children under 18</i>	30 (-4.6%)	14 (-6.3%)	3 (-4.9%)	3 (-4.3%)
Households with individuals 65 and over	294 (-45.2%)	104 (-46.4%)	28 (-45.9%)	30 (-43.5%)
<i>Householder 65 years and over living alone</i>	106 (-16.3%)	50 (-22.3%)	6 (-9.8%)	6 (-8.7%)
Total households	651	224	61	69

Source: U.S. Census Bureau, 2010 Census

Race

The impact following a disaster in terms of losses and the ability of the community to recover may also vary among minority population groups. Studies have shown that racial and ethnic minorities can be more vulnerable to natural disaster events. This is not reflective of individual characteristics; instead, historic patterns of inequality along racial or ethnic divides have often resulted in minority communities that are more likely to have inferior building stock, degraded infrastructure or less access to public services. Table 2.8 describes the population in Wheeler County by race and ethnicity.

Table 2.8: Race and Ethnicity in Wheeler County

Race	Count	Percent
Total Population	1,369	
One Race	1,341	98.0%
White	1,309	95.6%
Black or African American	0	0.0%
American Indian or Alaska Native	15	1.1%
Asian	9	0.7%
Native Hawaiian and other Pacific Islander	0	0.0%
Other race	8	0.6%
Two or more races	28	2.0%
Hispanic or Latino Origin		
Total Population	1,369	
Hispanic or Latino (of any race)	26	1.9%
Not Hispanic or Latino	1,343	98.1%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates.

Education

Educational attainment of community residents is also an influencing factor in socio demographic capacity. Compared to the state, Wheeler County has a slightly lower percentage of high school graduates and a significantly lower percentage of college graduates with a Bachelor's degree or higher - more than 14-percent less. Tables 2.9a and 2.9b compare the educational attainment in Wheeler County and the State of Oregon.

Table 2.9a: Educational Attainment – Wheeler County

Wheeler County	Count	Percent
Population 25 and over	1,144	
High school graduate or higher	1,048	91.6%
Bachelor's degree or higher	194	17.0%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Table 2.9b: Educational Attainment – Oregon

Oregon	Count	Percent
Population 25 and over	2,755,786	
High school graduate or higher	2,479,288	90.0%
Bachelor's degree or higher	866,373	31.4%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Educational attainment often reflects higher income and therefore higher self-reliance. Widespread educational attainment is also beneficial for the regional economy and employment sectors as there are potential employees for professional, service and manual labor workforces. An oversaturation of either highly educated residents or low educational attainment can also have negative effects on the resiliency of the community.

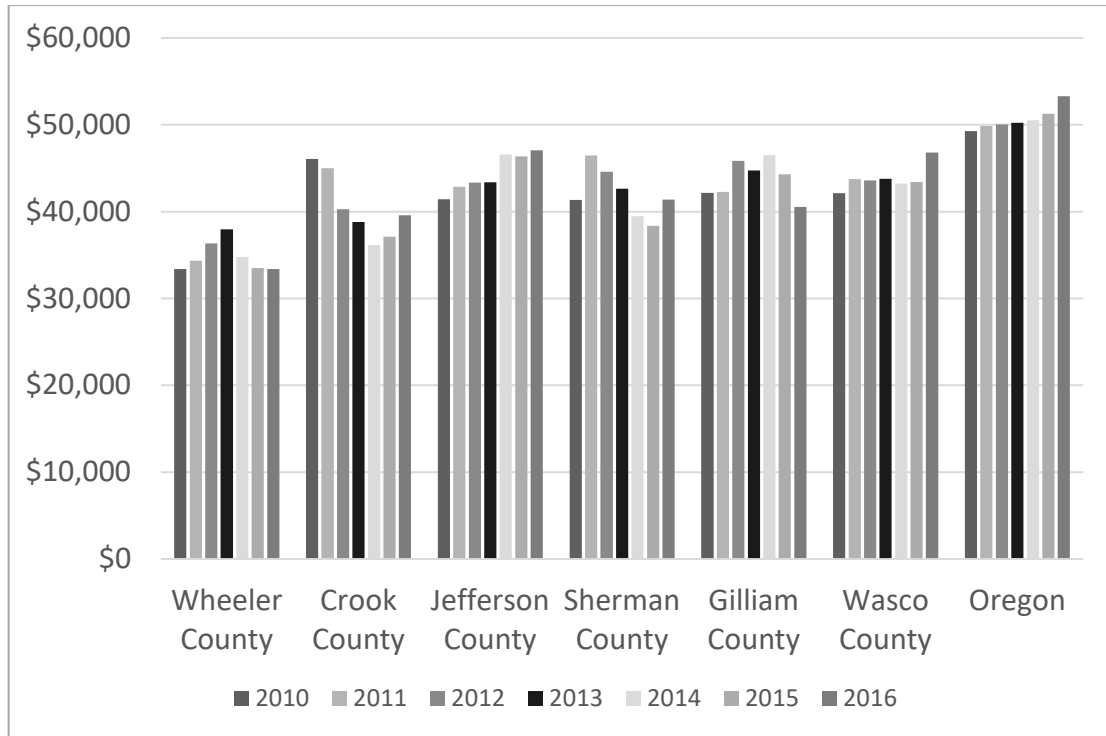
Income

Household income and poverty status levels are indicators of socio demographic capacity and the stability of the local economy. Household income can be used to compare economic areas as a whole, but does not reflect how the income is divided among the residents in the area.²⁰

Figure 2.6 illustrates changes in the median household income from 2010 to 2016 in Wheeler County and the surrounding communities. In 2016 the median household income in Wheeler County was \$33,403. This is significantly lower compared to the state average household income level (\$53,270), and is also the lowest in the entire north central Oregon region. Furthermore, the income level in the county remained essentially unchanged between 2010 and 2016, growth in income throughout the state over the same period of time was 8.1%.

²⁰ State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

Figure 2.6: Median Household Income, 2010-2016



Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates.

Income is a resiliency indicator as higher incomes are often associated with increased self-reliance and ability to prepare oneself if an emergency does occur. Low-income populations may require additional assistance following a disaster because they may not have the savings to withstand economic setbacks, and if work is interrupted, housing, food and necessities become a greater burden. Additionally, low-income households are more reliant upon public transportation, public food assistance, public housing and other public programs, all which can be impacted in the event of a natural disaster.

Table 2.10 describes an estimate of both the number and the percentage of individuals living below the poverty level. In 2010, the poverty guideline for a family of four was for annual household income levels at or below \$25,100.²¹ The Census Bureau estimates that 14.0-percent of the total population and 19.5-percent of children live below the poverty level across the county, and both of these levels have increased since 2005. In fact, the number of children living below the poverty level increased by 5.7-percent.

The poverty estimates as a percentage are significantly higher in Wheeler County compared to state and national estimates. The percentage of children living in poverty in the county is 39.9-percent. Poverty limits the ability of households to engage in household level mitigation activities. In addition, the higher the poverty rate, the increased assistance the community will

²¹ U.S. Department of Health and Human Services. Federal Register / Vol. 83, No. 12 / Thursday, January 18, 2018, pages 2642-2644.

likely need in the event of a disaster in the form of sheltering, medical assistance and transportation.

Table 2.10: Estimate on the Number of Residents Living in Poverty

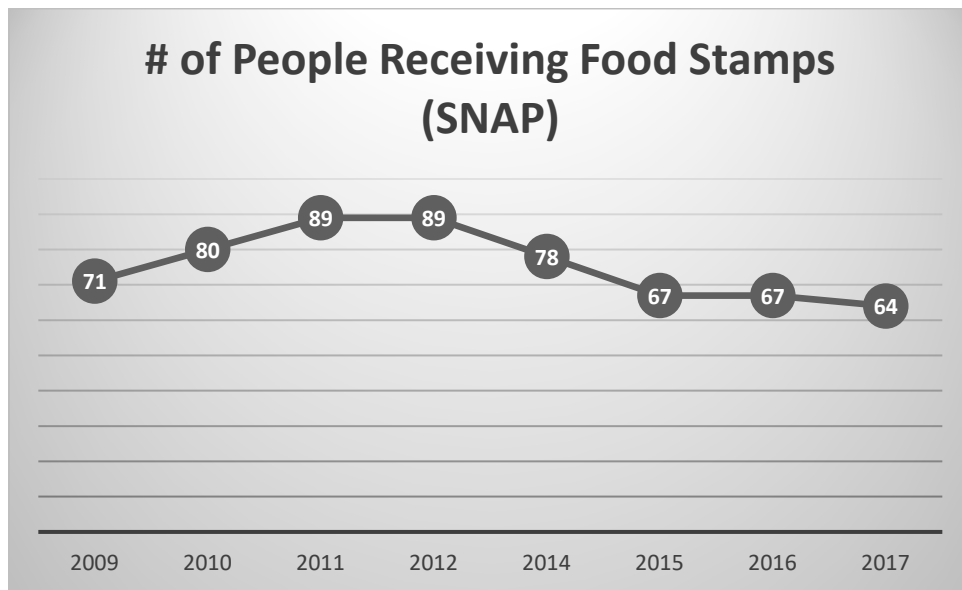
Jurisdiction	2005 Poverty All Ages	2016 Poverty All Ages	2005 Poverty Under 18	2016 Poverty Under 18
Wheeler County	247	258	69	77

Jurisdiction	2005 Percent Poverty All Ages (%)	2016 Percent Poverty All Ages (%)	2005 Percent Poverty Under 18 (%)	2016 Percent Poverty Under 18 (%)
Wheeler County	17.5%	19.6%	29.1%	39.9%
Oregon	14.1%	13.4%	18.8%	17.2%
United States	13.3%	14.0%	18.5%	19.5%

Source: U.S. Census Bureau, Small Area Estimates Branch, 2005 Estimates, 2016 Estimates.

The number of people receiving a benefit from the Supplemental Nutrition Assistance Program (SNAP – i.e. food stamps) in the county, however, has remained relatively unchanged in the last couple of decades.

Figure 2.7: Number of people in Wheeler County receiving food stamps (SNAP)



Source: Children First for Oregon, Oregon County Data Book, 2009-2017.

Health Insurance

Individual and community health play an integral role in community resiliency. Those who lack health insurance have higher vulnerability to hazards and will likely require additional community support and resources.

The U.S. Census Bureau estimated in 2009 that the number of uninsured residents in the county under the age of 65 equaled 327 (31.9-percent). It is important to note that the uninsured rate for this population was higher in the county compared to the state as a whole (19.4-percent), and the rate of uninsured persons under 19 in the county (22.9-percent) was more than 10-

percent higher compared to the state as a whole (11.0-percent). However, both of these rates have declined in the county since 2005.

Table 2.11: Health Insurance Coverage in Wheeler County

Year	Jurisdiction	Percent Uninsured - Under Age 65	Percent Uninsured - Under Age 19
2005	Wheeler County	37.0%	
	Oregon	18.7%	
2006	Wheeler County	32.2%	25.0%
	Oregon	19.1%	12.9%
2007	Wheeler County	22.8%	13.6%
	Oregon	18.8%	12.8%
2008	Wheeler County	28.5%	18.5%
	Oregon	18.0%	12.3%
2009	Wheeler County	31.9%	22.9%
	Oregon	19.4%	11.0%
2010	Wheeler County	26.3%	17.8%
	Oregon	19.7%	9.2%
2011	Wheeler County	21.0%	11.7%
	Oregon	18.1%	7.6%
2012	Wheeler County	20.3%	10.2%
	Oregon	17.4%	6.9%
2013	Wheeler County	23.8%	13.4%
	Oregon	17.2%	6.2%
2014	Wheeler County	14.7%	10.2%
	Oregon	11.6%	5.1%
2015	Wheeler County	9.1%	5.8%
	Oregon	8.4%	4.1%
2016	Wheeler County	9.5%	7.0%
	Oregon	7.4%	3.5%

Source: U.S. Census Bureau, Small Area Health Insurance Estimates, 2005-2016

The only health care and dental care available is from Asher Community Health Center (ACHC), located in Fossil, with satellite clinics in Spray and Mitchell. Two Physician Assistants provide primary care. Asher Clinic was established in 1974, operating out of the Sunday school rooms at United Methodist Church.

In July 2005 ACHC became the first rural Oregon county to receive a state grant to establish a school-based health center (SBHC). The SBHC was established at Mitchell School (K-12, approx. 70 students). The SBHC serves both students and the general community. Previously, Mitchell residents had to drive at least 45-miles (over a mountain pass) to Prineville for their medical services.

The combination of two grants, plus local tax district funds, provides about half of ACHCs operating revenue. The remainder is mostly patient fees, which are low as half of ACHC's patients qualify for reduced fees due to their poverty level. This funding base allows for two full-time Physician Assistants and a part-time physical therapist to meet the needs of Wheeler County's three communities.²²

Summary

Socio demographic capacity is a significant indicator of community hazard resiliency. The characteristics and qualities of the community population such as age, race, education, income, health and safety are significant factors that can influence the community's ability to cope, adapt to and recover from natural disasters. The current status of socio demographic capacity indicators can have long term impacts on the on the economy and stability of the community ultimately affecting future resiliency of the community.

Key Takeaways:

- The population of Wheeler County has been steadily declining for the last few decades. From 2000 to 2016, it declined by 11.5%;
- Wheeler County has an aging population. By 2030, it is forecast that 44% of the population will be over the age of 60;
- The percentage of residents with a higher education degree is well below the state average (17% vs 31.4%);
- Median annual household income in the county is \$33,403 - about \$20,000 lower than the state average;
- 40% of the children in Wheeler County live below the poverty level; and
- The percentage of residents without health care has dropped significantly since passage of the Affordable Care Act in 2010.

Regional Economic Capacity

Economic resilience to natural disasters is far more complex than merely restoring employment or income to the local community. Building a resilient economy requires an understanding of how the component parts of employment sectors, workforce, resources and infrastructure are interconnected in the existing economic picture. Once any inherent strengths or systematic vulnerabilities become apparent, both the public and private sectors can take action to increase the resilience of the local economy.

Regional Affordability

The evaluation of regional affordability supplements the identification of socio-demographic capacity indicators, i.e. median income, and is a critical analysis tool to understanding the economic status of a community. This information can capture the likelihood of individuals' ability to prepare for hazards, through retrofitting homes or purchasing insurance. Regional

²² Asher Community Health Center. <http://www.asherhealth.info/index.html>.

affordability is a mechanism for generalizing the abilities of community residents to get back on their feet without Federal, State or local assistance.

MEDIAN INCOME

Median income can be used as an indicator of the strength of a region’s economic stability. Table 2.12 shows that between 2000 and 2016 the median household income in Wheeler County increased at a much slower rate than both the state and nation as a whole and remains below state and national averages.

Table 2.12: Median Household Income Changes

	2000*	2010^	2016*	Change (2000-2016)	Percent Change (2000-2016)
Wheeler County	\$28,750	\$33,403	\$33,400	\$4,650	16.2%
Oregon	\$40,916	\$46,560	\$53,270	\$12,354	30.2%
United States	\$41,994	\$50,046	\$55,322	\$13,328	31.7%

Source*: U.S. Census Bureau, Summary File 3 (SF 3), Sample Data

Source^: U.S. Census Bureau, 2006-2010 American Community Survey,

Source*: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Employment and Wages

Data provided by the U.S. Census Bureau in the American Community Survey indicates that Wheeler County’s labor force (defined as the population of 16 and older which are in the labor force) decreased from 658 to 583 between 2010 and 2016.²³

During the same time period, unemployment levels in Wheeler County declined significantly reflecting national trends. According to the Oregon Employment Department, unemployment dropped as low as 3.9-percent in 2017.²⁴ Table 2.13 illustrates annual unemployment changes throughout the region since 2007. The unemployment rate in Wheeler County is consistent with trends throughout Oregon over the past five years.

²³ U.S. Census Bureau. American Fact Finder. Economic Characteristics. 2000. Economic Characteristics. 2016-2017 ACS, 5-year Estimates.

²⁴ Oregon Employment Department - “Local Area Employment Statistics”, <http://www.qualityinfo.org/olmisj/labforce>

Table 2.13: Regional Unemployment (Seasonally Adjusted)

Jurisdiction	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Wheeler County	5.6%	5.8%	9.0%	10.8%	9.7%	6.9%	6.3%	6.2%	5.2%	4.2%	3.9%
Crook County	6.2%	9.9%	18.0%	17.5%	15.7%	13.6%	12.1%	9.8%	8.3%	6.9%	6.3%
Gilliam County	4.5%	4.3%	6.8%	6.7%	6.5%	10.1%	9.5%	8.0%	6.4%	5.8%	4.2%
Grant County	8.0%	10.5%	13.5%	13.4%	13.4%	14.0%	12.4%	10.5%	8.7%	7.6%	6.8%
Jefferson County	6.8%	10.0%	14.8%	14.1%	13.1%	11.8%	10.4%	8.9%	7.3%	6.6%	5.6%
Morrow County	5.4%	6.3%	9.2%	8.9%	8.1%	8.1%	7.7%	6.9%	5.7%	4.8%	4.4%
Sherman County	4.9%	5.8%	9.0%	10.0%	9.0%	10.7%	9.3%	7.5%	6.1%	4.6%	4.8%
Wasco County	4.9%	6.0%	9.0%	9.3%	8.4%	8.4%	7.6%	6.6%	5.6%	4.8%	4.1%
Oregon	5.2%	6.5%	11.1%	10.8%	9.5%	8.8%	7.9%	6.8%	5.6%	4.8%	4.1%

Source: Oregon Employment Department, 2017.

As opposed to measurements of the labor force and total employment, covered employment provides a quarterly count of all employees covered by unemployment insurance. Table 2.14 displays the covered employment and payroll figures for Wheeler County and neighboring counties in 2017.

Table 2.14: 2017 Employment & Wages

Jurisdiction	Number of Employees	Annual Payroll	Average Pay
Wheeler County	312	\$9,052,196	\$29,013
Crook County	6,147	\$289,086,504	\$47,029
Gilliam County	811	\$31,951,373	\$39,398
Grant County	2,475	\$94,189,600	\$38,056
Jefferson County	6,714	\$255,142,582	\$38,002
Morrow County	5,796	\$291,849,685	\$50,354
Sherman County	825	\$37,646,522	\$45,632
Wasco County	12,012	\$463,325,416	\$38,572
Oregon	1,883,652	\$96,286,236,374	\$51,117

Source: Oregon Employment Department, County Covered Employment and Wages, 2017.

In 2016, there were 30 employment establishments operating in Wheeler County and 29 of those establishments had fewer than 20 employees.²⁵ This is quite common for small businesses throughout the country. The prevalence of small businesses in the county is a partial indication of sensitivity to natural hazards, because small businesses are typically more susceptible to financial uncertainty. If a business is financially unstable before a natural disaster occurs, financial losses (resulting from both damage caused and the recovery process) may have a bigger impact than they would for larger and more financially stable businesses.²⁶

Industry

Key industries are those that represent major employers and are significant revenue generators. Different industries face distinct vulnerabilities to natural hazards, as illustrated by the industry

²⁵ U.S. Census Bureau - 2016 County Business Patterns, <http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl>

²⁶ State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile

specific discussions below. Identifying key industries in the region enables communities to target mitigation activities towards those industries' specific sensitivities. It is important to recognize that the impact that a natural hazard event has on one industry can reverberate throughout the regional economy.

This is of specific concern when the businesses belong to the basic sector industry. Basic sector industries are those that are dependent on sales outside of the local community. The farm and ranch, information, and wholesale trade industries are all examples of basic industries. Non-basic sector industries are those that are dependent on local sales for their business such as retail, trade, construction, health services, and social assistance.

Employment by Industry

Wheeler County's economy is primarily based upon agriculture (irrigated farming), cattle ranching, and tourism. Economic resilience to natural disasters is particularly important for the major employment industries in the region. If these industries are negatively impacted by a natural hazard that employment is affected, the impact will be felt throughout the regional economy. Thus, understanding and addressing the sensitivities of these industries is a strategic way to increase the resiliency of the entire regional economy.

Agriculture

According to 2012 Census of Agriculture by the U.S. Department of Agriculture, 153 farms were located in Wheeler County with a total of 649,066 acres of land. Table 2.16 describes agriculture production in Wheeler County by type of crops harvested and livestock. The two major commodities are cattle (beef cows) and wheat (winter wheat).

Table 2.16: Agriculture Production in Wheeler County, 2012

Selected crops harvested	Number of Farms	Number of Acres	Number of Bushels
Corn for grain	3	116	20,718
Corn for silage or greechop	24	2,725	70,927
Wheat for grain, all	100	14,535	1,394,999
Winter wheat for grain	84	11,379	1,106,567
Spring wheat for grain	27	3,156	288,432
Oats for grain	N/A	N/A	N/A
Forage - land used for all hay and all haylage, grass silage, and greenchop	66	8,238	20,379
Livestock	Number of Farms	Total Number	
Cattle and calves inventory	90	18,647	
Hogs and pigs inventory	11	58	
Sheep and lambs inventory	10	234	
Layers inventory	19	292	

Source: U.S. Department of Agriculture, 2012 Census of Agriculture – County Data

In 2012, the gross farm and ranch sales in Wheeler County was \$14,158,000. Table 2.17 highlights the gross farm and ranch sales and state rank for Wheeler County and the surrounding counties.

Table 2.17: County Gross Farm and Ranch Sales, 2010 & 2012

County	2010 Dollars	2010 County Rank	2012 Dollars	2012 County Rank
Wheeler County	\$13,023,000	34	\$14,158,000	34
Crook County	\$37,287,000	27	\$42,298,000	28
Gilliam County	\$25,664,000	29	\$44,054,000	27
Grant County	\$46,082,000	25	\$25,369,000	30
Jeffereson County	\$63,133,000	20	\$65,032,000	21
Morrow County	\$395,759,000	3	\$568,111,000	2
Wasco County	\$89,741,000	13	\$89,783,000	15

Source: Oregon Department of Agriculture, Oregon Agriculture: Facts and Figures, Revised August 22, 2011

Source: U.S. Department of Agriculture, 2012 Census of Agriculture – County Data

In 2012 the average estimated market value of land and buildings per farm equaled \$2,749,539. The total value of all 153 farms in the county equaled \$420, 679,467. Table 2.18 describes the farm values in 2007 & 2012 by group in Wheeler County according to the U.S. Department of Agriculture.

Table 2.18: Farm Value of Sales, 2007 & 2012

2007 Value of Sales	Number of Farms	2012 Value Group	Number of Farms
Less than \$2,500	78	Less than \$2,500	56
\$2,500 to \$4,999	11	\$2,500 to \$4,999	17
\$5,000 to \$9,999	6	\$5,000 to \$9,999	11
\$10,000 to \$24,999	19	\$10,000 to \$24,999	19
\$25,000 to \$49,999	6	\$25,000 to \$49,999	11
\$50,000 to \$99,999	16	\$50,000 to \$99,999	15
\$100,000 or more	28	\$100,000 or more	30

Source: U.S. Department of Agriculture, 2007 Census of Agriculture – County Data

Source: U.S. Department of Agriculture, 2012 Census of Agriculture – County Data

Covered Employment

Table 2.19 identifies covered employment in Wheeler County by industry. While Wheeler County has considerable employment in some non-basic industries such as education, health services and government, the county's fourth largest industry (natural resources and mining) is of the basic nature and thus dependent to a large degree on sales outside of the local community. Basic industries encourage growth in non-basic industries and bring wealth into communities from outside markets. However, a high dependence on basic industries can lead to severe difficulties when recovering from a natural disaster if vital infrastructure or primary resource concentrations have been greatly damaged.

Table 2.19: Covered Employment in Wheeler County, 2010 & 2017

Industry	2010 Employment	2010 Percent of Industry	2017 Employment	2017 Percent of Industry
Total Private Coverage	176	58.5%	196	62.8%
Natural Resources & Mining	39	13.0%	36	11.5%
Trade, Transportation & Utilities	35	11.6%	55	17.6%
Retail	23	7.6%	44	14.1%
Education & Health Services	54	17.9%	52	16.6%
Leisure & Hospitality	26	8.6%	28	8.9%
Other Services	7	2.3%	5	1.6%
Total All Government	125	41.5%	116	37.1%
Total All Ownerships	301	100.0%	312	100.0%

Source: Oregon Employment Department, Covered Employment 2010 & 2017.

Summary

Regional economic capacity refers to the present financial resources and revenue generated in the community to achieve a higher quality of life. Forms of economic capital include income equality, housing affordability, economic diversification, employment and industry. The current and anticipated financial conditions of a community are strong determinants of community resilience, as a strong and diverse economic base increases the ability of individuals, families and the community to absorb disaster impacts for a quick recovery.

Key Takeaways:

- Unemployment is at historically low levels in Wheeler County (3.9% in 2017), while the number retired is at a record high²⁷.
- The three primary industries in the county are irrigated farming, cattle ranching and tourism.
- Considering the moderate diversity of its economy - although dependent on several basic industries for revenue generation - Wheeler County may experience a more difficult time in recovering from a natural disaster than communities with a more diverse economic base and less unemployment.²⁸
- In addition, it is important to consider what might happen to the economy if the largest revenue generators and employers (education and health services, natural resources and mining and trade, transportation and utilities), were heavily impacted by a disaster. To an extent, and to the benefit of Wheeler County, these particular industries are a mix of basic and non-basic industries, dependent on both external markets and local residents.
- It is imperative, however, that Wheeler County continues to recognize that economic diversification is a long-term issue. More immediate strategies and actions to reduce vulnerability from an economic perspective should focus on risk management for the

²⁷ County Planning Manager, July 2019.

²⁸ State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

county’s dominant industries (e.g. business continuity planning) as well as the dependence on main transportation arteries.

Built Capacity

Housing Building Stock

Housing characteristics are an important factor in hazard mitigation planning, as some housing types tend to be less disaster resistant than others, and therefore warrant special attention. Table 2.23 identifies the type of housing structures most common throughout Wheeler County.

Of particular interest are the number of mobile homes and other non-permanent housing structures, which account for 19.5-percent of the housing structures in the county. Mobile structures are particularly vulnerable to certain natural hazards, in particular windstorms, and special attention should be given to securing the structures as they are typically more prone to damage than wood-frame construction.²⁹

Also, it is important to consider multi-unit structures, as they are more vulnerable to the impacts from natural disasters due to the increased number of people living in close proximity. In short, a structural weakness in a multiunit structure will have an amplified impact on the population. In Wheeler County, only 2.6-percent of the housing units have two or more units.

Table 2.23: Housing Type Summary

Number of Units	2010	Percent	2016	Percent
1 unit	739	82.4%	758	77.8%
2 to 4 units	0	0.0%	9	0.9%
5 to 9 units	0	0.0%	0	0.0%
10 to 19 units	0	0.0%	12	1.2%
20 or more units	3	0.3%	5	0.5%
Mobile home	155	17.3%	190	19.5%
Boat, RV, van, etc.	0	0.0%	0	0.0%
Total housing units	897	100.0%	974	100.0%

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimate
 Source: U.S. Census Bureau, 2012-2016 American Community Survey, 5-Year Estimate

Age of housing is another characteristic that influences a structure’s vulnerability to hazards. Generally the older a home is, the greater the risk of damage from natural disasters. This is because stricter building codes have only been implemented in recent decades following improved scientific understanding of plate tectonics and earthquake risk. In 1974 a statewide Unified Building Code was adopted as a means to bring the building criteria for every city and

²⁹ State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

county under one all-inclusive code.³⁰ Under this code, the first provisions for seismic design criteria were implemented. Since the first adoption in 1974, there have been ten revisions to the code to enhance and improve the safety of building and the citizens who occupy them. In fact, according to the State of Oregon Building Codes Division, structural safety has increased more than 225-percent based on the minimum loading criteria base-shear factors since code were first adopted in 1974.³¹ The eleventh cycle is the most recent and was adopted in 2010 as the Oregon Structural Capacity Code.

Table 2.24 describes the age of the housing units throughout the county. According to the U.S. Census Bureau, roughly 76-percent of the housing units in the county were built prior to 1980; roughly the time when the first seismic codes were implemented statewide.

Table 2.24: 2016 Housing Units, Year Built

Year Built	Number	Percent
2014 or later	0	0.0%
2010 to 2013	1	0.1%
2000 to 2009	124	12.7%
1990 to 1999	103	10.5%
1980 to 1989	67	6.8%
1970 to 1979	167	17.1%
1960 to 1969	48	4.9%
1950 to 1959	71	7.2%
1940 to 1949	73	7.4%
1939 or earlier	320	32.8%
Total housing units	974	100.0%

Source: U.S. Census Bureau, 2012-2016 American Community Survey, 5-Year Estimate

Mitigation and preparedness planning should also consider type of occupancy when developing outreach projects or educational campaigns. Residents who own their own home are more likely to take steps to reduce the impact of natural hazards through mitigation or insurance methods. Renters may be less invested in physical improvements to the unit; as a result outreach around personal preparedness or renters insurance would benefit this population. As demonstrated in Table 2.25 below, approximately 18.2-percent of the housing units in Wheeler County are renter-occupied.

³⁰ State of Oregon Building Codes Division. Earthquake Design History. A Summary of Requirements in the State of Oregon. February 7, 2012.
http://www.oregon.gov/OMD/OEM/osspace/docs/History_Seismic_Codes_OR.pdf?ga=t.

³¹ State of Oregon Building Codes Division. Earthquake Design History. A Summary of Requirements in the State of Oregon. February 7, 2012.
http://www.oregon.gov/OMD/OEM/osspace/docs/History_Seismic_Codes_OR.pdf?ga=t.

Table 2.25: Housing Occupancy Summary

Occupancy	Number	Percent
Occupied housing units	696	71.4%
<i>Owner-occupied units</i>	518	53.1%
<i>Renter-occupied units</i>	178	18.2%
Vacant housing units	278	28.5%
Total housing units	974	100.0%

Source: U.S. Census Bureau, 2012-2016 American Community Survey, 5-Year Estimate

Physical Infrastructure

Physical infrastructure such as dams, roads, bridges, and utilities support Wheeler County communities and economies. Critical facilities are facilities that are critical to government response and recovery activities. However, the term may also refer to facilities or infrastructure that could cause serious secondary impacts when disrupted. Many things can be counted as critical infrastructure and facilities depending on the social, environmental, economic and physical makeup of the area under consideration. Some examples include: agriculture and food systems, communications facilities, critical manufacturing, emergency services, energy generation and transmission, government facilities, healthcare and public health facilities, information technology transportation systems and water. Due to the fundamental role that physical infrastructure plays both in pre and post-disaster, they deserve special attention in the context of creating resilient communities.³²

DAMS

Dam failures can occur at any time and are quite common. Fortunately, most failures result in minor damage and pose little or no risk to life safety. However, the potential for severe damage still exists. The Oregon Water and Resources Department has inventoried all dams located in Oregon and Wheeler County. Table 2.26 identifies the threat potential for the 19 dams in Wheeler County. All of the dams located in the county have a low threat potential level.

Table 2.26: Dam Threat Summary

Threat Potential Level	Number of Dams
High	0
Low	19

Source: Oregon Water Resources Department, Dam Inventory Query

ROADS

The Wheeler County Road Department maintains 31 roads and approximately 260 miles of road. Rowe Creek Road, Kahler Basin Road, Bridge Creek/Burnt Ranch Road and Parish

³² State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

Creek/Waterman Road are estimated to carry the highest volume of daily traffic of all the Wheeler County roads.³³ The county has four main arterial roads:

- U.S. Highway 26 runs east/west through Mitchell and the southern section of the county connecting Prineville to John Day.
- Oregon Route 19 by and large runs north/south and connects Fossil with Service Creek and Spray.
- Oregon Route 207 generally runs north/south and connects Mitchell at U.S. Highway 26 to Spray on to Heppner in Morrow County.
- Oregon Route 218 runs east/west and connects Fossil with U.S. Highway 97

Journey Through Time Scenic Byway³⁴

Rich in history, this route tells stories of fortunes made and lost, of Chinese laborers, of towns boomed and busted, of timber, agriculture, and pioneer settlers. It also tells a special story of the earth's history; of sea beds which have long been dry and of extinct creatures. The Journey Through Time stretches 286 miles through north central to eastern Oregon. It winds through five Oregon counties, including Wheeler County, beginning in the community of Biggs (Sherman County) and ends in Baker City (Baker County). The scenic byway encompasses Oregon Route 218 from the Wasco County boundary to the City of Fossil. The byway then meanders along Oregon Route 19 from Fossil to the Grant County Boundary.

AIRPORTS

According to the Federal Aviation Administration, there are no publicly owned and four privately owned airports located in Wheeler County.

The nearest public airports are located more than 20 miles outside of the county. The Condon State Pauling Field Airport near Condon (Gilliam County) is approximately 21 miles north of Fossil, and the Monument Municipal Airport near Monument (Grant County) is about 27 miles east of Spray. Access to these airports faces the potential for closure from a number of natural hazards, including wind and winter storms common to the region.³⁵ Additionally, both of these airports are small, general aviation facilities that can accommodate light single and twin engine piston driven aircraft and light jets. Neither are suitable for larger aircraft such as many fire-fighting tankers and commercial aircraft, should they need to utilize these facilities during a natural disaster.

Utility Lifelines

Utility lifelines are the resources that the public relies on daily, (i.e., electricity, fuel and communication lines). If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines closely relate to physical infrastructure, (i.e., dams and power plants) as they transmit the power generated from these facilities.

³³ Wheeler County Website. Road Department. <http://www.wheelercounty-oregon.com/roads.html>.

³⁴ Eastern Oregon: Journey Through Time Scenic Byway. <http://www.oregon.com/byways/journey>.

³⁵ State of Oregon Natural Hazards Mitigation Plan, Region 4 Southwest Oregon Regional Profile.

The network of electricity transmission lines running through Wheeler County are operated by Columbia Power Cooperative, Columbia Basin Electric Cooperative, Wasco Electric Cooperative and the Bonneville Power Administration. These entities primarily facilitate local energy production and distribution in the area.

COLUMBIA POWER COOPERATIVE

The Columbia Power Cooperative provides services to a majority of the county including the cities of Mitchell and Spray.

COLUMBIA BASIN ELECTRIC COOPERATIVE³⁶

Columbia Basin Electric serves over 3,500 members throughout a service area of approximately 3,000 square miles in five counties, including Wheeler County. The Cooperative serves residential, commercial, industrial, and irrigation customers throughout the county, including the City of Fossil. The Columbia Basin Electric Cooperative has two offices, one of which is located at 402 S. Main Street in Condon.

WASCO ELECTRIC COOPERATIVE

The Wasco Electric Cooperative engages in energy transmission and distribution, providing electric service to over 3,000 members with 1,685 miles of lines and ten substations to serve portions of Wheeler County.³⁷

BONNEVILLE POWER ADMINISTRATIVE³⁸

The Bonneville Power Administrative (BPA) is a federal nonprofit agency based in the Pacific Northwest. BPA markets wholesale electrical power from 31 federal hydro projects in the Columbia River Basin, one nonfederal nuclear plant and several other small nonfederal power plants. About 30-percent of the power used in the Northwest comes from BPA.

BPA also operates and maintains about three-fourths of the high-voltage transmission (15,215 circuit miles) in the service territory, which includes California, Idaho, Montana, Nevada, Oregon, Utah, Washington and Wyoming. Several of these lines run through Wheeler County.

Telecommunications

A number of telecommunication providers are available in Wheeler County. According to Oregon Public Utility Commission, the following companies provide services to the county: AT&T Mobility, Blue Mountain Digital, CenturyLink, Futaris, Inc., GCI Communication Corp., Hughes Net, King Street Wireless L.P., Oregon Telephone Corporation, Trans Cascades, U.S. Cellular, Verizon Wireless and, ViaSat, Inc.³⁹

³⁶ Columbia Basin Electric Co-op, Inc. Introduction. http://www.cbec.cc/Home_Page.php.

³⁷ Wasco Electric Cooperative. About Wasco Electric Cooperative. <http://www.wascoelectric.com/aboutWasco/>.

³⁸ Bonneville Power Administration. 2010 BPA Facts. http://www.bpa.gov/corporate/about_BPA/Facts/FactDocs/BPA_Facts_2010.pdf.

³⁹ Oregon Broadband Mapping Project. <http://broadband.oregon.gov/StateMap/index.html>.

Water Supply/Wastewater Treatment⁴⁰

CITY OF FOSSIL:

Water Supply: ground water, surface water, spring and well

Operator: City of Fossil

Capacity (MGD):* 0.08

Age of Water System: 1896

Wastewater Treatment System: yes

Operator: City of Fossil

System Design Capacity (MGD): 0.95

Age of Wastewater Collection System: 1995

CITY OF MITCHELL:

Water Supply: ground water, springs

Operator: City of Mitchell

Capacity (MGD):* 0.06

Age of Water System: 1986

Wastewater Treatment System: septic system

CITY OF SPRAY:

Water Supply: ground water

Operator: City of Spray

Capacity (MGD):* N/A

Age of Water System: 1997

Wastewater Treatment System: septic system

* **MGD** = million gallons per day

Public-Safety Access Point

Tri-County Communications is the call center responsible for answering emergency calls for police, firefighting and ambulance services in Wheeler, Gilliam and Sherman Counties. The call center is stationed at 135 S. Main Street in Condon (Gilliam County).

⁴⁰ Infrastructure Finance Authority. Oregon Community Profiles. <http://www.orinfrastructure.org/profiles/>.

Critical Facilities

Critical facilities are those facilities that are essential to government response and recovery activities (e.g., hospitals, police, fire and rescue stations, school districts and higher education institutions).⁴¹ The interruption or destruction of any of these facilities would have a debilitating effect on incident management. Critical facilities in Wheeler County are identified in Table 2.27 below.

Table 2.27: Critical Facilities

Facility Type	County Total
Hospitals (# of beds)	0 (0)
Sheriff's/Police Offices	1
Fire and Rescue Stations	5
Dams	21
Bridges	60
School Districts	3
Airports	4
<i>Public Airports</i>	0
<i>Private Airports</i>	4

Source: State of Oregon Natural Hazards Mitigation Plan, Region 6 Central Oregon Regional Profile.

HOSPITALS⁴²:

City of Fossil: Asher Community Health Center provides primary care and dental care at the main clinic in Fossil. The two closest hospitals are Mountain View Hospital in Madras (Jefferson County) and Pioneer Memorial Hospital in Heppner (Morrow County). Both are about 65 miles from Fossil.

- Emergency Services: Ambulance Service, Life Flight Network Service

City of Mitchell: The nearest hospital is Pioneer Memorial Hospital in Prineville (Crook County), which is approximately 48 miles from the city – over a mountain pass.

- Emergency Services: Ambulance Service, Life Flight Network Service

City of Spray: The nearest hospital is Pioneer Memorial Hospital in Heppner (Morrow County), which is roughly 55 miles away.

- Emergency Services: Ambulance Service, Life Flight Network Service

SHERIFF/ POLICE

The Oregon State Police Department and the Wheeler County Sherriff's Office, which is located in Fossil, both serve Wheeler County. Four full-time law enforcement officers make up the force

⁴¹ State of Oregon Natural Hazards Mitigation Plan, Region 6 Central Oregon Regional Profile.

⁴² Infrastructure Finance Authority. Oregon Community Profiles. <http://www.orinfrastructure.org/profiles/>.

for the Wheeler County Sheriff's Office: 2 Deputies, 1 Undersheriff, 1 Sheriff and 4 Reserve Deputies.

FIRE AND RESCUE

The three incorporated cities; Fossil, Mitchell and Spray, each have fire departments and ambulance service that provide service within each city's limits. All three are operated by volunteers. In addition, the Wheeler County Search and Rescue, Wheeler Point Rural Fire Protection District (Winlock) and the Twickenham Rangeland Protection Association (Twickenham) all provide volunteer services within the county.

Summary

Built capacity refers to the built environment and infrastructure that supports a community. The various forms of built capital mentioned throughout this section, play significant roles in the event of a disaster.

Physical infrastructure, including utility and transportation lifelines, are critical to maintain during a disaster and are essential for proper functioning and response. Community resilience is directly affected by the quality and quantity of built capital and lack of or poor condition of infrastructure can negatively affect a community's ability to cope, respond and recover from a natural disaster. Initially following a disaster, communities may experience isolation from surrounding cities and counties due to infrastructure failure. These conditions force communities to rely on local and immediate resources.

Key takeaways

- The county continues to decline in population which has resulted in no significant new development within the cities since the 2014 NHMP was completed. There have been no changes in development that impact the cities vulnerability to natural hazards.
- Critical facilities are those facilities that are essential to government response and recovery activities (e.g., hospitals, police, fire and rescue stations, school districts and higher education institutions).
 - Wheeler County has no hospitals. Asher Community Health Center in Fossil serves as the primary medical clinic in the county. It regularly transports patients via helicopter to the surrounding hospitals.
 - The counties utility, communication and transportation infrastructure is in decent condition and adequate to meet the needs of the county.

Community Connectivity Capacity

Social Organizations

Social systems have the ability to easily reach vulnerable populations, which have a tendency to be more at-risk in the event of a disaster. Social systems can be community organizations and programs that provide social and community-based services for the public. It would be beneficial for the county to work with such programs to help distribute information that will help educate those who do not have the resources to learn about hazard mitigation.

Below are a few methods that social organizations located throughout Wheeler County can use to become involved in hazard mitigation.

- Education and Outreach – Organizations can partner with the community to educate the public or provide outreach assistance and materials on natural hazard preparedness and mitigation.
- Information Dissemination – Organizations can partner with the community to provide and distribute hazard-related information to target audiences.
- Plan/Project Implementation – Organizations may have plans and/or policies that may be used to implement mitigation activities or the organization can serve as the coordinating or partner organization to implement mitigation actions.

Civic Engagement

Civic engagement and involvement are important indicators of community connectivity. Whether it is engagement through outlets such as volunteerism or through local, state, and national politics, you can gauge the connection people have to their community by the more they are willing to help out.

Those who are more invested in their community may also have a higher tendency to vote in political elections. Below, Table 2.28 outlines voter participation and turnout percentages from the 2016 Presidential General Election compared to the 2014 General Election. The 2016 Presidential General Election resulted in an 85-percent voter turnout in the county, while the 2014 General Election resulted in a turnout of 82-percent voter participation.⁴³ These results are higher than the overall voter participation reported in Oregon.

⁴³ Wheeler County Clerk. 2018.

Table 2.28: Voter Turnout Percentages

Jurisdiction	2016 Presidential General Election		2014 General Election	
	Wheeler County*	Oregon^	Wheeler County*	Oregon^
Total - Registered Voters	986	2,553,806	891	2,174,763
Total - Ballots Cast	840	2,051,448	730	1,541,782
Voter Turnout Percentage	85.2%	80.3%	82.0%	70.9%

Source*: Wheeler County Election Results, Wheeler County Clerk
Source^: Oregon Blue Book Election Results

Cultural Resources

Cultural resources provide residents with a sense of belonging and provide a glimpse into the past to teach current residents about the histories and lives of past residents. Historic sites, museums and libraries are just a few resources that give residents and visitors a sense of cultural connectivity to a place. These resources celebrate history and help define an area that people call home.

OREGON PALEO LEARNING INSTITUTE⁴⁴

The Oregon Paleo Lands Institute is an educational, community-based non-profit based in Fossil, Oregon. Their mission is to help northwest residents and visitors of all ages to explore, understand and enjoy the world-renowned natural history of north central Oregon, the ancient and living landscapes of Oregon's last 400-million years and the full fossil record of earth's last 50-million years.

JOHN DAY FOSSIL BEDS NATIONAL MONUMENT⁴⁵

John Day Fossil Beds National Monument protects one of the longest and most continuous records of evolutionary change and biotic relationships in North America. Here, scientists have unearthed countless fossils of land plants and animals dating back 6 to 54 million years as well as evidence of the dramatic climatic changes that have occurred.

One of the three units of the John Day Fossil Beds National Monument is located in Wheeler County. The Painted Hills Unit contains 3,132 acres of scenic marvels unique even in the Pacific Northwest. Located nine miles northwest of Mitchell, the Painted Hills are visited year-round.

HANCOCK FIELD STATION

Hancock Field Station is owned and operated by the Oregon Museum of Science and Industry based in Portland, Oregon. It is located in the Clarno Unit of the John Day Fossil Beds National

⁴⁴ Oregon Paleo Learning Institute website. About OPLI. <http://www.paleolands.org/find/time/here/C57>.

⁴⁵ U.S. Department of the Interior. National Park Service. John Day Fossil Beds National Monument. Painted Hills Unit. http://www.nps.gov/joda/planyourvisit/painted_hills_unit.htm.

Monument and has access to one of the world's most significant fossil sites, nearby canyons, archaeology sites, and the John Day River. In the nearby sedimentary rock formations, the fossil record unlocks the geological history and evolution of life and climate in Oregon. Juniper-sage grasslands provide excellent locations to study arid lands ecology. OMSI offers a variety of short and long-term educational opportunities at the camp.

HISTORIC PLACES

The National Register of Historic Places lists all types of facilities and infrastructure that help define a community. Whether it is first schoolhouse in town or even just the home of a resident who played a vital role in the success of the community, the *Register* lists all types of historic features that characterize the area. The Thomas Benton Hoover House and the Fossil Public School in Fossil are the only listings in Wheeler County on the *Register*.

Other important historic structures in Wheeler County include the Wheeler County Courthouse, Spray School and Richmond Schoolhouse.

Typically, these places provide current residents, youth, and visitors with a sense of community. Because of the history behind these sites, and their role in defining a community, it is important to protect these *historic sites* from the impacts natural disasters might have on them.

LIBRARIES AND MUSEUMS

Libraries and Museums are other facilities which a community will use to stay connected. Because all but one city within the county operates a public library, these facilities should be considered a common place for the community to gather during a disaster, as well as and serve a critical function in maintaining a sense of community. Below, Table 2.29 lists the libraries and museums located in Wheeler County.

Table 2.29: List of Libraries and Museums in Wheeler County

Site Name	Location
Fossil Public Library	Fossil
Spray Public/School Library	Spray
Asher Car Museum	Fossil
Fossil Museum	Fossil
Pederson’s Museum	Fossil
Pine Creek School House Museum	Fossil
Spray Pioneer Museum	Spray

Source: Oregon Public Libraries, www.publiclibraries.com/oregon.htm

Source: Wheeler County Website, Towns

Museums can also function in maintaining a sense of community as they provide residents and visitors with the opportunity to explore the past and develop cultural capacity. As a preservation of history, it is important to also consider museums in the mitigation process for community resilience, as these structures should be protected in critical times, especially disasters.

Community Stability

HOMEOWNERSHIP

Another measure of community stability and place attachment is homeownership. One does not seek to be a homeowner in a place they don't feel safe and secure. Residents who become homeowners search for a place in which they are happy, protected, and something they can afford. Homeownership is an indicator that residents will return to a community post-disaster, as these people are economically and socially invested in the community. Likewise, homeowners are more likely to take necessary precautions in protecting their property. Table 2.31 identifies owner occupied housing units across the region; the remaining households are either renter occupied or are vacant.

Table 2.31: Regional Homeownership

Jurisdiction	Homeownership Rate
Wheeler County	53.2%
Crook County	61.0%
Gilliam County	47.7%
Grant County	55.3%
Jefferson County	53.4%
Morrow County	61.9%
Sherman County	52.6%
Wasco County	55.3%
Oregon	55.6%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Summary

Key takeaways:

- Community connectivity capacity places a strong emphasis on social structure, trust and norms, as well as cultural resources within a community. In terms of community resilience, these emerging elements of social and cultural capital will be drawn upon to stabilize the recovery of the community.
- Social and cultural capitals are present in all communities; however, it is dramatically different from one town to the next as they reflect the specific needs and composition of the community residents. A community with low residential stability may hinder the full potential social and cultural resources, adversely affecting the community's coping and response mechanisms.
- Wheeler County has a wide range of resources that range from social organizations, civic engagement, and cultural capital that help support findings that suggest residents are well connected with a sense of community and regional stability.
- The county should consider investing time to inform and support its residents to build more resilient and better prepared communities, as they are more likely to return in the event of

a disaster. Likewise, it is important to consider the roles such services and facilities can, and will, provide to residents during a disaster event.

Political Capital

Government Structure

In Wheeler County, the administrative office is the office of the County Court. Wheeler County is a general law county governed by a three member County Court, consisting of a County Judge and two Commissioners. The County Judge is a nonpartisan, full time position serving a six year term. The Judge functions as the day to day administrator of the county as well as chairman of the board and as Juvenile and Probate Judge.

The two Commissioners are non-partisan positions who serve part time for a four year term. The Commissioners and Judge acting as the County Court, set policy for and represent Wheeler County in various forums. The County Court oversees all non-elected departments of the county. Although the County Court shares the actual administration of county affairs with the elective department heads, it is, nevertheless, the focal point for decisions that must be made locally with respect to county affairs. The court is served by a full time appointed court administrator.

Each of the participating cities is governed by a mayor and council form of government and are provided emergency services by a mix of county, private and volunteer services.

All the departments within the governance structure have some degree of responsibility in building overall community resilience. Each plays a role in ensuring that the county functions and normal operations resume after an incident, and the needs of the population are met. Some divisions and departments of Wheeler County government that have a role in hazard mitigation include:

- **Commission for Children and Families:** plans, advocates and stimulates the communities to act on behalf of children. The vision of the state and local commissions is all Oregon's children and youth will be safe, healthy, well-educated, and employable and valued contributors to their communities. Recommendations are made to Wheeler County Court for allocation and distribution of state and federal grant funds that come to Wheeler County through the Oregon Commission on Children & Families.⁴⁶ The Commission for Children and Families plans, advocates, and engages the community around issues on behalf of families and children, often thought of as vulnerable populations due to increased sensitivity to the impacts of hazard incidents. Because this department is in frequent contact with a vulnerable population, it would be a natural partner in mitigation actions for outreach efforts and to build the County's awareness of the needs of children and families.
- **Emergency Management:** is responsible for planning and coordination for phases of disaster management by implementing preparedness, response, mitigation and recovery plans. Wheeler County's Emergency Operations Plan is NIMS compliant and promulgated.

⁴⁶ Wheeler County Website. Commission on Children and Families. <http://www.wheelercounty-oregon.com/childrenfamilies.html>.

The Emergency Management Program is also responsible for the implementation of policies and procedures, assisting with preparation, review and enhancement of emergency preparedness programs as well as training exercises and resource development for cities, schools, agencies and the private sector. The program assists with major emergencies and disasters through coordination of the disaster response process, including the coordination of local, state, federal and non-governmental agency resources.⁴⁷

- **Planning:** responsibility includes coordination of all planning activities within the county such as those associated with cities, special districts, and state agencies in order to assure an integrated county comprehensive plan. Oregon law requires counties to adopt a comprehensive plan and allows for periodic revision of the plan. Comprehensive plans vary greatly but generally include a land use map and policy statement that interrelates all functional and natural systems and activities concerning land use such as water, sewer, transportation, recreation, and natural resources. Zoning and subdivision ordinances must be designed to implement the adopted comprehensive plan.⁴⁸
- **Road Department:** responsible for planning, maintenance and construction of county roads. The Wheeler County road system consists of 31 roads, 260 miles; 6 miles paved, 72 miles oil mat, 125 miles graveled and 57 miles of dirt road. Rowe Creek Road, Kahler Basin Road, Bridge Creek/Burnt Ranch Road and Parish Creek/Waterman Road are estimated to carry the highest volume of daily traffic of all the Wheeler County roads.⁴⁹ The Road Department will have important information about the resilience of the physical aspects of the community. This department can help prioritize projects for mitigation and will be a key partner in implementation as well.
- **Wheeler County Transportation:** Wheeler County Community Transportation is a county-owned transportation program for seniors and the disabled in Wheeler County. The populations that are served are potential high risk populations during and immediately after natural hazards occur.
- **Sherriff's Office:** The sheriff, elected every four years, conducts criminal investigations and detects and apprehends law violators. The office is also charged with patrolling and maintaining the security of county roads, private homes, and businesses. Other duties of the sheriff include performing search and rescue missions; enforcing marine law; transporting and providing for the security of state and county prisoners while appearing in court; processing and serving civil and criminal documents; operating the county detention facility;

⁴⁷ Wheeler County Website. Emergency Management. <http://www.wheelercounty-oregon.com/emanagement.html>.

⁴⁸ Oregon State Achieves. Oregon Historical County Records Guide. <http://arcweb.sos.state.or.us/pages/records/local/county/about/context/offices.html#LandUsePlanning>.

⁴⁹ Wheeler County Website. Road Department. <http://www.wheelercounty-oregon.com/roads.html>.

housing city, county, state, and federal prisoners; animal control; and enforcing nuisance abatement.⁵⁰

Existing Plan & Policies

Communities typically have a variety existing plans and policies that guide and influence land use, land development and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances and technical reports or studies. Plans and policies already in existence have support from local residents, businesses and policy makers. Many land-use, comprehensive and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.⁵¹

The Wheeler County Natural Hazards Mitigation Plan includes a range of recommended mitigation action items that, when implemented, will reduce the county’s vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the county’s other existing plans and policies. Linking existing plans and policies to the Natural Hazards Mitigation Plan helps identify what resources already exist that can be used to implement the action items identified in the Plan.

As required by Oregon law, each incorporated city in Wheeler County - Fossil, Mitchell and Spray - has a comprehensive plan

which provide for orderly development within the cities and account for a limited framework for each city to protect life and property from natural disasters and hazards. In addition, each of the participating cities has been granted Emergency Management Program Grant funds to develop Emergency Operations Plans within 2014.

Plan & Policy Integration and Consistency

Implementing the natural hazards mitigation plan’s action items through existing plans and policies increases their likelihood of being supported, receiving grant funding and it maximizes the county’s limited resources.

⁵⁰ Oregon State Achieves. Oregon Historical County Records Guide. <http://arcweb.sos.state.or.us/pages/records/local/county/about/context/offices.html#Sheriff>.

⁵¹ Burby, Raymond J., ed. 1998. Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities.

The following plans and policies are already in place in Wheeler County.

WHEELER COUNTY COMMUNITY WILDFIRE PROTECTION PLAN

- Date of Last Revision: November 2006
- Author/Owner: Wheeler County
- Description: The plan is a result of a county-wide effort initiated to reduce wildland fire risk to communities and their citizens, the environment, and quality of life within Wheeler County. Citizens, fire districts, county staff or elected officials, and agency representatives

Relationship of the CWPP to the Natural Hazards Mitigation Plan

The Community Wildfire Protection Plan (CWPP) is intended to be adopted for incorporation within the Wheeler County Natural Hazards Mitigation Plan. The CWPP contains goals and actions that seek to minimize the risk of wildfire hazards to the county.

worked together to create a plan that would be successful in implementing fuels reduction projects, fire prevention education campaigns, and other fire-related programs.

WHEELER COUNTY COMPREHENSIVE PLAN

- Date of Last Revision: June 2003

Relationship of the County Comprehensive Plan to the Natural Hazards Mitigation Plan

Goal 7 – Areas Subject to Natural Disasters and Hazards, of the Wheeler County Comprehensive Plan provides the framework for the county to protect life and property from natural disasters and hazards.

The following policies are in place to guide the identification of areas subject to natural hazards, regulation of development in those areas, and protection of citizens, property, and the environment from the effects of natural hazards.

- To encourage development to locate outside floodplains, natural drainage ways, steep slopes, and other hazardous areas.
- To determine ways of reducing flood hazards.
- To require site specific information clearly determining the degree of hazard present from applicants who seek approval to develop residential, commercial, or industrial uses within know areas of natural disasters and hazards.
- To cooperate and work with the State and Federal Agencies to reduce hazards associated with heavy rains and flash floods.

- Author/Owner: Wheeler County
- Description: The intent of the Wheeler County Comprehensive Plan is to establish a single, coordinated set of policies which will act to provide for orderly development of Wheeler County. These policies will give a direction to planning, establish priorities for action, serve as a basis for future decisions, provide a standard by which progress can be measured, and promote a sense of community for an improved quality of life. It will also help all levels of government and private enterprise to understand the wants and needs of all Wheeler County citizens.

Relationship of the Emergency Operations Plan to the Natural Hazards Mitigation Plan

By in large, the EOP attempts to be all-inclusive in combining the following four phases of emergency management:

Mitigation: activities that eliminate or reduce the probability and vulnerability to disasters. Also included are those long term activities which lessen the undesirable effects of unavoidable hazards;

Preparedness: serve to develop the response capabilities needed in the event an emergency should arise. Planning and training are among the activities conducted under this phase;

Response: provides emergency services during a crisis. These activities help to reduce casualties and damage and speed recovery. Response activities include warning, evacuation, rescue, and other similar operations; and

Recovery: short- and long-term activities that return all systems to normal or improved standards. Short-term operations seek to restore vital services to the community and provide for the basic needs of the public. Long-term recover focuses on restoring the community to its normal, or improved, state of affairs. The recovery time is also an opportunity to institute mitigation measures, particularly those related to the recent emergency.

**WHEELER COUNTY
EMERGENCY
OPERATIONS PLAN**

- Date of Last Revision:
September 2012
- Author/Owner:
Ecology & Environment Inc./Wheeler County
- Description:
The Emergency Operations Plan (EOP) is an all-hazard plan that describes how Wheeler County will organize and respond to emergencies and disasters in the community. Specifically, the EOP describes the roles and responsibilities of departments and personnel within Wheeler County

when an incident occurs, and it establishes high level guidance that supports implementation of the National Incident Management System (NIMS), including adherence to the concepts and principles of the Incident Command System (ICS).

WHEELER COUNTY TRANSPORTATION SYSTEM PLAN

- Date of Last Revision: June 2001
- Author/Owner: David Evens and Associates, Inc./Wheeler County

Relationship of the Transportation System Plan to Natural Hazards Mitigation Plan

Transportation systems are important in evacuating and responding to natural disasters. Mitigation actions that focus on strengthening transportation systems can be incorporated into the Wheeler County Transportation System Plan.

- Description:
The Wheeler County Transportation System Plan guides the management of existing transportation facilities and the design and implementation of future facilities for the

next 20 years. The plan constitutes the transportation element of the county's comprehensive plan and satisfies the requirements of the Oregon Transportation Planning Rule established by the Department of Land Conservation and Development (DLCD). It identifies and prioritizes transportation projects for inclusion of the Oregon Department of Transportation's (ODOT) Statewide Transportation Improvement Program (STIP). The plan primarily covers the unincorporated areas of Wheeler County but also addresses issues raised within the incorporated cities of Fossil, Mitchell, and Spray.

Summary

Implementing the natural hazards mitigation plan's action items through existing plans and policies increases their likelihood of being supported and getting updated, and maximizes the county's resources.

Chapter 3: Risk Assessment

This section of the NHMP addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk begins with the identification of hazards that can impact the jurisdiction. Included in the hazard assessment is an evaluation of potential hazard impacts – type, location, extent, etc. The second step in the risk assessment process is the identification of important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places, and drinking water sources. The last step is to evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The information presented below, along with community characteristics presented in the Chapter 2: Community Profile will be used as the local level rationale for the risk reduction actions identified in Chapter 4: Mitigation Strategy. The risk assessment process is graphically depicted in Figure 3.1 below. Ultimately, the goal of hazard mitigation is to reduce the area where hazards and vulnerable systems overlap.

Figure 3.1: Community Risk from Natural Hazards



Source: FEMA, Local Mitigation Planning Handbook, March 2013.

Hazard Identification

The first step in the risk assessment process is hazard identification. Wheeler County identifies nine natural hazards that could potentially have an impact on the county. These hazards include: drought, earthquake, flood, landslide/debris flow, severe weather, volcanic event, wildfire, windstorm, and winter storm.

Table 3.1 categorizes the hazards identified by Wheeler County and compares each to the regional hazards identified in the State of Oregon NHMP for the Central Oregon Region, which includes Wheeler County.

Table 3.1: Wheeler County Hazard Identification

Wheeler County Hazards*	Oregon NHMP Region 6: Central Oregon Regional Hazards^
Drought	Drought
Earthquake	Earthquake
Flood	Flood
Landslide/ Debris Flow	Landslide/Debris Flow
Severe Weather	
Volcanic Event	Volcano-Related Hazards
Wildfire (WUI)	Fires in Urban/Wildland Interface
Windstorm	Windstorm
Winter Storm	Winter Storm

Source*: Wheeler County NHMP Steering Committee, Updated March 29, 2018.

Source^: State of Oregon Natural Hazards Mitigation Plan, Region 6: Central Oregon

Federal Disaster Declarations

Looking at the past events that have occurred in the county can provide a general sense of the hazards that have caused significant damage in the county. Where trends emerge, disaster declarations can help inform hazard mitigation project priorities.

President Dwight D. Eisenhower approved the first federal disaster declaration in May 1953 following a tornado in Georgia. Since then, federally disaster declarations have been approved within every state as a result of natural hazard related events.

As of August, 2018 FEMA has approved a total of 79 federal disaster declarations in Oregon and 8 for Wheeler County. The declarations for Wheeler County include 4 severe storms, 2 floods, 1 coastal storm (statewide for the Hurricane Katrina Evacuation), and 1 drought.¹

A Presidential Major Disaster Declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, and designed to help disaster victims,

¹ Federal Emergency Management Agency. <https://www.fema.gov/data-visualization-disaster-declarations-states-and-counties>.

businesses, and public entities.² When governors ask for presidential declarations of major disaster or emergency, they stipulate which counties in their state they want included in the declaration. Table 3.2 summarizes the eight major disasters declared for Wheeler County by FEMA since 1953. The table shows that all of the disaster declarations in Wheeler County have been weather related.

Table 3.2: FEMA Disaster Declarations – Wheeler County

Declaration Number:	Declaration (Amendment) Date:	Incident(s):	Incident(s) Period:
DR-4452	9-Jul-2019	Severe Storms, Flooding, Landslides and Mudslides	06-Apr-2019 to 19-Apr-2019
DR-1683	22-Feb-2007	Severe Winter Storms, Flooding	14-Dec-2006 to 15-Dec-2006
DR-1632	20-Mar-2006	Severe Storms, Flooding, Landslides and Mudslides	18-Dec-2005 to 21-Jan-2006
DR-3228	7-Sep-2005	Hurricane Katrina Evacuation	29-Aug-2005 1-Oct-2005
DR-1510	19-Feb-2004 (4-Mar-2004)	Severe Winter Storms	26-Dec-2003 to 14-Jan-2004
DR-1160	23-Jan-1997	Severe Winter Storms, Land & Mudslides, Flooding	25-Dec-1996 6-Jan-1997
DR-1099	9-Feb-1996	Severe Storms, Flooding	4-Feb-1996 to 21-Feb-1996
DR-3039	29-Apr-1977	Drought	29-Apr-1997
DR-184	24-Dec-1964	Heavy Rain, Flooding	24-Dec-1964

Source: FEMA, <https://www.fema.gov/data-visualization-disaster-declarations-states-and-counties>

Wheeler County’s largest ever recorded wildfire, the Jennie’s Peak Fire, occurred in August of 2018 and burned almost 46,000 acres. The fire burned in the west central part of the county and did not threaten the counties three main towns of Fossil, Mitchell and Spray. However, it did come close to burning the Painted Hills and John Day Fossil Beds National Monument, two key tourist attractions in the county. It did not receive a disaster declaration

Future Climate Projections

The 2018 report “Future Climate Projections: Wheeler County”³ presents a future climate assessment for Wheeler County relevant to specific natural hazards for the 2020s (2010–2039 average) and 2050s (2040–2069 average) compared to the 1971–2000 average historical baseline. The projections were analyzed for a lower greenhouse gas emissions scenario as well as a higher greenhouse gas emissions scenario, using multiple global climate models. This summary lists only the projections for the 2050s under the higher emissions scenario. Projections for both time periods and both emissions scenarios can be found within relevant sections of the main report.

² Federal Emergency Management Agency. The Disaster Process and Disaster Aid Programs. “A Presidential Major Disaster Declaration.” <http://www.fema.gov/hazard/dproc.shtm>.

³ Dalton, M., Rupp, D., and Hawkins, L. (2018, August). Future Climate Projections: Wheeler County: A Report to the Oregon Department of Land Conservation and Development. Corvallis, OR. Oregon State University, College of Earth, Ocean, & Atmospheric Sciences, Oregon Climate Change Research Institute.

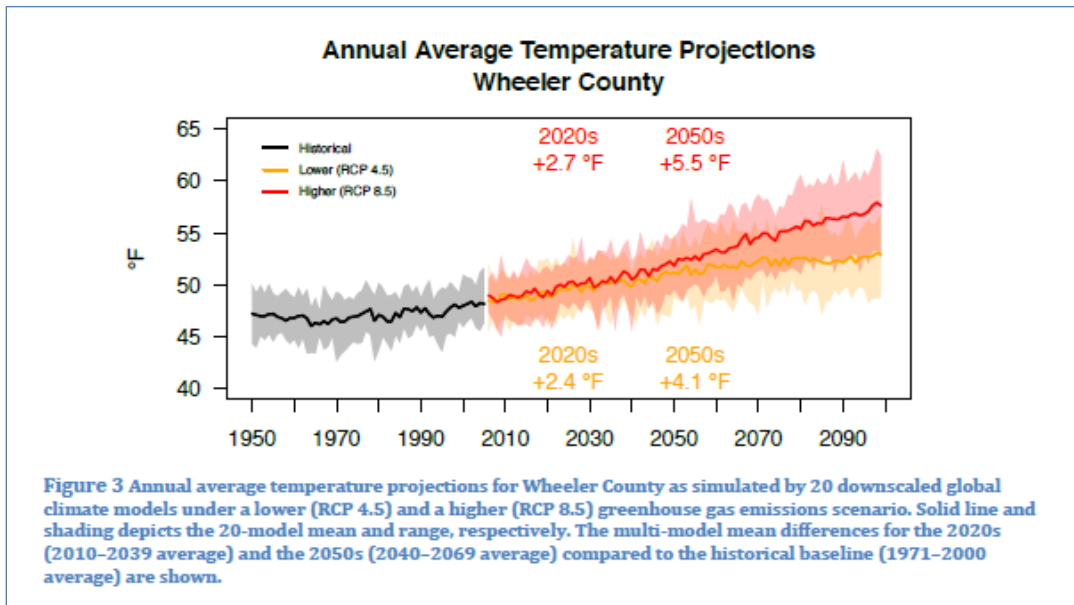
Heat Waves

Extreme heat events are expected to increase in frequency, duration, and intensity due to continued warming temperatures.

In Wheeler County, the frequency of hot days with temperatures at or above 90°F is projected to increase on average by 29 days (with a range of 11 to 39 days) by the 2050s under the higher emissions scenario compared to the historical baseline.

In Wheeler County, the temperature of the hottest day of the year is projected to increase by 8°F (with a range of 3 to 12°F) by the 2050s under the higher emissions scenario compared to the historical baseline.

Figure 3.2



Cold Waves

Cold extremes are still expected to occur from time to time, but with much less frequency and intensity as the climate warms.

In Wheeler County, the frequency of days at or below freezing is projected to decline on average by 10 days (with a range of 5 to 15 days) by the 2050s under the higher emissions scenario compared to the historical baseline.

In Wheeler County, the temperature of the coldest night of the year is projected to increase by 9°F (with a range of 0 to 15°F) by the 2050s under the higher emissions scenario compared to the historical baseline.

Heavy Rains

The intensity of extreme precipitation events is expected to increase slightly in the future as the atmosphere warms and is able to hold more water vapor.

In Wheeler County, the magnitude of precipitation on the wettest day and wettest consecutive five days per year is projected to increase on average by about 14% (with a range of ---1% to 36%) and 11% (with a range of ---6% to 31%), respectively, by the 2050s under the higher emissions scenario compared to the historical baseline.

In Wheeler County, the frequency of days with at least ¼” of precipitation and the frequency of days exceeding a threshold for landslide risk is not projected to change substantially.

River Flooding

Mid- to low-elevation areas in Wheeler County’s Blue Mountains that are near the freezing level in winter, receiving a mix of rain and snow, are projected to experience an increase in winter flood risk due to warmer winter temperatures causing precipitation to fall more as rain and less as snow.

Drought

Drought conditions, as represented by low spring snowpack, low summer soil moisture, and low summer runoff, are projected to become more frequent in Wheeler County by the 2050s compared to the historical baseline.

Wildfire

Wildfire risk, as expressed through the frequency of very high fire danger days, is projected to increase under future climate change. In Wheeler County, the frequency of very high fire danger days per year is projected to increase on average by about 39% (with a range of -12 to +102%) by the 2050s under the higher emissions scenario compared to the historical baseline. Air Quality Under future climate change, the risk of wildfire smoke exposure is projected to increase in Wheeler County. The number days with high concentrations of wildfire- specific particulate matter is projected to increase by 53% by 2046– 2051 under a medium emissions scenario compared with 2004–2009. Windstorms Limited research suggests very little, if any, change in the frequency and intensity of windstorms in the Pacific Northwest as a result of climate change.

Dust Storms

Limited research suggests that the risk of dust storms in summer would decrease in eastern Oregon under climate change in areas that experience an increase in vegetation cover from the carbon dioxide fertilization effect.

Increased Invasive Species & Pests

Warming temperatures, altered precipitation patterns, and increasing atmospheric carbon dioxide levels increase the risk for invasive species, insect and plant pests for forest and rangeland vegetation, and cropping systems.

Loss of Wetland Ecosystems

Freshwater wetland ecosystems are sensitive to warming temperatures and altered hydrological patterns, such as changes in precipitation seasonality and reduction of snowpack.⁴

The following subsections summarize the characteristics and extent of each hazard. For additional information on each hazard, refer to Chapter 2: Risk Assessment, Region 6: Central Oregon in the 2015 State of Oregon Natural Hazards Mitigation Plan⁵.

Drought

CHARACTERISTICS

A drought is a prolonged period of below-average precipitation that causes a water deficit in a particular area. Droughts can occur anywhere in the United States and can vary in duration considerably. The duration of a drought and its severity depend on a number of compounding factors, including precipitation, soil moisture, stream flow, groundwater and reservoir levels, agricultural health, local geography, and snowpack. Humans also play an important role in drought through factors such as water demand and water management. With such a high number of compounding factors, predicting droughts is an extremely difficult task. At this time, scientists can accurately predict drought conditions only one month in advance. The U.S. Drought Monitor is currently one of the most accurate tools for drought monitoring and is updated weekly to reflect drought conditions across the country.

The severity and physical characteristics of a drought vary drastically from region to region. Droughts are not uncommon in Oregon and occur in all parts of the state in both summer and winter months. Droughts appear to be recurring and they can have a profound effect on the economy, particularly the hydro-power and agricultural sectors. Although drought may not cause significant direct impacts to non-farming communities, the financial impact affects the economic stability of the county. The environmental consequences may also be far-reaching. They include insect infestations in forests and the lack of water to support endangered fish species. In recent years, the state has addressed drought emergencies through the Oregon Drought Council. This interagency (state/federal) council meets to discuss forecasts and to advise the Governor as the need arises.

LOCATION

Located east of the Cascades and largely dependent on winter snowpack, Wheeler County is particularly susceptible to drought. Historically, Wheeler County has declared disaster for drought frequently, including 6 out of the last 18 years. This makes drought a major concern for residents of the county. As a result, it is crucial that citizens take the proper actions in order to reduce demand on the limited local water supply. All of Wheeler County is subject to drought. Particularly vulnerable elements include the ranching and agricultural industry and the City of Fossil, which annually restricts water usage.

⁴ Dalton, M., Rupp, D., and Hawkins, L. (2018, August). Future Climate Projections: Wheeler County: A Report to the Oregon Department of Land Conservation and Development. Corvallis, OR. Oregon State University, College of Earth, Ocean, & Atmospheric Sciences, Oregon Climate Change Research Institute

⁵ State of Oregon Natural Hazard Mitigation Plan, Chapter 2: Risk Assessment, Region 6: Central Oregon, 2015.

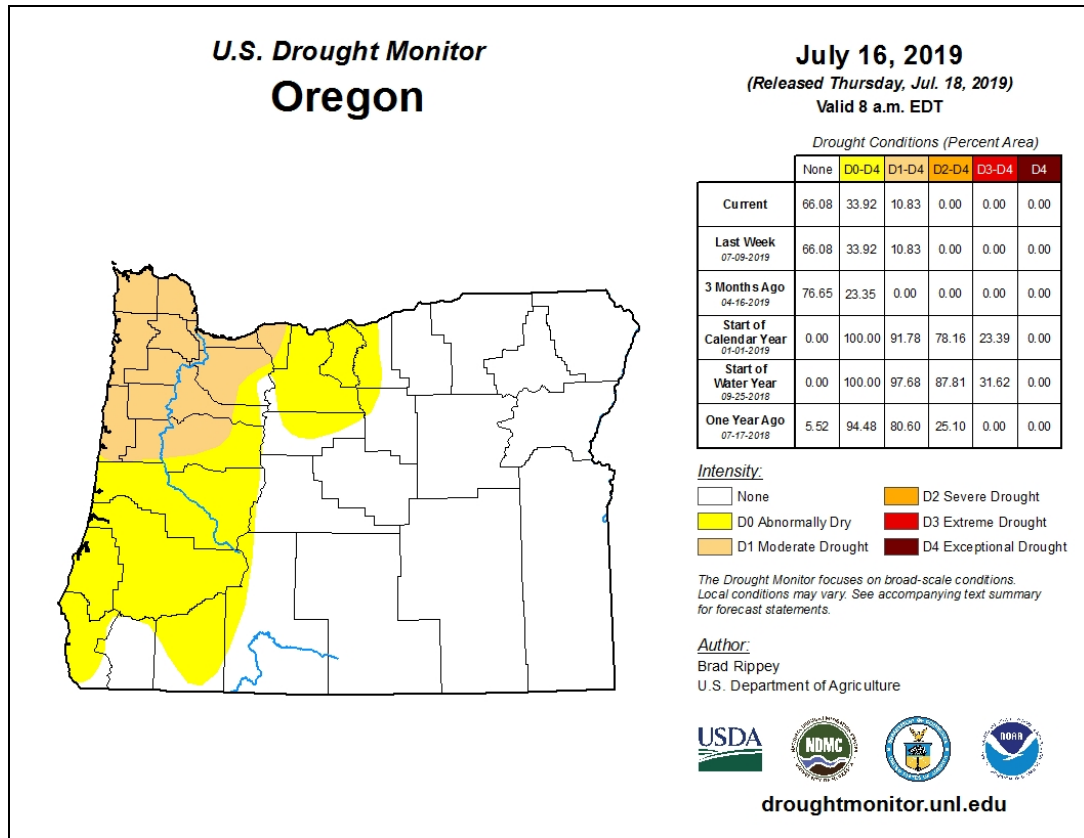
POTENTIAL MAGNITUDE

The U.S. Drought Monitor (USDM) shows the location and intensity of drought across the U.S. The data is updated weekly. The map below shows the drought conditions as of July 16, 2019. As is shown, a small portion of Wheeler County is experiencing abnormally dry conditions which may include impacts such as short-term dryness, slowing planting, impacts to the growth of crops, lingering water deficits and pastures and crops that are not fully recovered.

This type of information is a good tool to utilize when the County is evaluating and implementing the drought mitigation actions in this plan. It can be compared against past data and can expose patterns of drought over time.

It is available from the National Weather Service and has links to other valuable sources of drought information from the Oregon Water Resources Department, the Westwide Drought Tracker, and NOAA.

Figure 3.3: Snapshot of Current Drought Conditions in Oregon



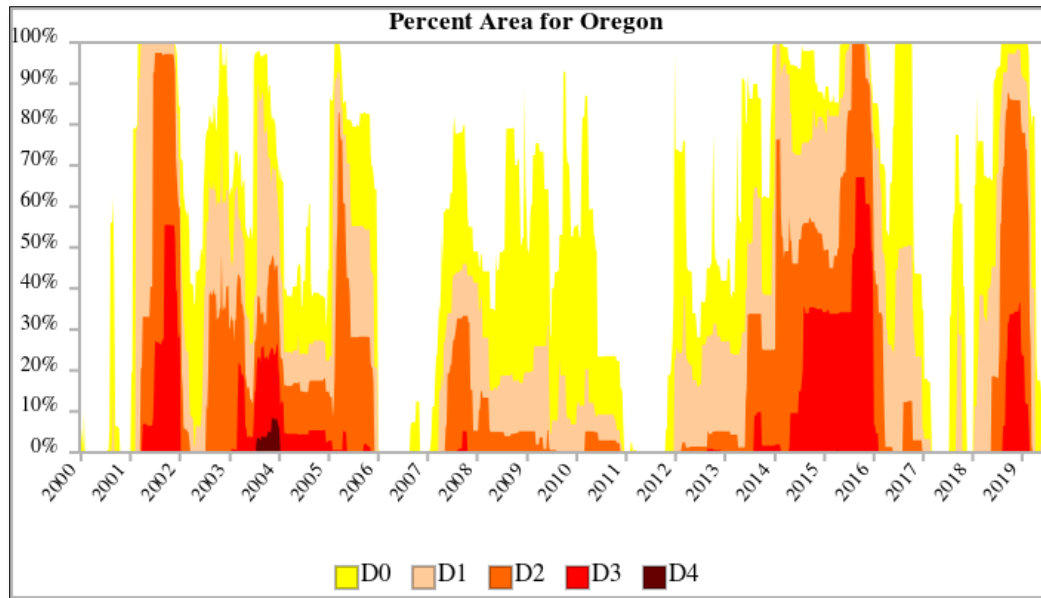
SIGNIFICANT DROUGHTS

Table 3.4: Significant Droughts in Wheeler County

Time Period	Description
1904 to 1905	A statewide drought period for approximately 18 months.
1917 to 1931	a 15 year dry period in Oregon punctuated by brief wet spells in 1920, 1921, and 1927.
1939 to 1941	Three year period of intense drought in Oregon
1959 to 1964	Drought period primarily affecting eastern Oregon.
1977	A federal emergency declaration was made on April 29, 1977 for 19 counties in Oregon including Wheeler County due to drought conditions.
1985 to 1997	Generally a dry period with statewide droughts in 1992 and 1994.
2001	Governor John Kitzhaber issued a state of drought emergency for four counties in Oregon including Wheeler County on June 22, 2001. Executive Order No. 01-09 was issued due to conditions caused by drought, low water, and energy shortages in the western states.
2003	Governor Theodore Kulongoski issued a state of drought emergency for five counties in Oregon including Wheeler County on June 26, 2003. Executive Order No. 03-05 was issued due to drought and low water conditions.
2005	Governor Theodore Kulongoski issued a state of drought emergency for five counties in Oregon including Wheeler County on May 25, 2005. Executive Order No. 05-06 was issued due to drought and low water conditions.
2014	Governor John Kitzhaber issued a state of drought emergency for three counties in Oregon including Wheeler County on May 29, 2014. Executive Order No. 14-05 was issued due to conditions caused by drought and low water conditions.
2015	Governor Kate Brown issued a state of drought emergency for two counties in Oregon including Wheeler County on April 20, 2015. Executive Order No. 15-04 was issued due to conditions caused by drought, low snow pack levels and low water conditions.
2018	Governor Kate Brown issued a state of drought emergency for Wheeler County on July 18, 2018. Executive Order No. 18-12 was issued due to conditions caused by low streamflow and hot, dry conditions.

Source: State of Oregon Natural Hazards Mitigation Plan, Region 6: Central Oregon; Oregon Water Resources Department, Public Declaration Status Report.

Figure 3.4: Drought Conditions in Oregon 2000-2019.



D0 = Abnormally Dry

- Short-term dryness slowing planting, growth of crops
- Some lingering water deficits
- Pastures or crops not fully recovered

D1 = Moderate Drought

- Some damage to crops, pastures
- Some water shortages developing
- Voluntary water-use restrictions requested

D2 = Severe Drought

- Crop or pasture loss likely
- Water shortages common
- Water restrictions imposed

D3 = Extreme Drought

- Major crop/pasture losses
- Widespread water shortages or restrictions

D4 = Exceptional Drought

- Exceptional and widespread crop/pasture losses
- Shortages of water creating water emergencies

POTENTIAL IMPACTS TO THE COMMUNITY

The economy of Wheeler County is highly dependent on natural resource industries such as ranching and hay growing which are both particularly susceptible to droughts.

The Oregon State University Extension Service published a report in June 1979 following the 1977 drought. Highlights of the survey findings indicate that the 1977 drought affected ranches in eastern Oregon in the following ways⁶:

- 80-percent of ranchers affected
- Three million AUM's* forage lost
- 862,000 AUM's forage leased
- 210,000 tons of feed purchased
- 69,000 tons reduced hay sales
- 89,000 AUM's salvaged from grain crops
- 115,000 animals sold
- 41 million gallons of water hauled

Other affects and adjustments include reduced rate of gain of cattle, delayed breeding, herd health problems, damaged grain crops and water development and equipment investments.

*AUM – Animal Unit Months: is the amount of forage needed to sustain one cow and her calf, one horse or five sheep or goats for a month.⁷

Earthquake

CHARACTERISTICS

Seismic events were once thought to pose little or no threat to Oregon communities. However, recent earthquakes and scientific evidence indicate that the risk to people and property is much greater than previously thought. Oregon and the Pacific Northwest in general are susceptible to earthquakes from four sources: 1) the offshore Cascadia Subduction Zone; 2) deep intraplate events within the subducting Juan de Fuca Plate; 3) shallow crustal events within the North American Plate, and 4) earthquakes associated with volcanic activity.

All types of earthquakes in the region have some tie to the subducting, or diving, of the dense, oceanic Juan de Fuca Plate under the lighter, continental North American Plate. There is also a link between the subducting plate and the formation of volcanoes some distance inland from the offshore subduction zone. Central Oregon includes portions of five physiographic provinces including the High Cascades, Blue Mountains, Basin and Range, High Lava Plains, and Deschutes-

⁶ Oregon State University Extension Services. "Effects of the 1977 Drought on Eastern Oregon Ranches." June 1979. http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/4743/SR%20no.%20555_ocr.pdf?sequence=1.

⁷ U.S. Bureau of Land Management. Oregon/Washington. Rangelands/Grazing. <http://www.blm.gov/or/resources/rangelands/index.php>.

--Columbia Plateau. Consequently, its geology and earthquake susceptibility varies considerably.⁸⁸

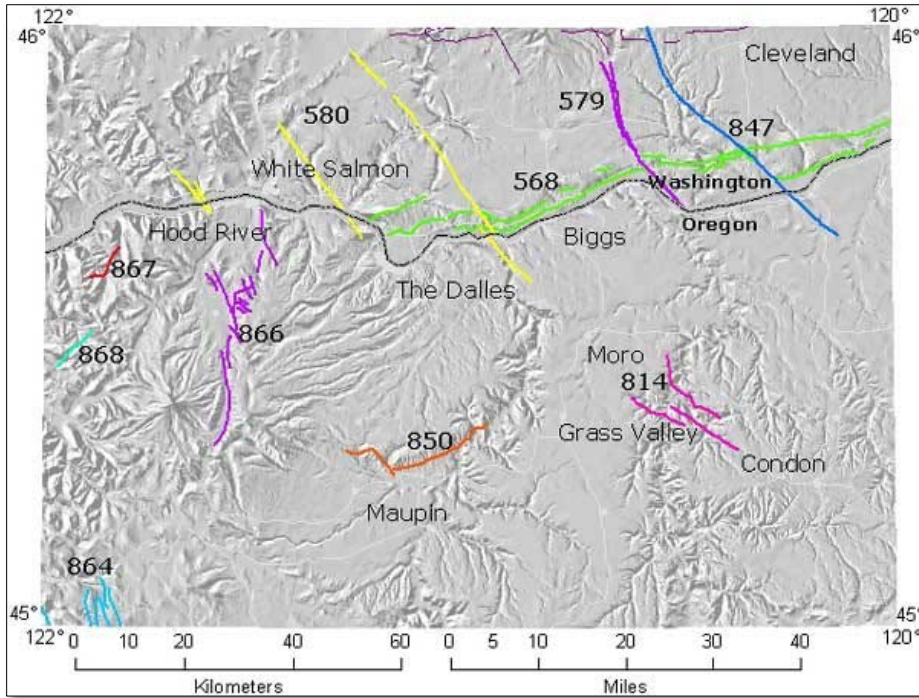
There have been several significant earthquakes in the region; however all have been located in Klamath and Lake Counties. Additionally, faults have been located throughout the region, including in Wheeler County.

Wheeler County is most susceptible to crustal earthquakes, with less potential for impacts from subduction, intraplate, and events associated with renewed volcanic activity.

This suggests Wheeler County can most likely expect shorter duration events with low levels of ground shaking and limited liquefaction (Region 5 Profile; DOGAMI). Figure 3.2 and Figure 3.3 each show identified faults located around Wheeler County. There are no identified faults located in Wheeler County, but there are several in the surrounding area including neighboring counties of Gilliam, Morrow, Grant and Crook.

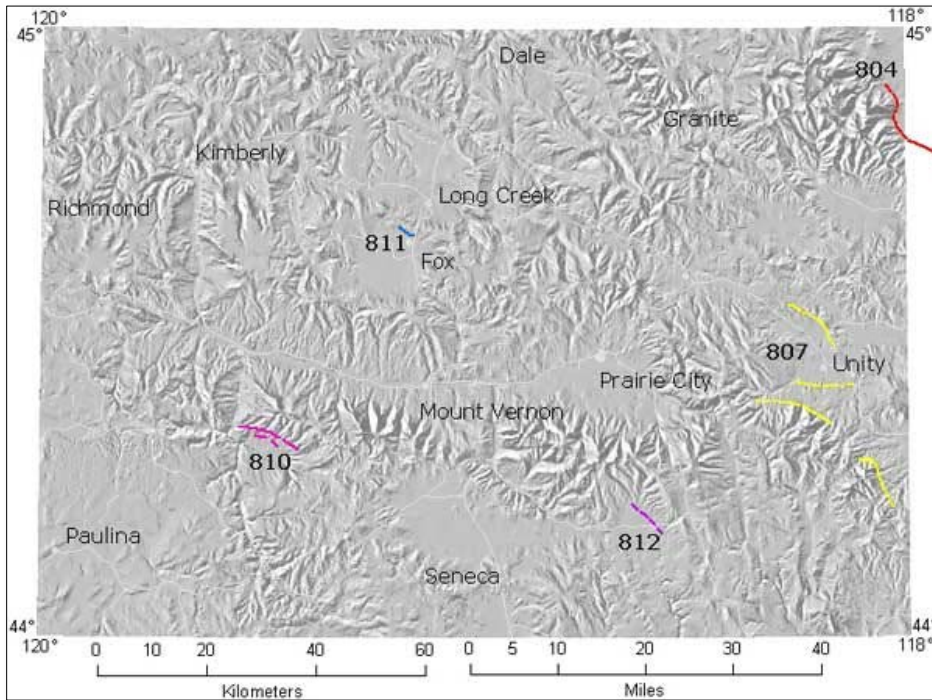
⁸⁸ Deschutes County Natural Hazards Mitigation Plan, 2015.

Figure 3.5: Regional Fault Map



Source: U.S. Geological Survey (USGS), Quaternary Fault and Fold Database, The Dalles 1° X 2° Sheet

Figure 3.6: Regional Fault Map



Source: U.S. Geological Survey (USGS), Quaternary Fault and Fold Database, Canyon City 1° X 2° Sheet

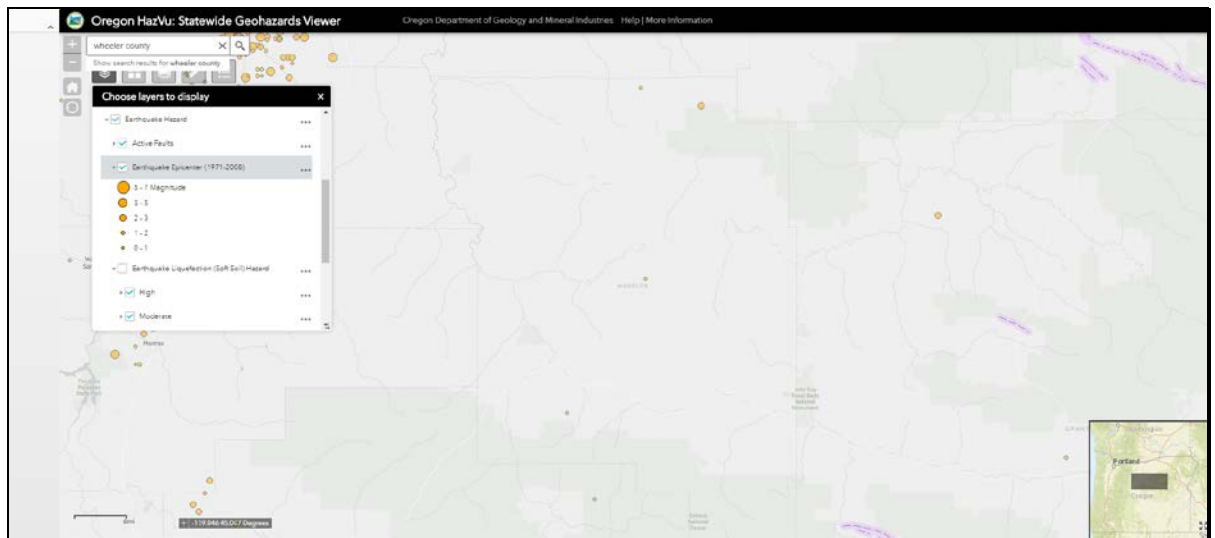
LOCATION AND POTENTIAL MAGNITUDE

Areas within Wheeler County typically have low ground shake amplification, very low liquefaction susceptibility, and moderate earthquake-induced landslide susceptibility. While no major seismic activity has occurred in Wheeler County during recorded history, there has been seismic activity in the Lost Valley and Fossil areas.

PREVIOUS OCCURRENCES

The figure below shows that there have been very few recorded earthquakes in Wheeler County. Those that have occurred have been in the 1-2 magnitude and were likely not even felt by the population.

Figure 3.7: Earthquakes in Wheeler County 1970-2008



Source: Oregon HazVu: Statewide Geohazards Viewer. Accessed July 23, 2019

POTENTIAL IMPACTS TO THE COMMUNITY

While it is unlikely that the county will experience a moderate to severe earthquake, a larger quake could cause extensive damage to the critical infrastructure and buildings in Wheeler County. For example, a majority of the housing units in the county were built before modern seismic codes were adopted. Also, the relative remoteness of the county, its below average per capita income, and large elderly population would also make it harder for the county to recover from a major earthquake.

Flood

CHARACTERISTICS

Flooding is the most common natural hazard in the United States⁹. As global warming continues to exacerbate sea level rise and extreme weather, our nation's floodplains are expected to grow by approximately 45 percent by century's end.

Simply put, a flood is the accumulation of water over normally dry land. It is caused by the overflow of inland waters (like rivers and streams) or tidal waters, or by an unusual accumulation of water from sources such as heavy rains or dam or levee breaches.

Wheeler County is subject to a variety of flood conditions that include: spring run-off from melting snow, intense warm rain during the winter months, ice-jam flooding, local flash flooding, and flooding associated with the breaching of natural debris dams.

Flash floods waters can move at a very fast speed. Walls of water can reach heights of 10 to 20 feet or more and generally carry large amounts of debris with them. While the possibility of a flash flood is always present, historically the likelihood of a flash flood is the greatest during the months of June and July.

Although not as notable as flash floods, the most common flood condition in the county is associated with warm rain during the winter months. Rain-on-snow floods occur during the winter months and have come to be associated with La Niña events, a three to seven year cycle of cool, wet weather. Brief, cool, moist weather conditions are generally followed by a system of warm, moist air from tropical latitudes. The intense warm rain associated with this system quickly melts foothill and mountain snow. Some of the most devastating flooding events in Oregon are associated with these events.

LOCATION

All of Wheeler County is subject to a flood hazard. Primary flood sources in Wheeler County are the John Day River, Bridge Creek, and Keyes Creek. The City of Mitchell has historically experienced flash flooding from Bridge Creek.

The hazard is primarily located with the 100 year and 500 year flood zones on the FEMA flood insurance rate maps. A 100 year flood is a flood event that has a 1% probability of occurring in any given year (however it has a 26% chance of occurring over any 30-year time period, the length of most home mortgages). A 500 year flood is a flood event that has a 0.2% probability of occurring in any given year. Base flood elevations have also been determined for the 100 year flood zone. The extent of the hazard can be viewed spatially on the flood hazard maps (FIRM).

PREVIOUS SIGNIFICANT OCCURRENCES

Flash Floods:

The City of Mitchell has experienced flash floods numerous times along Bridge Creek, which runs through the center of the city. A significant flash flood also occurred in 1884 near the Painted

⁹ Flooding: America's #1 Natural Hazard, FEMA, August 16, 2004,

Hills in the southwest part of the county, killing a total of four people. Table 3.5 identifies historical flash floods in Wheeler County.

More recently on April 20th, 2019, thunderstorms produced locally heavy rainfall with 1 to 2 inches falling in Wheeler County. Total rainfall of 1.67 inches was recorded in the hills just to the south and east of Mitchell. This heavy rain over a short period of time triggered a flash flood through Huddleston Heights and Nelson Street with mud and debris blocking roads in and around the town of Mitchell.¹⁰ The photo below shows that debris along Main and Nelson in the heart of town.



Downtown Mitchell, Oregon after the flash flood on April 20, 2019. Source: The Oregonian Newspaper.

Table 3.5: Historical Flash Floods

Date	Location	Damage/Fatalities
Jul-1956	City of Mitchell	Flash flood destroyed approximately 20 buildings in Mitchell.
Jun-1990	City of Mitchell	Flash flood in the City of Mitchell caused extensive damage.
Jun-1884	Painted Hills (vicinity)	Flash flood killed four people, including three children.

¹⁰ National Oceanic and Atmospheric Administration, National Climate Data Center, Storm Event Database.

Riverine Floods:

Significant floods have also occurred along the John Day River. The flood stage at the United States Geological Survey (USGS) gauge site in Service Creek is 11.5-feet, moderate flood stage is 12.5-feet, and major flood stage is 15-feet. The highest recorded flood at the site crested in December 1964 following significant rain throughout the Pacific Northwest. The “Christmas Day Flood” as it is commonly referred to crested at 17.85-ft in Service Creek, more than five-feet above flood stage. The mean average streamflow at the site is 4,900-cubic feet per second (cfs).¹¹ During the flood in 1964, the streamflow was more than eight times the average. The flood did not cause any damage to buildings but washed out several roads in Wheeler County leaving the area isolated for several days. Table 3.6 identifies historical flood records above major flood stage at the USGS gauge site in Service Creek.

Table 3.6: Historical Flood Records – John Day River at Service Creek, 1930-2011

Date Crest	Gage Height (ft)	Streamflow (cfs)
23-Dec-1964	17.85	40,200
19-Mar-1932	16.75	28,900
1-Jan-1997	16.49	35,200
26-Mar-1952	15.5	26,800
22-May-1948	15.25	23,900
17-May-2011	15.2*	N/A
8-May-1956	15.1	28,100

Source: National Oceanic and Atmospheric Administration, National Weather Service, Northwest River Forecast Center

May 2011:

An upper level low pressure system moved over the Pacific Northwest. Moist and unstable conditions ahead of the low triggered widespread thunderstorms with heavy rainfall and isolated large hail. This combined with the abundant spring snow-pack and wet ground to cause flooding and flash flooding.

The John Day River near Service Creek crested at 15.2 on May 17th, which was 2.7 feet above flood stage.

OTHER HISTORICAL OCCURRENCES

A review of data from the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information Storm Events Database (accessed on July 24, 2019) reveals a number of additional flooding events in the recent past.

¹¹ National Oceanic and Atmospheric Administration. National Weather Service. Northwest River Forecast Center. John Day River at Service Creek. <http://www.nwrfc.noaa.gov/river/station/flowplot/flowplot.cgi?lid=SERO3>. Accessed April 5, 2012.

Flash floods in Wheeler County after the 1990 flood include the following:

- July 30, 1998. A three foot wall of water came down Alder Creek and the water level stayed up for two and a half hours. Alder Creek is a tributary of the John Day River northeast of Service Creek.
- April 26, 2001. A slow moving thunderstorm produced an estimated 1 inch of rain over mountainous terrain in southeastern Wheeler County. Subsequently, a small stream along State Highway - 26 overflowed its banks and washed debris across the road near mile marker 94. A local rancher mentioned that water covered the road to a depth of 1 1/2 feet, leaving debris that accumulated to a depth of 6 inches. The Oregon Dept. of Transportation closed the road for several hours while a road grader cleared the surface.
- August 25, 2002. Flash Flooding was reported between Spray and Service Creek.
- June 26, 2004. Four inches of water was observed on Highway 26, 10 miles west of Mitchell. Rocks and running water as well as flooding of ditches and canyons was also observed. A weather spotter reported .80 inches of rain in 20 minutes.
- June 4, 2007. Daytime heating over the mountains and an upper level trough produced a moist and unstable air mass which led to severe thunderstorms and flash flooding. Rainfall of 1.75 inches in 2 hours and 2.60 inches storm total. Public property damage occurred due to several county roads being washed out in the Twickenham area.

Additional floods in Wheeler County (1988 – 2019) include the following:

- June 3, 2010. Heavy rainfall in early June pushed many streams and rivers to near or above flood stage. Flooding occurred on Little Creek in Union, Mill Creek in Cove, Imnaha River, John Day River, Wallowa River, and Grand Ronde River. A landslide was reported along the Lostine River near Turkey Flats. The John Day River at Service Creek crested at 12.5 feet on June 5 at 5 am. Flood stage is 11.5 feet.
- May 5, 2011. An upper level low pressure system moved over the Pacific Northwest. Moist and unstable conditions ahead of the low triggered widespread thunderstorms with heavy rainfall and isolated large hail. This combined with the abundant spring snow-pack and wet ground to cause flooding and flash flooding. As the upper low brought colder air, late season heavy snow ended the episode in the Blue Mountains. Snowfall amounts in inches included Milkshakes Snotel (9) and High Ridge Snotel (7)¹². The John Day River near Service Creek crested at 15.2 on May 17th, which was 3.7 feet above flood stage.
- February 2, 2017. Flows on the John Day River reached flood levels downstream of Monument due to the breaking up of an ice jam. The John Day River at Service Creek briefly rose to 12.2 feet (flood stage is 11.5 feet). This was the result of an ice jam near Monument Oregon, blocking the river and then breaking free, sending the large volume of water downstream.
- March 16, 2017. An extended period of snow melt, combined with a period of heavy rain, caused an extended period of flooding along portions of the John Day River. The John Day river near Service Creek, (flood stage 11.5) crested at 12.0 feet at 1815 on March 16th, fell below flood stage and then rose again to 12.1 feet at 1900 on March 19th. Fell below flood stage 0600 on the 20th.

¹² A SNOTEL stands for SNOW TElemetry and is an automated snowpack data collection site.

- April 9, 2019. Snow water equivalents near 200% of normal in the Blue Mountains coupled with warm temperatures and near record rainfall totals for April produced significant river flooding across eastern Oregon. Numerous sections of Oregon Highway 19 and 207 were closed due to water over road and damage to road surfaces. Numerous county roads were damaged with rock and mudslides as well as plugged culverts. Flooding was reported in the city park in Spray.

Landslide/Debris Flow

CHARACTERISTICS

The general term *landslide* refers to a range of geologic failures including slides, flows, falls, topples, and spreads. Most slope failures in Wheeler County are complex combinations of these distinct types, but the generalized groupings provide a useful means for framing discussion of slide characteristics, identification methods, and potential mitigation alternatives. These basic types are combined with the type of geologic material to form the common landslide names such as debris flow and rock fall.

Some landslides can move at rapid rates and thus pose life threats. These are commonly channelized debris flows, debris avalanches, and rock falls. These types of rapidly moving landslides are common throughout the region, especially along U.S. Highway 26 corridor between Mitchell and Prineville (Deschutes County).

More information on landslides can be found on the Landslide Hazards in Oregon Fact Sheet: <http://www.oregongeology.org/pubs/fs/landslide-factsheet.pdf>

LOCATION

Approximately 80-percent of the main corridors in the county are susceptible to landslides. Areas with particular concern include:

- U.S. Highway 26 between Mitchell and Prineville.
- Oregon Route 19 between Spray, Fossil and Condon (Gilliam County).
- Oregon Route 207 between Mitchell and Richmond.
- Oregon Route 218 between Fossil and Antelope (Wasco County).¹³

POTENTIAL MAGNITUDE AND IMPACT

Generally, landslides are a hazard that has the potential to cause harm in multiple ways. However, landslides are also a natural process that shapes the landscape and contributes to the overall environmental quality of our world. There are benefits to landslides and the ecological role that landslides play is often overlooked. Landslides contribute to aquatic and terrestrial biodiversity. Debris flows and other mass movements play an important role in supplying sediment and coarse woody debris to maintain pool/riffle habitat in streams. As disturbance agents, landslides engender a mosaic of seral stages, soils, and sites (from ponds to dry ridges) to forested landscapes” (Geertsema, Highland, & Vaugeouis, 2009). When a landslide

¹³ See Appendix I: Transportation Maps of Wheeler County.

impacts people, property, or assets (e.g., roads, buildings, and infrastructure), and the environment, it is a natural hazard and often it results in a natural disaster.¹⁴

SIGNIFICANT LANDSLIDES/DEBRIS FLOWS

Table 3.7 identifies landslides/debris flows that have occurred recently in Wheeler County.

Table 3.7: Significant Landslides in Wheeler County

Date	Location	Description
23-Jun-2009	U.S. Highway 26	Landslides and rock falls closed the highway and caused an injury near Mitchell.
4-Jun-2009	U.S. Highway 26	A localized thunderstorm caused a landslide/debris flow that buried U.S. Highway 26 about eight miles west of Mitchell. The incident closed the road near mile marker 60 because of rocks, debris, mud, and running water. A local weather spotter in the area of the storm reported and half inch of rainfall in five to seven minutes.
9-Dec-2008	Oregon Route 218	Rock falls affected one lane of traffic near the border with Wasco County.
20-Nov-2008	Oregon Route 218	Rock falls on the shoulder and roadway and affected one lane of traffic south of Fossil.
19-Nov-2008	Oregon Route 218	Landslides and rock falls closed the highway near the border with Wasco County.
29-Nov-2007	Oregon Route 19	Rock falls affected both lanes of traffic and caused property damage near Spray.
4-Oct-2007	U.S. Highway 26	Rock falls on the highway affected both lanes of traffic.
15-Aug-2007	U.S. Highway 26	Rock falls affected both lanes of traffic and caused property damage.
14-Aug-2007	U.S. Highway 26	Rock falls affected both lanes of traffic near the border with Grant County.
1-Aug-2007	U.S. Highway 26	Rock falls on the highway affected both lanes of traffic.
27-Jun-2007	U.S. Highway 26	Rock falls near the border with Crook County affected both lanes of traffic and caused property damage.
26-Apr-2001	U.S. Highway 26	A slow moving thunderstorm produced an inch of rain in southeastern Wheeler County. A small stream along U.S. Highway 26 overflowed its banks and washed debris across the road near mile marker 94. About 1.5 feet of water covered the road and debris accumulating to a depth of six inches. The Oregon Department of Transportation closed the road for several hours.

Source: Oregon Department of Geology and Mineral Industries. Statewide Landslide Information Database for Oregon (SLIDO-3). Accessed Sept 17, 2019.

¹⁴ Preparing for Landslide Hazards: A Land Use Guide for Oregon Communities. June 2019.

Table 3.8

City	Landslide Susceptibility Exposure (%)			
	Low	Moderate	High	Very High
Fossil	-0.3%	64.3%	2.4%	33.7%
Mitchell	9.9%	49.0%	41.2%	0.0%
Spray	34.2%	60.9%	4.9%	0.0%
Wheeler Co.	10.0%	37.5%	40.1%	12.4%

Source: Oregon Department of Geology and Mineral Industries. 2016 Landslide Susceptibility Overview Map of Oregon, Open-File Report 0-16-02

Statewide Landslide Information Database for Oregon (SLIDO)

Additional information on historical landslides and risks posed to a specific address can be found in the Statewide Landslide Information Database for Oregon (SLIDO).

SLIDO is compilation of landslides in Oregon that have been identified on published maps. Many landslides have not yet been located or are not on these maps and therefore are not in the database. The database does not contain information about relative hazards. The interactive map lets you view information on location, type, and other attributes related to identified landslides in Oregon.

Severe Weather

CHARACTERISTICS

Wheeler County experiences severe weather almost every year. The National Oceanic and Atmospheric Administration (NOAA) define severe weather as “a thunderstorm that produces a tornado, winds of at least 58 mph (50 knots), and/or hail at least one inch in diameter.” According to NOAA, “thunderstorms affect relatively small areas when compared with hurricanes and winter storms. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Despite their small size, all thunderstorms are dangerous. Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe.”¹⁵

LOCATION AND EXTENT

All of Wheeler County is subject to severe weather. Thunderstorm winds and hail storms are a frequent occurrence in the county. However, a review of the storm event database for Wheeler County since 1988 reveals that those events rarely cause major damage to people, their property the economy or the natural environment.

¹⁵ National Oceanic and Atmospheric Administration. “Severe Weather”. <http://www.noaawatch.gov/themes/severe.php>.

SIGNIFICANT SEVERE WEATHER

Table 3.8 identifies significant severe weather events that have occurred recently in Wheeler County.

Table 3.9: Recent Significant Severe Weather in Wheeler County

Date	Location	Description
26-Jun-2017	Hancock Field Station	A disturbance, associated with subtropical moisture, caused thunderstorms producing large hail and severe wind gusts over portions of eastern Oregon and southeastern Washington. Locally heavy rain and local flooding occurred with some storms. Estimated hail of 1.00 inch reported at Hancock Field Station, 2 miles ENE of Clarno in Wheeler county. Very heavy rain with minor flooding also occurred.
8-Jun-2016	Waterman	A few severe thunderstorms developed with good rotation associated. One of these storms managed to produce a short-lived tornado. In addition to the tornado a wind gust about 70 MPH was reported 14 miles east of Mitchell. That same area received golf ball (1.75) hail. Other areas that received hail ranging from penny to golf ball in size were: 1.75 2 miles N of Monument, 1.75 in Monument, 1.00 just east northeast of Ukiah, 1.00 a mile northeast of Ukiah, 0.88 14 miles north northwest of Dayville, and 0.75 9 miles southeast of Spray.
23-Apr-2012	Fossil	An upper level disturbance moving north on the back side of an upper level ridge combined with a very moist atmosphere to produce local severe thunderstorms and flooding. 1.00 inch hail reported.
4-Aug-2009	Service Creek	An upper level low pressure area near the northern California coast pushed moisture north into central Oregon. This moisture combined with daytime heating to produce severe thunderstorms. Spotter reported estimated gust to 69 mph.
4-Jun-2009	Spray	An unusually moist and unstable air mass combined with daytime heating to produce thunderstorms with damaging wind, heavy rainfall, and locally large hail. Six large juniper trees were uprooted or split. Other trees lost large limbs. A 25 foot section of 1/8 inch steel panel was blown off a cow shelter.
19-Jul-2004	Mitchell	A severe thunderstorm produced strong wind gusts estimated at 80-90 MPH. These winds knocked down numerous tree limbs.
4-May-1998	Mitchell	Heavy rain and quarter inch hail reported. Culverts along the West Branch of Bridge Creek were washed out neary Waterman.
1-Aug-1997	Winlock/Fossil	Hail between 0.5 and 1.25 inches in maginitude reported. Many vehicles and sides of homes were damaged
17-May-1997	May Ridge	Lightning struck and killed a man and the horse he was riding on May Ridge.

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information (NCEI), Storm Events Database 1950 - 2018.

Volcanic Event

CHARACTERISTICS

Wheeler County is situated east of the Cascade Mountain Range, which derived from volcanic activity. Mount Saint Helens, an active volcano in this chain, erupted violently in 1980 and began erupting steam and ash again during fall 2004 and spring 2005. There are also several other active and potentially active volcanoes in the range including: Mt. Hood, Mt. Jefferson, the Three Sisters, Broken Top, Mt. Bachelor, and Newberry Crater. Volcanic activity can produce many types of hazardous events including landslides, fallout of tephra (volcanic ash), lahars, pyroclastic flows, and lava flows.¹⁶ Pyroclastic flows are fluid mixtures of hot rock fragments, ash and gases that can move down the flanks of volcanoes at speeds of 50 to more than 150 kilometers per hour (30 to 90 miles per hour).¹⁷ Lahars or volcanic debris flows are water-saturated mixtures of soil and rock fragments and can travel very long distances (over 100 km) and travel as fast as 80 kilometers per hour (50 miles per hour) in steep channels close to a volcano.¹⁸ These hazards can affect very small local zones (only meters across) to areas hundreds of kilometers downwind.

LOCATION/EXTENT

An analysis was done in Oregon HazVU: the Statewide Geohazards Viewer to examine the areas of high and moderate hazard associated with the Cascade volcanos. No areas of concern for Wheeler County were identified.

Volcanic ash fall, however, could have an impact across the county. The prevailing winds in the area are out of the west and minor amounts of ash from the 1980 Mt. St. Helens eruption did reach areas of the Columbia Plateau. Wheeler County is not technically in the Columbia Plateau, but is located adjacent to it and is generally impacted by the same wind patterns.

For more information on the health hazards associated with volcanic ash fall, please see: *The Health Hazards of Volcanic Ash: A Guide for the Public* to get more information on how to prepare and deal with the hazards posed by volcanic ash fall¹⁹.

Table 3.9 identifies prominent volcanoes in the Cascade Mountain Range west of Wheeler County.²⁰

¹⁶ Oregon Natural Hazards Mitigation Plan, Region 6: Central Oregon, September 2015.

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ International Volcanic Health Hazard Network, USGS, Cities and Volcanoes Commission and GNS Science, 2019.

²⁰ Ibid.

Table 3.10: Prominent Volcanoes

Name	Elevation	Type
Mt. Jefferson	10,495 ft	Composite volcano
Mt. Washington	7,796 ft	Mafic volcano
North Sister	10,085 ft	Mafic volcano
Middle Sister	10,047 ft	Composite volcano
South Sister	10,358 ft	Composite volcano
Broken Top	9,152 ft	Composite volcano
Mt. Bachelor	9,065 ft	Mafic volcano
Newberry Crater	7,984 ft.	Composite volcano
Mt. Thielsen	9,187 ft	Basalt/andesite shield volcano
Crater Lake (Mt. Mazama)	8,926 ft (Mt. Scott)	Overlapping shield and composite volcanoes
Mt. McLaughlin	9,496 ft	Mafic volcano

Source: USGS/Cascades Volcano Observatory

Wildfire (WUI)

CHARACTERISTICS

Wildfire has been and will remain a permanent part of life in the western states. Fundamental shifts in wildfire behavior in Oregon have produced record fire losses, costs and damage to communities. Over a century of land management practices and changing policy, starting with the removal of tribal communities and subsequent loss of their controlled burning practices, followed by widespread fire suppression and shifts in land use, has enabled fuels to accumulate far beyond historic conditions. Population growth has increased human-caused ignitions, putting people and communities in harm's way. Additionally, fire seasons have become longer, drier and hotter, owing to climate impacts.

Wildfire effects in Oregon have been profound. Air quality has suffered in fire-prone regions like central and southwestern Oregon as well as in Portland and the Willamette Valley. Whether in urban or rural areas, fire frequently impacts Oregon's most vulnerable populations. Recent power outages in California, driven by increased wildfire risk, are powerful reminders of the breadth and reach of wildfire impacts, especially its threat to vulnerable populations.

Wildfire is a natural force on the landscape and in some regions a necessary catalyst for balance and resilience. But current conditions are out of balance and demand a swift and enduring response. Oregon must enact a cohesive strategy encompassing communities, natural landscapes and effective wildfire response combining immediate investments and policies to address the symptoms of uncharacteristic and harmful wildfire, with long-term investments to help Oregon adapt to a new wildfire reality.²¹

²¹ Governor's Council on Wildfire Response, November 2019: Report and Recommendations.

Wheeler County contains a diverse set of wildfire hazard and risk situations. Conditions throughout the county are conducive to large and fast moving wildfires. Many of the significant fire events occur as a result of dry lightning storms. Wide spread dry lightning is fairly frequent, occurring approximately every one to three years. Significant fires can also be caused by humans. Wildfires in Wheeler County caused by humans have mainly resulted from debris burning and equipment use. The Wheeler County Emergency Operations Department lists the following conditions and concerns found in portions of the county which contribute to the wildfire threat and potential for catastrophic losses:

- The John Day River Canyon with numerous side canyons, all with very steep slopes.
- In recent years, the populations within Wheeler County have moved into traditional resource land including forested lands. This has produced a significant increase in threats to life and property and has pushed existing fire protection beyond its original or current design capabilities.
- Wheeler County has more than 326,000 acres of wildlands with no organized fire protection. Fires in these areas have historically been suppressed by local landowners affected by the fire or other fire protection agencies. Most of this unprotected land is rangeland with intermixed areas of Juniper woodlands and sagebrush. Structures scattered throughout these lands also go unprotected.
- Residential developments next to areas with heavy fuel loads. There are many homes and structures that are in danger from possible wildland fire. Many of these homes are situated in risk areas due to the desire for seclusion. Some homes in these areas do not have adequate defensible space around them, and it will be a major hurdle to inform/convince them that defensible space is a necessary objective.
- All fire districts are completely voluntary and have limited number of volunteers and resources.

LOCATION/EXTENT

Wildfires are a natural part of the ecosystem in Oregon. However, wildfires can present a substantial hazard to life and property in growing communities. The most common wildfire conditions include: hot, dry, and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). Once a fire has started, its behavior is influenced by numerous conditions, including fuel, topography, weather, drought, and development (Sanborn Map Company, Inc., 2013). Post-wildfire geologic hazards can also present risk. These usually include flooding, debris flows, and landslides. Post-wildfire geologic hazards were not evaluated in this project.

All of Wheeler County is subject to a wildfire hazard. In addition, Wheeler County identifies approximately 150,993 acres of land within Wildland-Urban Interface (WUI) boundaries. The Wildland-Urban Interface is an area within or adjacent to an at-risk community identified in a Community Wildfire Protection Plan (CWPP). The Wildland-Urban Interface is the area where structures or human improvement meet or intermingle with wildland vegetation, which includes timber, grassland and brush fields. Communities with wildland fire risk (and their boundaries) are identified by the state through the risk assessment process or during development of

Community Wildfire Protection Plans. Areas of the county within the Wildland-Urban Interface include: Fossil (city), Mitchell (city), Spray (city), Barnhouse, Baty Subdivision, Camp Hancock, Crystal Springs, Kinzua Junction, the Painted Hills (John Day Fossil Beds National Monument), Richmond, Service Creek, Twickenham, and Oregon Route 19 (between Fossil and Spray).

Based on the Oregon Emergency Management (OEM) hazard analysis conducted by county emergency program managers, Wheeler County has a high probability of wildfire.

Table 3.11 Local Probability Assessment of Wildfire in Region 6

	Crook	Deschutes	Jefferson	Klamath	Lake	Wheeler
Probability	H	H	H	H	H	H

Source: 2015 Oregon Natural Hazards Mitigation Plan, Chapter 2: Risk Assessment, Region 6: Central Oregon

Based on the OEM hazard analysis conducted by county emergency program managers, Wheeler County has the highest vulnerability to wildfire when compared to nearby counties.

Table 3.12. Local Vulnerability Assessment of Wildfire in Region 6

	Crook	Deschutes	Jefferson	Klamath	Lake	Wheeler
Vulnerability	M	M	M	L	M	H

Source: 2015 Oregon Natural Hazards Mitigation Plan, Chapter 2: Risk Assessment, Region 6: Central Oregon

SIGNIFICANT WILDFIRES

Table 3.13 describes historical fires (greater than 600 acres burned) in Wheeler County.

Table 3.13: Historical Wildfires and Damages, 1960-2018

Fire Year	Fire Name	Report Date	General Cause	Total Acres Burned
2018	Jennie's Peak	17-Aug-2018	Unknown	45,956
2014	Pine Creek Complex	13-Jul-2014	Lightning	30,257
1996	Wheeler Point	10-Aug-1996	Equipment Use	21,980
2014	Bailey Butte	14-Jul-2014	Lightning	10,276
2000	Tamarack Creek	4-Aug-2000	Debris Burning	7,900
2006	Maxwell	24-Jul-2006	Lightning	7,000
2008	Bridge Creek	7-Aug-2008	Lightning	4,891
1968	68953136	5-Jul-1968	Lightning	4,009
2001	Sentinel Peak	10-Jul-2001	Equipment Use	3,500
2009	McGinnis Creek	24-Jul-2009	Equipment Use	3,417
1994	First Creek	9-Jul-1994	Lightning	3,220
2007	Shelton	2-Aug-2007	Smoking	2,726
1985	85953210	25-Jul-1985	Equipment Use	2,426
1994	Big Springs	3-Aug-1994	Lightning	1,770
1994	Parrish Creek	27-Jul-1994	Lightning	1,740
2002	Chamber Springs	7-Nov-2002	Debris Burning	1,080
1994	Badger	4-Aug-1994	Lightning	1,000
2005	Wills Canyon	21-Aug-2005	Lightning	895
1968	68953140	5-Jul-1968	Lightning	891
2003	Frog Hollow	28-Jul-2003	Lightning	752
1973	73953242	10-Jun-1973	Lightning	643
2001	Blue Banks	11-Jul-2001	Lightning	600
1994	Reno Canyon	28-Mar-1994	Debris Burning	600

Source: Oregon Department of Forestry,
http://www.odf.state.or.us/DIVISIONS/protection/fire_protection/fires/FIRESlist.asp

Impacts to the Community:

Tables 3.13 and 3.14 lists the damages resulting from the Wheeler Point wildfire that burned more than 21,000 acres and Tamarack Creek wildfire that burned nearly 8,000 acres.

Table 3.14: Wheeler Point Fire Damages

Wheeler Point, August 1996	Damages
Real Property	\$500,000.00
Personal Property	\$100,000.00
Total Property Damage	\$600,000.00
Douglas Fir	\$131,250.00
Logs/Lumber Products	\$200,000.00
Ponderosa Pine	\$943,200.00
Range	\$43,000.00
Recreation	\$144,190.00
Watershed/Soils	\$703,640.00
Wildlife	\$216,285.00
Total Crop/Timber/Wildlife Damage	\$2,381,822.00

Source: Oregon Department of Forestry

Table 3.15: Tamarack Creek Fire Damages

Tamarack Creek, August 2000	Damages
Total Property Damage (barn)	\$20,000.00
Douglas Fir	\$109,955.00
Grand Fir	\$64,327.00
Ponderosa Pine	\$411,068.00
Range	\$132.00
Watershed/Soils	\$47,912.00
Wildlife	\$7,144.00
Total Crop/Timber/Wildlife Damage	640,539.00

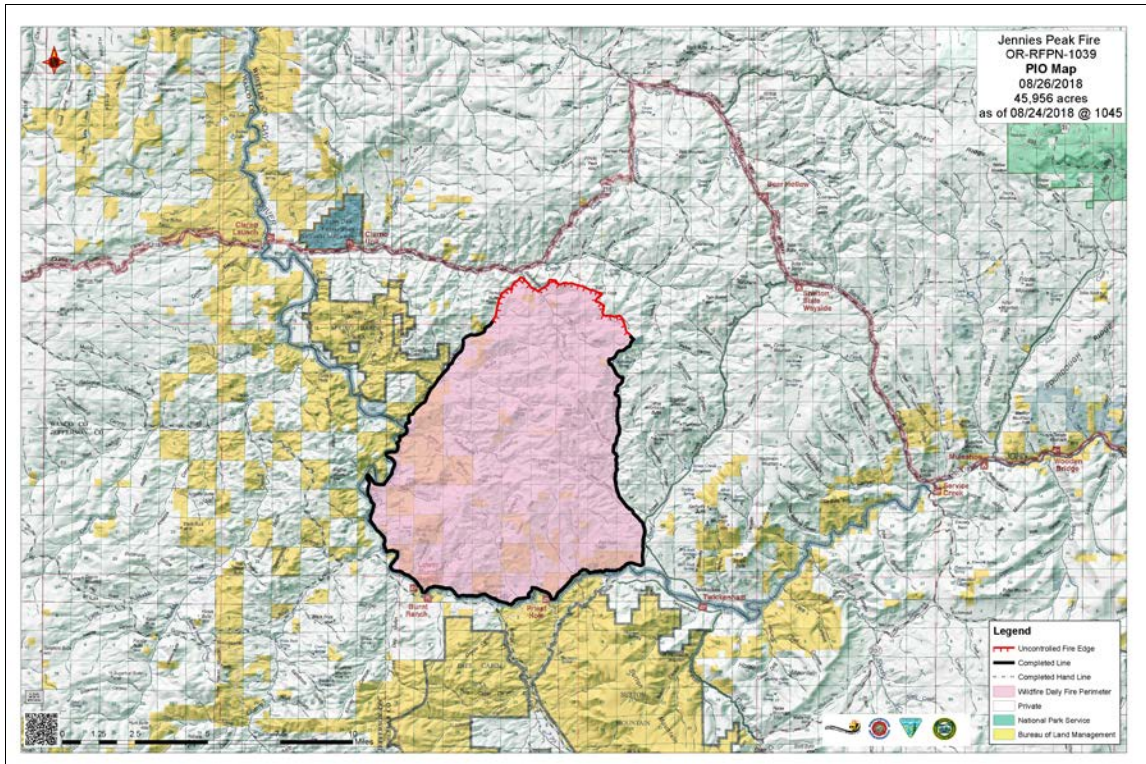
Source: Oregon Department of Forestry

Wildfire Trends

The summer of 2018 was a historic wildfire season in the Western USA, Oregon and Wheeler County. Through mid-August, about 5.7 million acres had burned, an area larger than New Jersey.

Because of the rural nature and low population density of the County, the direct impact of the Jennie's Peak Fire was of limited scope to people and infrastructure. However, the fire did consume vast areas of range and timber land, mostly privately owned. No data on specific damage of this fire to property and the economy is currently available.

Figure 3.8: 2018 Jennie’s Peak Fire



Source: InciWeb Incident Information System, USFS. Accessed 7/24/19.

In the Columbia Basin Region of Oregon, a number of fires consumed over 100,000 acres of brush, timber and grassland. This included the 45,956 acre Jennie’s Peak Fire – the largest wildfire ever recorded in Wheeler County. In addition, the county also experienced two other large fires in 2018, the 30,245 acre Pine Creek and 10, 276 acre Bailey Butte Fire.

The amount of acreage burned in 2018 surpassed the totals for 2016 and 2017 which is consistent with a trend going back to at least the early 1980s: The amount of acreage consumed by fire is growing. Fires are getting bigger, and fire seasons are lasting longer.²²

The National Interagency Fire Center has data on the total number of wildfires and acres burned for each year going back to 1926. But modern data collection, with figures that can be compared year over year, began only in 1983. That year, 18,000 fires burned a little more than 1 million acres. The overall trend since that year has been a steady increase despite significant year-over-year variation.

In 1990, for instance, 4.6 million acres burned. In 2000, it was 7.4 million. The year 2015 saw a modern-day record: 10.1 million acres burned, an area larger than the state of Maryland. 2017 was the most expensive fire season on record.

²² “Wildfires have gotten bigger in recent years, and the trend is likely to continue,” Washington Post, August 14, 2018.

Total consumed acreage is increasing not necessarily because there are more fires, but because the typical fire is getting bigger. Throughout the 1980s and 1990s, the average wildfire burned anywhere from 40 to 80 acres of land. The 2010s, on the other hand, have seen several years when the average fire was more than 100 acres in size. In 2018, the average fire has burned through about 130 acres.

There are a number of factors driving these trends. The Western USA is getting warmer and drier, making it easier for fires to start and spread. A 2016 Columbia University study found that average temperatures in Western forests have increased by about 2.5 degrees since 1970, which has led to the burning of about 16,000 more square miles than would have occurred had temperatures remained the same.²³

That study estimated that climate change is responsible for about half the increase in fires since the 1980s. Other factors include persistent weather patterns that have steered Pacific moisture away from the West Coast, according to the study. And paradoxically, firefighting efforts play a role: When fires are prevented from spreading, dry fuel accumulates, potentially contributing to even larger fires later.

Regardless, a warming climate means that wildfires will likely continue to get more severe in the decades to come.²⁴

The Deschutes Collaborative Forest Project

An excellent source of information on dealing with wildfires in Eastern and Central Oregon is the Deschutes Collaborative Forest Project. It is a collaborative approach to forest restoration to prevent catastrophic wildfire; sustain recreational opportunities; ensure jobs, quality habitat and clean drinking water. Its mission is to bring together a group of diverse stakeholders bringing our community together to improve the health of our forest, supporting active restoration projects to reach common goals:

1. Reduced risk of catastrophic effects of wildfire;
2. Improved wildlife and fish habitat;
3. Thriving local businesses that depend on the forest; and
4. The well-being of those who work in, live by and love our forest.²⁵

Their website (<http://deschutescollaborativeforest.org/>) is a great place to go to find out more on best forest management practices that Wheeler County could utilize in becoming more resilient to wildfires.

²³ <http://www.earth.columbia.edu/articles/view/3343>

²⁴ "Wildfires have gotten bigger in recent years, and the trend is likely to continue," Washington Post, August 14, 2018.

²⁵ Deschutes Collaborative Forest Project website, accessed January 22, 2019. <http://deschutescollaborativeforest.org/>

Windstorm

CHARACTERISTICS

A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. Although windstorms can affect the entirety of Wheeler County, they are especially dangerous in developed areas with significant tree stands and major infrastructure, especially above ground utility lines. A windstorm will frequently knock down trees and power lines, damage homes, businesses, public facilities, and create tons of storm related debris.

These areas experience thunderstorms, which are sometimes accompanied by strong outflow and surface winds. Fallen trees and structural damage from windstorms are not uncommon in these areas. The prominent Cascade Range can act as a buffer to strong storms that mostly affect western Oregon. However, the interior counties in this region may experience strong down sloping winds off the lee side of the mountains. High winds in inter-mountain areas in Central Oregon are not uncommon.²⁶

A majority of destructive surface winds in Oregon are from the southwest. Under certain conditions, very strong east winds may occur, but these usually are limited to small areas in the vicinity of the Columbia River Gorge or low-mountain passes. High winds in inter-mountain valleys are not uncommon. For example, stiff winds from the Ochoco Mountains often occur throughout this region.

LOCATION/EXTENT

Table 3.15 identifies the probability of severe wind events in the region as identified in the State of Oregon Natural Hazards Mitigation Plan.

Table 3.16: Probability of Severe Wind Events

One-minute average, 30 ft above the ground	25-Year Event (4% annual probability)	50-Year Event (2% annual probability)	100-Year Event (1% annual probability)
Region 6 - Central Oregon (includes Wheeler County)	60 mph	65 mph	75 mph

Source: State of Oregon Natural Hazards Mitigation Plan, Windstorm Chapter. February 2012.

Based on the OEM hazard analysis conducted by county emergency program managers, the probability that Wheeler County will experience windstorms is high, while its vulnerability is medium.²⁷

SIGNIFICANT PREVIOUS WINDSTORMS

A review of the National Climate Data Center Storm Events Database (<http://www.ncdc.noaa.gov/stormevents>) on July 24, 2019 revealed only one windstorm (in

²⁶ Oregon Natural Hazards Mitigation Plan, Regional Risk Assessments, Region 6: Central Oregon - Hazards and Vulnerability, Windstorms. September 2015

addition to any associated with thunderstorm winds noted previously) in the area from 1988 to 2019.

May 25, 2012. A brief gust with swirling winds caused minor damage at a residence 4 miles southeast of Mount Vernon. Sheet metal was pulled off a building and boards were twirled around. Mount Vernon is a community just east of Wheeler County in the John Day Basin.

Winter Storm

CHARACTERISTICS

Communities in Wheeler County are known for cold and snowy winter conditions. In general the region is prepared, and those visiting the region during the winter usually come prepared. However, there are occasions when preparation cannot meet the challenge. Drifting, blowing snow has brought highway traffic to a standstill. Also, windy and icy conditions have closed mountain passes and canyons to certain classes of truck traffic. In these situations, travelers must seek accommodations, sometimes in communities where lodging is very limited. Local residents can also experience problems. During the winter, heat, food, and the care of livestock are everyday concerns. Access to farms and ranches can be extremely difficult and present a serious challenge to local emergency managers.

LOCATION/EXTENT

Wheeler County lies within the Blue Mountains and is dominated by rugged terrain and elevations between 2,500' to over 6,000'. As such, it is susceptible to winter weather throughout the county. Heavy snow is common on an annual basis and can impact all three of the incorporated cities and transportation lifelines. Significant Winter Storms

In 2004 Wheeler County was one of thirty counties in Oregon designated as a disaster by FEMA due to severe winter storms. The disaster was initially declared on February 19, 2004 from storms that occurred between December 23, 2003 and January 14, 2004. Wheeler County was one of two counties to be amended into the declaration on March 4, 2004 as an area among those areas determined to have been adversely affected by the catastrophe declared a major disaster by the President in his declaration of February 19, 2004.

January 1950 was a very cold month statewide, with frequent snowstorms. For the state as a whole, snow was the heaviest during this January than ever before since the beginning of weather record keeping, which began in 1890. January 1950 snowfall totals throughout Wheeler County included:

- Fossil: 49.3 inches
- Mitchell: 25.8 inches

A sample of other major winter storms in the Ochoco-John Day Highlands region from 2000 to 2019 are noted below.

²⁷ Oregon Natural Hazards Mitigation Plan, Regional Risk Assessments, Region 6: Central Oregon - Hazards and Vulnerability, Windstorms. September 2015.

- November 26, 2006. A strong Pacific storm system brought 4 to 6 inches of snow to the Columbia Gorge and north central Oregon and 6 to 8 inches of snow to the Ochoco John Day Highlands.
- November 28, 2007. A vigorous upper level trough combined with a stationary front laying northeast to southwest across the Blue Mountains produced heavy snow.
- January 8, 2008. An upper level trough and associated cold front brought heavy snow.
- January 26-28, 2008. Two low pressure areas combined with a slow moving cold front produced sustained heavy snow and freezing rain across eastern Oregon. Snowfall in inches included 4 miles north of Bingham Springs (13), Milkshakes Snotel (10), 4 miles north northwest of Meacham (14), Bowman Springs Snotel (6), Madison Butte Snotel (6), Dufur (5), Bend (5), Condon (10), 1 mile northeast of Fossil (9.5), 6 miles northeast of Mitchell (6), 2 miles east of Mitchell (9), Mitchell (7), Pendleton (9), Heppner (9), Irrigon (8), 2 miles north northwest of Hermiston (6), Pilot Rock (6.5), John Day (6), 4 miles north northeast of Prairie City (7), 3 miles north northwest of Wallowa (5), Joseph (12), and 3.5 miles east southeast of Mosier (6). Freezing rain accumulations included 1/4 inch 5 miles south southwest of Chenoweth and at Boardman and 1/2 inch at Arlington. A multi-vehicle accident following the storm on January 28 closed Interstate 84, 15 miles west of Arlington for 5 hours.
- December 12-14, 2008. An arctic front brought heavy snow and much below normal temperatures.
- November 21, 2010. An Arctic cold front combined with Pacific moisture to produce widespread heavy snowfall and very cold temperatures. Extreme cold temperatures followed the snowfall with many locations setting records on November 24th including Joseph (-9), Long Creek (-10), Meacham (-24), Pendleton (-7). Other sub-zero temperatures were observed at Bend (-8), Hermiston (-8), Joseph (-11), LaGrande (-6), Redmond (-8), Antelope (-5), Condon (-2), Moro (-7), Mitchell (-1), Seneca (-19), and Union (-8).
- February 7, 2014. Snowfall of 6 inches at Mitchell. Widespread snow across north-central Oregon.
- December 24, 2014. A storm system moved into the interior Pacific Northwest Christmas Eve providing significant snow accumulations to the Blue Mountains and the Ochoco and John Day Highlands. Snow accumulations in inches of 6 inches near Mitchell.
- December 12-13, 2015. Several Pacific storm systems moved across the region over the Dec 12-13 weekend. Each storm system brought several inches of snow to the mountain areas. Snowfall amounts in inches include: 21.0 10 miles west of La Pine, 14.0 at Tollgate, 12.0 13 miles southwest of Mitchell, and 9.0 6 miles east southeast of Granite.
- December 14, 2016. Estimated heavy snow accumulation of 10 inches in the Ochoco Mountains, 15 miles west-southwest of Mitchell.
- February 23-27, 2019. Persistent troughing off the coast of the Pacific Northwest focused a stream of mid-level moisture over the Inland Northwest resulting in a long duration snow event as the plume drifted north and south several times between the 22nd and 27th of February. Snowfall rates were greatly enhanced over central Oregon with the proximity of a nearly stationary surface boundary where snowfall rates were in excess of 1 inch per hour. Storm total snowfall amounts were measured at: 40 inches in Sisters, 33 inches in Bend, 30 inches in Redmond, 26 inches in Meacham, 22 inches in Prineville, 21 inches in Elgin, 16 inches in Mitchell, 14 inches in Lostine and La Grande, 12 inches in Pendleton and Joseph and 10 inches in John Day. In Bend a few roofs collapsed under the weight of the snow.

Hazard Probability

Probability is the likelihood of future occurrence within a specified period of time. Wheeler County evaluated the best available probability data to develop the probability scores presented below. For the purposes of this plan, the county utilized the Oregon Emergency Management Hazard Analysis methodology probability definitions to determine hazard probability. The definitions are:

LOW = More than 10 years between events scores between 0 and 3 points

MEDIUM = From 5 to 10 years between events scores between 4 and 7 points

HIGH = An event is likely within the next 5 years scores between 8 and 10 points

Table 3.16 presents the probability scores for each of the natural hazards present in Wheeler County. As shown in the table, several hazards are rated with high probabilities including drought, flood, severe weather, wildfire, windstorms and winter storm.

Table 3.17: Natural Hazard Probability Assessment Summary – Wheeler County

Threat Event/Hazard	Severity	Weight Factor	Subtotal	Probability
Drought	10	7	70	High
Earthquake	1	7	7	Low
Flood - Riverine	10	7	70	High
Landslide/Debris Flow	5	7	35	Medium
Severe Weather	10	7	70	High
Volcanic Event	1	7	7	Low
Wildfire (WUI)	10	7	70	High
Windstorm	5	7	35	Medium
Winter Storm	10	7	70	High

Source: Wheeler County NHMP Steering Committee, Updated March 29, 2018.

Community Vulnerability

Natural disasters occur as a predictable interaction among three broad systems: natural environment (e.g., climate, rivers systems, geology, forest ecosystems, etc.), the built environment (e.g., cities, buildings, roads, utilities, etc.) and societal systems (e.g., cultural institutions, community organization, business climate, service provision, etc.). A natural disaster occurs when a hazard impacts the built environment or societal systems and creates adverse conditions within a community.

It is not always possible to predict exactly when natural disasters will occur or the extent to which they may impact the community. However, communities can minimize losses from disaster events through deliberate planning and mitigation, as well as by identifying distinct vulnerabilities.²⁸ Several factors that are commonly considered variables in a community's

²⁸ State of Oregon Emergency Management, Natural Hazard Mitigation Plan, February 2012.

collective vulnerability to disaster are listed below, followed by Table 3.17 that outlines specific vulnerable populations and general county-wide concerns along with the hazards that are most likely to impact them.

Population

VULNERABLE POPULATIONS

A characteristic of disasters is that they exceed the ability of emergency response agencies to provide assistance promptly. In a major disaster, members of the public may be on their own for several days. Individuals may need to go for several days without utilities and food and water sources. Disasters may also isolate individuals by damaging transportation routes. Not all people are able to respond to these conditions appropriately. Many people are in vulnerable populations that may have difficulty following official instructions and taking protective actions. For instance, someone who is developmentally disabled or deaf may not be able to hear or understand instructions on sanitation, evacuation routes or shelter locations.

Vulnerable populations are those groups that possess specific characteristics that inhibit their ability to prepare for, respond to, or recover from a disaster. These include elderly, youth, transient, disabled, mentally ill, and low income populations. These groups are more heavily impacted because they may lack the necessary knowledge, skills, social support structures, or the mental and physical abilities necessary to take care of themselves. Historically, vulnerable populations present a special challenge to emergency managers and response agencies and they are more likely to be victims of a disaster. Fortunately, many people that fall into one of these categories have families, friends, neighbors, and other caretakers that will be able to assist them. But many of them do not have adequate support and those who do may not be able to rely on it in a major event.

Elderly

According to 2010 Census figures from the U.S. Census Bureau, persons 60 and older made up 38.3-percent of the population in Wheeler County. This figure is expected to rise to 44.3-percent by 2030.²⁹ Furthermore, out of the 651 household located in the county, 106 (16.3-percent) are occupied by individuals 65 or older who live alone. Nationwide, as the baby boomer generation enters their 60's, the senior population is expected to dramatically increase.

Residential Care Facility: Haven House Retirement Center

714 Main Street
Fossil, Oregon 97830
Licensed for Residential Care, not for Assisted Living
Licensed for 34 residents
Facilities: 19 apartments

Youth (Wheeler County Steering Committee to update the information for youth, tourist, etc.)

²⁹ Source: 2030 (Projected), Office of Economic Analysis, Department of Administrative Services, State of Oregon, released 2013.

Special Education Students: students with Individualized Education Programs (IEPs) established under the guidelines of the federal Individuals with Disabilities Education Act (IDEA). During the 2005-06 academic year, 14 special education students were enrolled in Wheeler County public schools, eight in the Fossil School District and six in the Mitchell School District. During that year, special education students made up 6.5-percent of the student population in the county.³⁰

City of Mitchell: The district operates a dorm for high school students which have been predominately exchange students. Located adjacent to the high school, the dorm has a capacity for up to twenty students.

City of Spray: The district operates a two dorms for high school students which have been predominately exchange students. They each can house up to six students. The dorm for girls is located across the street from the school and the dorm for boys is located in a private residence about a mile west of Spray.

Tourist/Travelers

In 2017, Wheeler County had an estimated 7,200 overnight visitor stays.³¹ Travelers along U.S. Highway 26 and visitors to the City of Mitchell are particularly vulnerable (historically) to flash floods during the summer months. Also, tourists traveling along the Journey Through Time Scenic Byway or visiting the John Day Fossil Beds National Monument(s) throughout the county are at risk to a variety of hazards. Many of the corridors throughout the county are subject to landslides/debris flows that can temporarily close portions of or the entire highway.

Tourists are particularly vulnerable to disasters. They are usually unfamiliar with the hazards in the region and they don't have the knowledge or the materials needed to take care of themselves in a disaster. For example, a typical tourist may have difficulty finding evacuation routes or shelters. A light traveling tourist would also not have their own supply of food, water, flashlights, radios, and other supplies that locals can use to take care of themselves in a disaster. Finally, tourists – being away from home - usually do not have a support structure of family, friends and neighbors that local residents can rely on.

Disabled

According to 2017 Census figures from the U.S. Census Bureau, 309 (21.9-percent) of all residents in Wheeler County have some form of a disability.

Hearing disability: According to 2017 Census estimates, 142 (10.1-percent) of all county residents have a hearing disability.³² The Census defines hearing disability as a person who is deaf or has a hearing impairment that makes it very difficult to hear conversations, televisions, or radio broadcasts.

³⁰ Oregon Department of Education. "Oregon Education Data Book." Volume 2. 2006-2007. Page 61. <http://www.ode.state.or.us/search/page/?id=1727>

³¹ Oregon Travel Impacts Statewide Estimates, Dean Runyan and Associates. June 2018. Prepared for the Oregon Tourism Commission.

³² US Census Bureau, Disability Characteristics, 2013-2017 American Community Survey 5-Year Estimates for Wheeler County, Oregon.

Vision disability: According to 2017 Census estimates, 46 (3.3-percent) of all county residents have a vision disability.³³ The Census defines vision disability as a person who is blind or has serious difficulty reading or driving due to a visual impairment even when wearing glasses.

Cognitive disability: According to 2017 Census estimates, 62 (4.6-percent) of all county residents have a cognitive disability.³⁴ The US Census defines cognitive disability is when a person, because of a physical, mental, or emotional problem, has difficulty remembering, concentrating, or making decisions.

Ambulatory disability: According to 2017 Census estimates, 183 (13.5-percent) of all county residents have an ambulatory disability.³⁵ The US Census defines ambulatory disability as a person having serious difficulty walking or climbing stairs.

Independent living: According to 2017 Census estimates, 120 (10.1-percent) of all county residents have an independent living disability.³⁶ The US Census defines independent living disability as a person, because of a physical, mental or emotional problem, has difficulty doing errands alone such as visiting the doctor's office or shopping.

Low-Income

In 2010, the poverty guideline for a family of four equaled income levels at or below \$25,100. The Census Bureau estimates that 14.0-percent of the total population and 19.5-percent of children live below the poverty level across the county, and both of these levels have increased since 2005. In fact, the number of children living below the poverty level increased by 5.7-percent. The poverty estimates as a percentage are significantly higher in Wheeler County compared to state and national estimates. The percentage of children living in poverty in the county is 39.9-percent.

Not having sufficient financial resources during and after a disaster can be great disadvantage. Lower income people are more likely to live in mobile homes or other homes that are less able to resist damage from flooding, windstorms, and severe weather. Low-income people tend to have the greatest difficulty recovering from a disaster.

³³ US Census Bureau, Disability Characteristics, 2013-2017 American Community Survey 5-Year Estimates for Wheeler County, Oregon.

³⁴ US Census Bureau, Disability Characteristics, 2013-2017 American Community Survey 5-Year Estimates for Wheeler County, Oregon.

³⁵ US Census Bureau, Disability Characteristics, 2013-2017 American Community Survey 5-Year Estimates for Wheeler County, Oregon.

³⁶ US Census Bureau, Disability Characteristics, 2013-2017 American Community Survey 5-Year Estimates for Wheeler County, Oregon.

Table 3.18: Vulnerable Populations in Wheeler County

Natural Hazard Mitigation Plan Issue: Population									
Wheeler County Asset Identification	Drought	Earthquake	Flood	Landslide	Severe Weather	Volcanic Event	Wildfire	Windstorm	Winter storm
Wheeler County									
Disabled residents			X	X	X		X	X	X
Low income residents			X	X	X		X	X	X
Tourists/travelers, especially along Hwy 26, to the John Day Fossil Beds and the Painted Hills National Monument.			X	X	X		X	X	X
City of Fossil									
Eldery residents at the Haven House Retirement Center	X	X	X		X	X	X	X	X
City of Mitchell									
Foreign exchange students housed in the Mitchell School Dormitory		X	X		X				
Residents in the Huddleson Heights and High Street neighborhoods in Mitchell are in close proximity to wildlands.			X		X		X	X	X
City of Spray									
Exchange students in the Spray School Dormitory		X			X			X	X

Source: Wheeler County NHMP Steering Committee, March, 2018 and DLCD staff.

Economic, Environmental and Other Critical Infrastructure

Wheeler County’s economy is currently driven by three main engines: agriculture, government, and – closely allied to government – health and social services, all of which can be disrupted by various hazards. The largest employer in the County is the combined agriculture/forestry/hunting and fishing sectors. Thus, the current economic well-being of the County is tied directly to the well-being of the natural environment.

While the metrics presented thus far in this plan show the economic distress through which Wheeler County has survived and describe the components of the economy, they only partially reflect the quality of life in Wheeler County. There are many quality of life or well-being measures that are essential to understanding Wheeler County. Even economists are beginning to acknowledge and research variables that measure elements of quality of life.

One measure of those characteristics is social capital - the relationships or networks that people develop to facilitate economic and social well-being. Wheeler County has very positive social

capital when social capital is measured as an index of variables like religious organizations, public and private associations, nonprofits, voter turn-out, and response to census questionnaires as they relate to total population.

Well-being can also be associated with natural amenities and, again, Wheeler County is above average. The natural amenities scale is a measure of the physical characteristics of a county area that enhance the location as a place to live. The scale was constructed by combining six measures of climate, topography, and water area that reflect environmental qualities most people prefer. These measures are warm winter, winter sun, temperate summer, low summer humidity, topographic variation, and water area.³⁷

The quality of life in Wheeler County is thus a symbiotic relationship between economic, environmental and social infrastructure. Therefore, making this infrastructure resilient to natural disasters is important in supporting and enhancing the quality of life of residents in the county.

Natural capital is essential in sustaining all forms of life and plays an often under represented role in natural hazard community resiliency planning. With four distinct mild seasons, a diverse terrain and the proximity to national forests, Wheeler County historically has had to deal with habitual drought, flooding, wildfires, and landslides. By identifying potential hazards, temperature and precipitation patterns as well as natural capitals such as key river systems, Wheeler County can focus on key areas to better prepare, mitigate and increase the resiliency of local communities.

Transportation networks, systems for power transmission, and critical facilities such as hospitals and police stations are all vital to the functioning of a county. Due to the fundamental role that infrastructure plays both pre- and post-disaster, it deserves special attention in the context of creating more resilient communities.³⁸

Table 3.19 below lists county-wide and city critical infrastructure and services concerns along with the hazards that are most likely to impact them.

³⁷ Economic Impact and Facilities Analysis for Fossil and Wheeler County, Oregon. Oregon State University Extension Service Rural Studies Program January 2013.

³⁸ State of Oregon Emergency Management Plan, Region 5: Mid-Columbia Regional Profile, February 2012

Table 3.19: Vulnerable Critical Infrastructure & Services in Wheeler County

Natural Hazard Mitigation Plan Issue: Critical Infrastructure									
Wheeler County Asset Identification	Drought	Earthquake	Flood	Landslide	Severe Weather	Volcanic Event	Wildfire	Windstorm	Winter storm
Wheeler County									
Painted Hills and the John Day Fossil Beds National Monument	X			X			X		
John Day River	X		X	X					X
Forest(s)/woodland areas (Ochoco National Forest, Umatilla National Forest)	X						X	X	
Agricultural land (farms/ranches)	X				X	X	X	X	X
County parks (Bear Hollow County Park, Shelton Wayside County Park)	X				X		X	X	X
Bridge(s) over Bridge Creek		X	X						
Communications and Electrical Power		X	X		X			X	X
Federal Aviation Administration (FAA) Radar Dome					X		X	X	X
Mt. Pisgah Lookout, eight miles southwest of Mitchell					X		X	X	X
Rancheria (Rancherie) Rock Lookout, seven miles southeast of Fossil					X		X	X	X
City of Fossil									
Fossil City Parks (4)	X		X		X	X	X	X	X
Fossil Water Supply (well, spring, pump, mix station)	X	X	X				X		
Asher Clinic	X	X	X			X	X	X	
Fossil City Hall	X		X				X		
Fossil Elementary School (built in 1925)	X	X			X	X	X	X	X
Fossil Volunteer Fire Department		X	X	X			X	X	
Wheeler County Courthouse		X	X				X	X	
Wheeler High School (built in 1950)	X	X	X	X	X	X	X	X	X
Main Street in Fossil (Bed & Breakfast, Fossil Fuel, Hardware, Post Office, Grocery Store, Car Dealership, Bank, Museum, etc.)	X		X				X		
City of Mitchell									
Mitchell City Park	X		X		X	X	X	X	X
Mitchell School (built in 1983)		X		X			X		X
Main Street in Mitchell (Post Office, Sidewalk Café, Judy’s Place, Cannon’s Tire Center and residences)			X						
City of Spray									
Spray River Front Park	X		X		X	X	X	X	X
City Hall		X	X						
Spray School (built in 1955)		X	X						

Source: Wheeler County NHMP Steering Committee, March 2018.

Seismic vulnerability assessments have highlighted the need for seismic retrofit of critical facilities. In 2006 the Oregon Department of Geology and Mineral Industries conducted a statewide seismic needs assessment survey using rapid visual screening. Table 3.19 identifies the results on critical facilities located in Wheeler County. FEMA recommends that all buildings with a *collapse potential** score of 2.0 or less should be considered to have inadequate performance during the anticipated maximum seismic event.³⁹ Six facilities in Wheeler County have collapse potential scores of 2.0 or less, including all four schools. The six facilities with high collapse potential (greater than 10-percent) include: Fossil Elementary School, Wheeler High School, Fossil Volunteer Fire Department and Wheeler County Sheriff’s office in Fossil, as well as Mitchell School in Mitchell and Spray School in Spray. One facility, Spray Volunteer Fire Department, has a moderate collapse potential (greater than 1-percent).

***Collapse Potential** – A RVS score of 2.0 represents that there is a 1 in 100 chance (1-percent probability), that the building will collapse due to ground motion caused by the maximum considered earthquake. A score of 0.0 implies a 1 in 1 chance (100-percent probability). FEMA recommends that all buildings with a score of 2.0 or less should be considered to have inadequate performance during the anticipated maximum seismic event. DOGAMI has refined the relative rank of the RVS score into four categories: Very High (RVS less than or equal to zero, 100-percent probability of collapse), High (RVS from 0.1 to 1.0, greater than a 10-percent probability of collapse), Moderate (RVS from 1.1 to 2.0, greater than a 1-percent probability of collapse) and Low (RVS greater than or equal to 2.1, probability of collapse less than 1-percent). New construction is deemed to have low collapse potential. Sites that have been or are planned to have seismic rehabilitation are deemed to have moderate collapse potential. Sites that were missed during the field screening are deemed to have high collapse potential.

Table 3.20: Statewide Seismic Needs Assessment Using Rapid Visual Screening (RVS)

City	Facility Name	Inspection Date	Final Score	FEMA-154 Collapse Potential
Fossil	Fossil Elementary School	26-Jul-06	0.6	High (>10%)
Fossil	Wheeler High School	26-Jul-06	0.3	High (>10%)
Fossil	Fossil Volunteer Fire Department	15-Sep-06		High (>10%)
Fossil	Wheeler County Courthouse	26-Jul-06	0.6	High (>10%)
Mitchell	Mitchell School	26-Jul-06	0.3	High (>10%)
Mitchell	Mitchell Fire & Ambulance	26-Jul-06	2.3	Low (<1%)
Spray	Spray School	26-Jul-06	0.2	High (>10%)
Spray	Spray Volunteer Fire Department	26-Jul-06	1.9	Moderate (>1%)
Spray	Wheeler Fire Department	26-Jul-06	2.3	Low (<1%)

³⁹ Statewide Seismic Needs Assessment. Appendix I: Spreadsheet and Site Summary Report Data Field Definitions.

Vulnerability Summary

Vulnerability is a measure of the exposure of the built environment to hazards. The exposure of community assets to hazards are critical in the assessment of the degree of risk a community has to each hazard. Identifying the facilities and infrastructure at risk from various hazards can assist the county in prioritizing resources for mitigation, and can assist in directing damage assessment efforts after a hazard event has occurred. The exposure of county assets to each hazard and potential implications are explained in each hazard section.

Vulnerability is the percentage of population and property likely to be affected under an “average” occurrence of the hazard. Wheeler County evaluated the best available vulnerability data to develop the vulnerability scores presented below. For the purposes of this plan, the county utilized the Oregon Emergency Management Hazard Analysis methodology vulnerability definitions to determine hazard probability. The definitions are:

LOW = less than 1-percent affected scores between 0 and 3 points

MEDIUM = between 1 and 10-percent affected scores between 4 and 7 points

HIGH = more than 10-percent affected scores between 8 and 10 points

Table 3.21 presents the vulnerability scores for each of the natural hazards present in Wheeler County. As shown in the table, the county is highly vulnerable to the following hazards: drought, earthquake, flood, severe weather, volcanic events, wildfire, and winter storm.

Table 3.21: Community Vulnerability Assessment Summary – Wheeler County

Threat Event/Hazard	Severity	Weight Factor	Subtotal	Vulnerability
Drought	10	5	50	High
Earthquake	8	5	40	High
Flood - Riverine	10	5	50	High
Landslide/Debris Flow	5	5	25	Medium
Severe Weather	10	5	50	High
Volcanic Event	10	5	50	High
Wildfire (WUI)	10	5	50	High
Windstorm	5	5	25	Medium
Winter Storm	10	5	50	High

Source: Wheeler County NHMP Steering Committee, March, 2018.

National Flood Insurance Program (NFIP)

Risk Assessment - §201.6(c)(2)(ii): “All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods.”

Wheeler County, the City of Fossil, and the City of Mitchell participate in the Nation Flood Insurance Program (NFIP). Flood Insurance Rate Maps (FIRMs) for Wheeler County are current as of July 17, 1989; FIRMs for the City of Fossil are current as of May 4, 1989; FIRMs for the City

of Mitchell are current of April 17, 1989; and FIRMS for the City of Spray are current as of August 16, 1989. Table 3.21 shows that as of September 11, 2018 there were 11 National Flood Insurance Program (NFIP) policies in force with a total value of \$969,400. Between 1978 and September 11, 2018 there were four NFIP claims; three in the City of Fossil and one in Wheeler County, with a total payment of \$10,236.

Table 3.22: NFIP Summary Table

Jurisdiction	FIRM Date	NFIP Status [^]	# NFIP Policies	Total Coverage	Ttl Premium	# NFIP Claims	Total Paid
Wheeler County	Jul-89	P	5	\$299,600	\$1,470	1	\$1,470
Fossil	May-89	P	6	\$669,800	\$4,762	3	\$8,766
Mitchell	Apr-89	P	0	\$0	\$0	0	\$0
Spray	Aug-89	NP	0	\$0	\$0	0	\$0
Totals			17	\$969,400	\$8,159	4	\$10,236

Source: State NFIP Coordinator; ^ P = Participating, NP = Not Participating

Table 3.22 illustrates that as of November 2, 2012, Wheeler County, the City of Fossil and the City of Mitchell have zero repetitive flood loss properties and zero severe repetitive loss properties (validated or pending). Wheeler County's last Community Assistance Visit was August 27, 1992. The City of Fossil's last Community Assistance Visit was August 27, 1992, and the City of Mitchell's last Community Assistance Visit was August 28, 1992. Neither Wheeler County nor the City of Fossil nor the City of Mitchell is a member of the Community Rating System (CRS).

Table 3.23: NFIP Repetitive Loss and Severe Repetitive Loss Summary

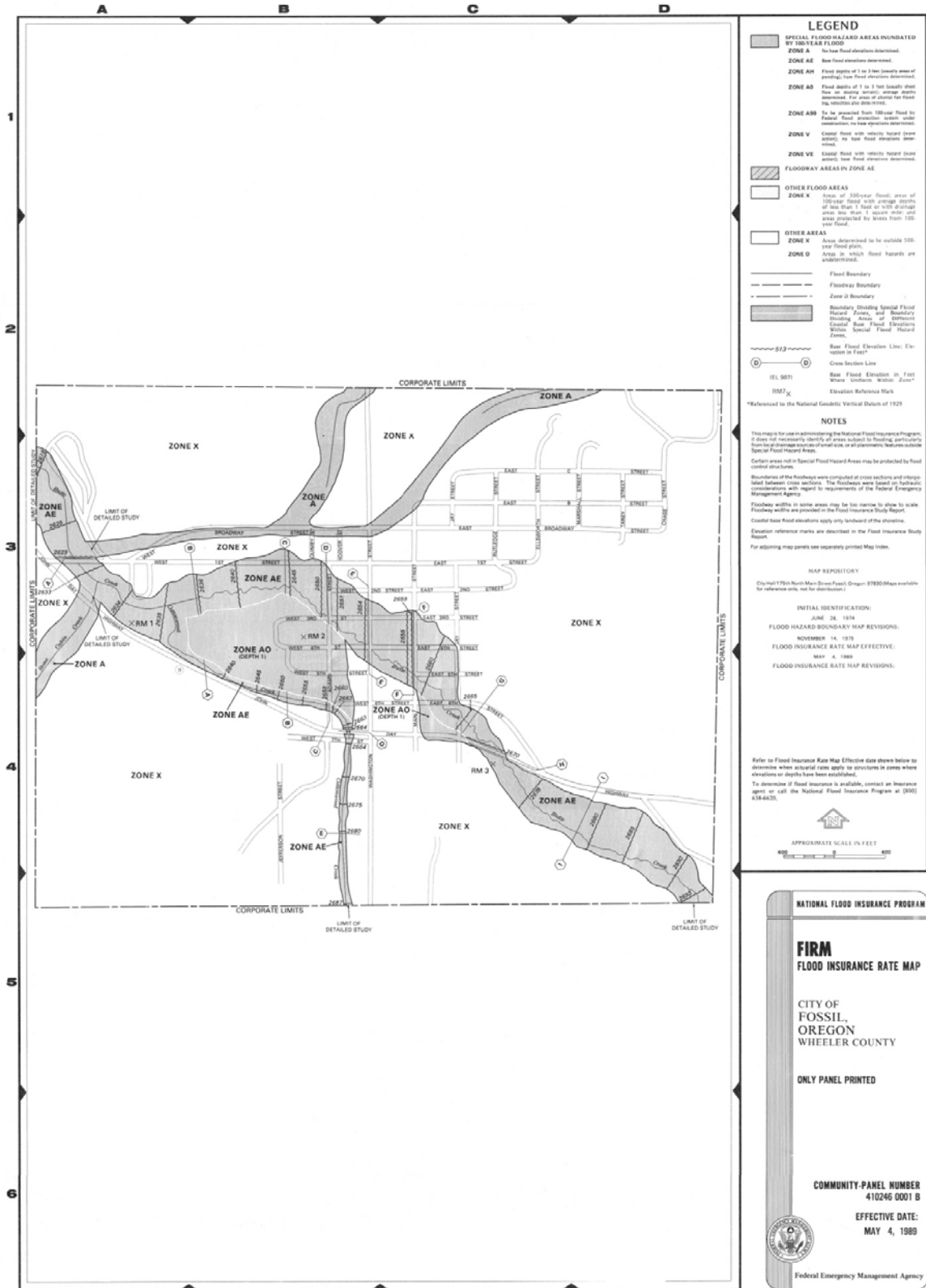
Jurisdiction	#RL Properties	# SRL Properties-Validated	# SRL Properties-Pending
Wheeler County	0	0	0
Fossil	0	0	0
Mitchell	0	0	0
Spray	0	0	0
Totals	0	0	0

Source: State NFIP Coordinator, 2018.

NATIONAL FLOOD INSURANCE POLICY MAPS

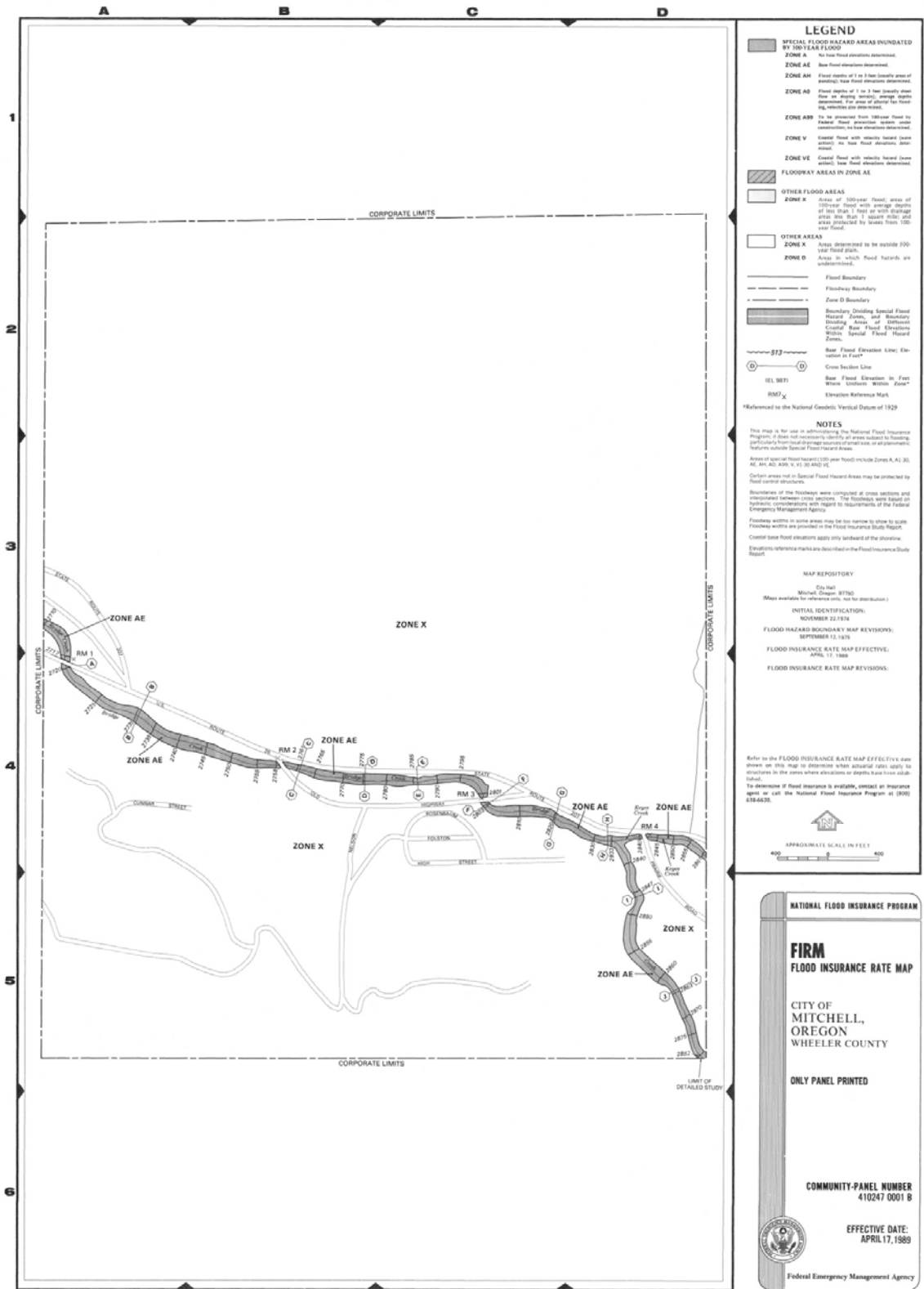
The following maps are National Flood Insurance Policy Maps (FIRMs) from FEMA. Figure 3.4 is the City of Fossil, Figure 3.5 is the City of Mitchell, and Figure 3.6 is the City of Spray. Each map is from 1989 and elevation levels are determined on each map.

Figure 3.9: City of Fossil FIRM



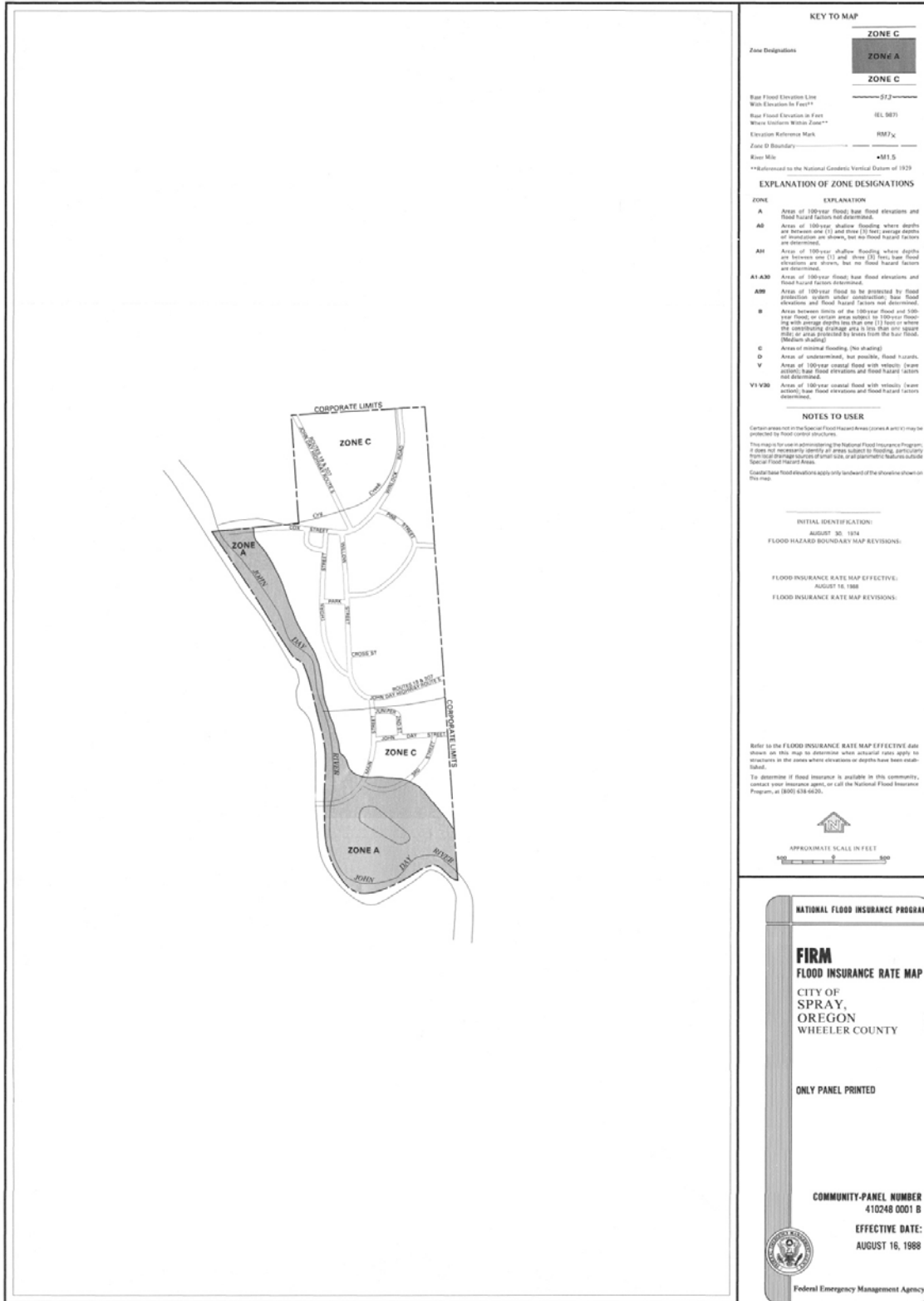
Source: FEMA

Figure 3.10: City of Mitchell FIRM



Source: FEMA

Figure 3.11: City of Spray FIRM



Source: FEMA

Risk Assessment

Table 3.24 presents the entire hazard analysis matrix for Wheeler County. The hazards are listed in rank order from high to low. The table shows that hazard scores are influenced by each of the four categories combined. With considerations for past historical events, the probability or likelihood of a particular hazard event occurring, the vulnerability to the community, and the maximum threat or worst case scenario, wildfire and flood are tied as the two highest ranked hazards in Wheeler County. Winter storm, landslide/debris flow, and severe weather make-up the next three highest ranked hazards, while drought, windstorm, earthquake and volcanic event make-up the four lowest ranked hazards in the matrix.

One would think that hazards with a more prominent history and a higher likelihood of occurring in the future should be ranked high. However, if such hazards do not have a high vulnerability or threat to the community, the score will remain relatively low. As shown in the table, windstorm has a higher history of occurrence in the county than landslide/debris flow. However, the landslide/debris flow has a higher total threat scores since the county is potentially more vulnerable to a worst case scenario landslide/debris flow than is for a windstorm. The hazard scores are influenced by not one or two of the categories, but all four combined.

Table 3.24: Hazard Analysis Matrix – Wheeler County

Hazard	History			Probability			Vulnerability			Maximum Threat			Total Threat Score	Hazard Rank
	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal		
Wildfire (WUI)	10	2	20	10	7	70	10	5	50	10	10	100	240	1
Drought	10	2	20	10	7	70	10	5	50	10	10	100	240	1
Severe Weather	9	2	18	10	7	70	10	5	50	10	10	100	238	2
Winter Storm	8	2	16	10	7	70	10	5	50	10	10	100	236	3
Flood - Riverine	5	2	10	10	7	70	10	5	50	10	10	100	230	4
Volcanic Event	0	2	0	1	7	7	10	5	50	10	10	100	157	5
Earthquake	0	2	0	1	7	7	8	5	40	9	10	90	137	6
Landslide/Debris Flow	5	2	10	5	7	35	5	5	25	5	10	50	120	7
Windstorm	5	2	10	5	7	35	5	5	25	5	10	50	120	7

Source: Wheeler County NHMP Steering Committee, March 2018.

For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area. However, given the lack of variability between the three incorporated cities and the county as a whole in the 2014 plan and the desire to streamline the planning process, the steering committee (which had representatives from each local jurisdiction) decided to complete one risk assessment for the county as a whole.

Chapter 4: Mitigation Strategy

This section outlines Wheeler County’s strategy to reduce or avoid long-term vulnerabilities to the identified hazards. Specifically, this section presents a mission and specific goals and actions thereby addressing the mitigation strategy requirements contained in 44 CFR 201.6(c). The Natural Hazard Mitigation Plan steering committee reviewed and updated the goals and action items documented in this plan. Additional planning process documentation is in Appendix B.

The information provided in the Risk Assessment is to provide the basis and justification for the mitigation actions identified in this plan. This section describes the components that guide implementation of the identified mitigation strategies and is based on strategic planning principles. This section provides information on the process used to develop the mission, goals and action items. It also includes an explanation of how the County intends to incorporate the mitigation strategies outlined in the plan into existing planning mechanisms and programs such as the County comprehensive land use planning process, capital improvement planning process, and building codes enforcement and implementation.

The plans goals are designed to drive actions and they are intended to represent the general end toward which the County effort is directed. Goals identify how the County intends to work toward mitigating risk from natural hazards. The goals are guiding principles for the specific recommendations that are outlined in the action items.

The plans action items are the detailed recommendations for activities that government agencies, businesses and residents could engage in to reduce risk.

Mitigation Plan Goals

The Wheeler County Natural Hazards Mitigation Steering Committee as well as stakeholders established Wheeler County’s mitigation goals and action items. The goals are based on the goals established by the State of Oregon Natural Hazards Mitigation Plan as well as the regional goals shared by Gilliam County, Sherman County, and Wheeler County. However, specific emphasis and language is specific to Wheeler County.

Goal 1: Safety of life and property.

Goal 2: Increased cooperation and collaboration between groups and agencies.

Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education.

Goals 1 and 2 were established by the 2008 Wheeler County NHMP Steering Committee and Stakeholders and were approved by the cities and county government. Goals 1 and 2 are regional goals shared by Gilliam, Sherman and Wheeler counties. Goal 3 was established by the 2012 Wheeler County NHMP Steering Committee and was approved by the cities and county government. These goals were reaffirmed by the 2019 Wheeler County NHMP Steering Committee.

Mitigation Actions

The 2019 Wheeler County Natural Hazard Mitigation Plan (NHMP) contains a number of action items that have been continued from the 2014 plan, as well as a number of new action items. The timing for action item implementation is broken into Routine (activities that are part of “regular County business” and are currently in process), Short Term (1-3 years), Mid Term (4-7 years) and Long Term (7-10 years). Mitigation actions have also been given a high, moderate or low priority status.

2018 was one of the worst wildfire seasons on record in Oregon and Wheeler County. In August, one fire alone - the Jennie’s Peak Fire - consumed 45,956 acres of grass land and timber on public and private land. It was the largest wildfire in Wheeler County history and came just 4 years after the 2nd largest wildfire in county history, the 30, 257 acre Pine Creek Complex. The Wheeler County NHMP Steering Committee has ranked wildfires as the greatest natural hazard risk to the county. Not surprisingly, the bulk of the new mitigation action items in this plan update concern wildfires. A number of these new mitigation items come from the current Wheeler County Cooperative Wildfire Protection Plan (CWPP). Highlighting these in the NHMP brings additional attention to their importance and establishes the ability to fund them through FEMA grants.

Each action item has a corresponding “mitigation action item commentary” that describes the activity, identifies the rationale for the project, potential ideas for implementation, and assigns coordinating and partner organizations. Each mitigation action item commentary can assist the community in preparing potential projects for grant funding. These action item commentaries are located in Appendix A.

Government Structure

Beyond Emergency Management, most departments within the county and city governance structures have some degree of responsibility in building overall community resilience. Each plays a role in ensuring that jurisdiction functions and normal operations resume after an incident, and the needs of the population are met. For further explanation regarding how these departments influence hazard resilience, reference *Chapter 2: Community Profile*.

Existing Plan & Policies

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Linking existing plans and policies to the Natural Hazards Mitigation Plan helps identify what resources already exist that can be used to implement the action items identified in the Plan. Plans and policies already in existence have support from local residents, businesses and policy makers. A list documenting plans and policies already in place in the county and participating cities can be found in *Chapter 2: Community Profile*.

Community Organizations and Programs

In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. The county and cities can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on a number of issues, one of which could be natural hazard preparedness and mitigation. The *Community Profile* provides a comprehensive list of community organizations and programs, and offers a more thorough

explanation of how existing community organizations and programs can be utilized for hazard mitigation.

Rationale or Key Issues Addressed

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from a number of sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in Appendix A.

Ideas for Implementation:

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

IMPLEMENTATION THROUGH EXISTING PROGRAMS

The Wheeler County multi-jurisdictional Natural Hazard Mitigation Plan includes a range of action items that, when implemented, will reduce loss from hazard events in the County. Within the plan, FEMA requires the identification of existing programs that might be used to implement these action

The Benefits of Plan Integration

Where possible, Wheeler County should implement the multi-jurisdictional Natural Hazard Mitigation Plan's recommended actions through existing plans and policies...

...Implementing the Natural Hazard Mitigation Plan's action items through such plans and policies increases their likelihood of being supported and implemented.

items. Wheeler County currently addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, Wheeler County will work to incorporate the recommended mitigation action

items into existing programs and procedures.

Many of the Wheeler County multi-jurisdictional Natural Hazards Mitigation Plan's recommendations are consistent with the goals and objectives of the County's existing plans and policies and, where possible should be implemented through them. Plans and policies already in existence have support from local residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.¹ Implementing the Natural Hazard Mitigation Plan's action items through such plans and policies increases their likelihood of being supported and implemented.

¹ ibid

Coordinating Organization:

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

Internal and External Partners:

The internal and external partner organizations listed in the mitigation action commentaries are potential partners recommended by the project Steering Committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the County or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

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

Plan Goals Addressed:

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

Timeline:

Action items include routine, short, mid, and long-term activities. Each action item includes an estimate of the timeline for implementation.

Routine actions items are activities that are currently in process and will continue to be implemented in the next planning period.

Short-term action items are activities that may be implemented with new or additional resources and/or authorities in the next 1-3 years.

Medium-term action items are activities that may be implemented with new or additional resources and/or authorities in the next 4-7 years.

Long-term action items may require new or additional resources and/or authorities, and may take from 8-10 years to implement.

Table 4.1: 2019 Wheeler County Mitigation Action Items

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
Multi-Hazard													
MH#1	Complete an inventory of public buildings that may be particularly vulnerable to natural hazards in Wheeler County.	Wheeler County Emergency Management	Wheeler County, County NHMP Steering Committee, DOGAMI, OEM, FEMA, Cities of Fossil, Mitchell and Spray	Short Term / High Priority	X	X		X	X	X	X	No Action	Retain
MH#2	Seek funding for the implementation of priority projects that reduce the vulnerability of critical public facilities in Wheeler County.	Wheeler County Emergency Management	Wheeler County, County NHMP Steering Committee, DOGAMI, OEM, FEMA, Cities of Fossil, Mitchell and Spray	Short Term / High Priority	X	X		X	X	X	X	No Action. Timeline has been changed from Long Term to Short Term	Retain
MH#3	Work with utilities operating in Wheeler County to establish ongoing tree-pruning programs around transmission lines and trunk distribution lines.	Columbia Basin Cooperative, Columbia Power Cooperative	Wheeler County, County Emergency Management, Cities of Fossil, Mitchell and Spray	Routine / High Priority	X	X		X	X	X	X	This is a routine task that is done on a regular basis.	Retain
MH#4	Reduce the effects of natural hazards on existing utility lines.	Columbia Basin Cooperative, Columbia Power Cooperative	Wheeler County, Cities of Fossil, Mitchell and Spray	Routine / High Priority	X	X		X	X	X	X	This is a routine task that is done on a regular basis.	Retain
MH#5	Develop and maintain a comprehensive impact database on severe natural hazard events in Wheeler County.	Wheeler County	County Planning Department, GIS, Cities of Fossil, Mitchell and Spray, National Weather Service, National Oceanic and Atmospheric Administration, ODOT, Oregon Climate Service, Overhead Utilities	Routine / Medium Priority	X	X	X	X	X	X	X	No Action	Retain

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
MH#6	Seek funding for generators and satellite telephones for critical facilities.	Wheeler County Emergency Management	Cities of Fossil, Mitchell and Spray	Short Term / Medium Priority	X	X	X	X	X	X	X	No Action	Retain
MH#7	Identify opportunities to reduce existing barriers to interagency cooperation and work together to reduce risk and loss from natural hazards.	Wheeler County Emergency Management	Cities of Fossil, Mitchell and Spray, Surrounding Counties	Routine / Medium Priority	X	X		X	X	X	X	This is a routine task that is done on a regular basis.	Retain
MH#8	Secure funding to improve infrastructure that will increase the capacity and availability of water in order to protect the City of Fossil from the natural hazards (i.e. drought, wildfire, etc.) that occur on an annual basis.	City of Fossil	County Emergency Management, DEQ, Water Master Office District 21, Engineers, Contractors, OEM, Army Corp of Engineers, FEMA	Long Term / Medium Priority	X	X			X			No Action.	Retain
MH#9	Develop a multi-faceted educational program to educate residents about this plan and the natural hazards identified within. This effort may utilize print and electronic media, including but not limited to: newsletters, social media platforms such as Facebook, radio, television, internet blogs, videos, podcasts, and presentations to local civic and business groups.	Wheeler County Emergency Management	Wheeler County, Cities of Fossil, Mitchell and Spray and other stakeholders as appropriate for each hazard (example: ODF and Fire Districts for fire, DOGAMI for landslides, etc.)	Short Term / High Priority	X	X	X	X	X	X	X	New Action for the 2019 Plan Update. Lots of educational resources are available from FEMA, ODF, OEM, etc. Contact OEM for guidance.	
MH#10	Increase by 25% the number of people in Wheeler County signed up for the Everbridge Frontier Regional Emergency Notification System.	Wheeler County Emergency Management	Wheeler County, Cities of Fossil, Mitchell and Spray	Short Term / High Priority	X		X	X	X	X	X	New Action for the 2019 Plan Update	
MH#11	Obtain financial assistance and/or regulatory support for low-income residents and renters who are vulnerable to extreme heat and/or	Wheeler County	Wheeler County Emergency Management, Cities of Fossil, Mitchell and	Short Term / Low	X			X	X	X	X	New Action for the 2019 Plan Update	

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
	diminished air quality to install air conditioning systems.		Spray.										
MH#12	Invest in and promote rainwater collection systems in public, residential, and commercial properties.	Wheeler County Extension Service	County Emergency Management, Cities of Fossil, Mitchell and Spray.	Short Term / Low	X		X	X	X	X	X	New Action for the 2019 Plan Update	
MH#13	Invest in and promote community gardens and local food production.	Wheeler County Extension Service	Cities of Fossil, Mitchell, and Spray	Short Term / Low	X	X	X	X	X	X	X	New Action for the 2019 Plan Update	
MH#14	Consider requiring new development to include onsite rainwater storage and/or emergency drinking water storage tanks. Include water storage solutions in seismic retrofit projects for schools and other public buildings.	Wheeler County Planning Department	County Emergency Management, Cities of Fossil, Mitchell and Spray.	Medium Term / Low	X			X	X	X	X	New Action for the 2019 Plan Update	
MH#15	Invest in and promote solar and other alternative energy in public, residential, and commercial properties.	Wheeler County	County Planning Department, County Emergency Management, Cities of Fossil, Mitchell and Spray, Oregon Department of Energy, Energy Trust of Oregon.	Long Term / Low	X		X	X	X	X	X	New Action for the 2019 Plan Update	
MH#16	Develop hazard-specific evacuation plans that consider likely impacts to bridges, other key transportation infrastructure and lifelines.	Wheeler County Emergency Management	Wheeler County Road Department, ODOT, Oregon Military Department, Office of Emergency Management	Medium Term / Medium	X	X	X	X	X	X	X	New Action for the 2019 Plan Update	

Drought													
DR#1	Make available to county residents and the public information regarding droughts.	Wheeler County Emergency Management	County Court, Public Works, Cities of Fossil, Mitchell, and Spray, Oregon Department of Agriculture, OSU Extension, Cattle Association, Soil and Water Conservation District, Oregon Dept. of Forestry, Watermaster, Oregon Dept. of Fish and Wildlife	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified
DR#2	Promote the planting of native and drought-resistant plants that require less water during drier months.	Wheeler County Extension Service	County Emergency Management, Cities of fossil, Mitchell, and Spray.	Short Term / Low Priority	X		X	X	X	X	X	New Action for the 2019 Plan Update	
DR#3	Provide water conservation education to kids in schools.	Wheeler County Emergency Management	County Schools (Fossil Charter, Mitchell Schools, and Spray Schools), Wheeler Soil and Water Conservation District.	Short Term / Moderate Priority			X	X	X	X	X	New Action for the 2019 Plan Update	
DR#4	Develop a Drought Emergency Plan	Wheeler County Emergency Management	County Planning Department.	Long Term / Low Priority	X	X	X	X				New Action for the 2019 Plan Update	
DR#5	Consider require water conservation during drought conditions.	Wheeler County	County Emergency Management, Cities of Fossil, Mitchell and Spray.	Medium Term / Low Priority	X			X	X	X	X	New Action for the 2019 Plan Update	
Earthquake													
EQ#1	Make available to county residents and the public information regarding earthquakes.	Wheeler County Emergency Management	County Court, Fire Departments, Cities of Fossil, Mitchell and Spray, American Red Cross	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified

EQ#2	Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency (FEMA) to seismically retrofit critical facilities with a high collapse potential rate by the Department of Geology and Mineral Industries (DOGAMI).	Wheeler County Emergency Management	County Court, School Districts, Oregon Military Department, Office of Emergency Management, Federal Emergency Management Agency, Oregon Department of Transportation	Long Term / Moderate	X			X				New Action	
Flood													
FL#1	Make available to county residents and the public information regarding floods and their potential impact on Wheeler County.	Wheeler County Emergency Management	County Court, Fire Departments, Cities of Fossil, Mitchell and Spray, American Red Cross	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified
FL#2	Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances. Update the County Flooding Ordinance by adopting DLCD's model floodplain development code when available.	Wheeler County Planning Department	County Court, County Planning Department, Cities of Fossil, Mitchell, and Spray, OEM, DLCD, FEMA	Short Term / High Priority	X	X		X	X	X	X	Coordinating organization shifted to the Wheeler County Planning Department	Modified
FL#3	Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency (FEMA) to construct, install, and maintain a "Flash Flood Warning System" that has been designed to protect lives and property in the City of Mitchell.	City of Mitchell	County Emergency Management, CenturyTel, OEM, FEMA, US Postal Service	Short Term / High Priority	X	X				X		Not completed. Timeline and priority shifted to Short Term / High Priority	Retain
FL#4	Secure funding to implement proposed solutions from a drainage study to improve the three drainage basins and facilities that are currently inadequate, undersized, and poorly maintained in the City of Spray.	City of Spray	County Emergency Management, Ferguson Surveying and Engineering, OEM, ODOT, FEMA, US Army Corp of Engineers	Short Term / High Priority	X	X					X	Not completed. Timeline and priority shifted to Short Term / High Priority	Retain

FL#5	Coordinate with the State Floodplain Coordinator and the Department of Land Conservation and Development (DLCD) to update the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for Wheeler County and the incorporated cities participating in the Nation Flood Insurance Program (NFIP) and Risk Map.	Wheeler County Planning Department	County Emergency Management, Cities of Fossil, Mitchell and Spray, Oregon Department of Land Conservation and Development, Oregon Military Department, Office of Emergency Management, Federal Emergency Management Agency.	Routine / High Priority	X			X				Wheeler County, the City of Fossil, and the City of Mitchell participate in the Nation Flood Insurance Program (NFIP). Flood Insurance Rate Maps (FIRMs) for Wheeler County are current as of July 17, 1989; FIRMs for the City of Fossil are current as of May 4, 1989; FIRMs for the City of Mitchell are current of April 17, 1989; and FIRMS for the City of Spray are current as of August 16, 1989.	Retain
Landslide/Debris Flow													
LS#1	Make available to county residents and the public information regarding landslides/debris flows.	Wheeler County Emergency Management	County Court, County Public Works, County Road Dept., Cities of Fossil, Mitchell, and Spray, ODOT, School Districts, Medical Clinic, DOGAMI, American Red Cross	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified

LS#2	Develop education and public outreach to engage adjacent landowners to improve slope management practices.	Wheeler County Emergency Management	County Court, County Public Works, County Road Dept., Cities of Fossil, Mitchell, and Spray, ODOT, School Districts, Medical Clinic, DOGAMI, American Red Cross	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified
LS#3	Explore low-cost mitigation options, such as maintenance of slide fences, ditches and other drainage facilities.	Wheeler County Emergency Management	County Public Works, County Road Dept., Cities of Fossil, Mitchell, and Spray, ODOT	Medium Term / Moderate Priority	X	X		X	X	X	X	New Action	
Volcanic Event													
VE#1	Make available to county residents and the public information regarding volcanic events.	Wheeler County Emergency Management	County Court, Public Health, Cities of Fossil, Mitchell, and Spray, Medical Clinic, Media, School Districts, OEM, DEQ, American Red Cross, USGS, DOGAMI	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified
VE#2	Evaluate the county's Emergency Operations Plan with regard to preparing for a volcanic event	Wheeler County Emergency Management	County Court, County Planning Department, Cities of Fossil, Mitchell, and Spray, OEM, USGS, DOGAMI	Long Term / Low Priority	X			X				New Action. If an eruption occurred, ash fallout from Cascade volcanoes could potentially affect the entire county. However, there is virtually no risk from lahars, debris, or pyroclastic flows in Wheeler County.	

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
Wildfire²													
WF#1	Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to reduce wildland fire risk in Wheeler County.	Wheeler County, County Wildfire Protection Plan (CWPP) Local Coordinating Group	County Court, County Road Dept., Wheeler County Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Community and County leaders, Cities of Fossil, Mitchell, and Spray and Citizens	Routine		X	X	X	X	X	X	While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy	Retained
WF#2	Conduct risk assessment activities with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to assess areas in the county at risk to wildland fires.	County Wildfire Protection Plan (CWPP) Local Coordinating Group	Wheeler County, County Court, Wheeler County Fire Defense Board, Sheriff, ODF, USFS Umatilla and Ochoco, NPS, Community and County leaders, Cities of Fossil, Mitchell and Spray	Routine		X	X	X	X	X	X	While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy	Retained
WF#3	Coordinate information and outreach activities with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to promote fire prevention and risk reduction.	County Wildfire Protection Plan (CWPP) Local Coordinating Group	Wheeler County, County Court, Wheeler County Fire Defense Board, Sheriff, ODF, USFS Umatilla and Ochoco, NPS, Community and County leaders, Cities of Fossil, Mitchell and Spray	Routine		X	X	X	X	X	X	While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy	Retained

² The wildfire mitigation actions in this plan are consistent with the goals, objectives and action items described in the current Wheeler County Wildfire Protection Plan.

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
WF#4	Work with the Community Wildfire Protection Plan (CWPP) Local Coordinating Group to implement fuel reduction strategies to reduce the risk to wildland fires.	County Wildfire Protection Plan (CWPP) Local Coordinating Group	Wheeler County, County Court, Wheeler County Fire Defense Board, Sheriff, ODF, USFS Umatilla and Ochoco, NPS, Community and County leaders, Cities of Fossil, Mitchell and Spray	Routine		X	X	X	X	X	X	While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy	Retained
WF#5	Make available to county residents and the public information regarding wildfires.	Wheeler County Emergency Management	Sheriff, Cities of Fossil, Mitchell and Spray, Fire Districts, County Public Works, ODF, American Red Cross, Humane Society, Utilities, BLM, USFS, State Fire Marshall, ODF&W, FEMA	Short Term / High Priority		X	X	X	X	X	X	Blend this action in with MH #9	Modified
WF#6	Provide Wheeler County Road Department with fire-fighting training and equipment.	Wheeler County Road Dept.	Wheeler County, CWPP Local Coordinating Group, ODF, Fire Districts, State Fire Marshall, BLM, USFS	Short term / High Priority		X	X	X	X	X	X	No Action	Retained
WF#7	Work with ODF, USFS, BLM, and local fire districts to develop a "lessons learned" assessment of the 2018 wildfire season.	CWPP Local Coordinating Group	County Emergency Management, Wheeler County, County Court, Wheeler County Fire Defense Board, Sheriff, ODF, USFS Umatilla and Ochoco, NPS, Community and County leaders, Cities of Fossil, Mitchell and Spray	Routine	X	X	X	X				New Action. 2018 was the largest wildfire season on record in Wheeler County. Assess if existing wildfire protection practices worked. What did and what didn't?	

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
												What types of pre-disaster efforts would have made a difference?	
WF#8	Develop seasonal paid county firefighter positions which would provide wildfire Initial Attack in the summer months within the county.	Wheeler County Emergency Management	Wheeler County Commission, the Cities of Fossil, Mitchell and Spray, CWPP Local Coordinating Group	Medium Term / Moderate Priority	X	X		X				New Action. Perhaps collaborate with adjacent counties on this to create economies of scale.	
WF#9	Assist Rural Fire Protection Districts and City Fire Departments in upgrading their firefighting equipment, facilities and training as needed.	Wheeler County Emergency Management	Rural Fire Districts, City Fire Departments, CWPP Local Coordinating Group ODF, BLM, USFS	Medium Term / Moderate Priority	X	X		X				New Action	
WF#10	Distribute fire prevention literature and material to home owners and visitors.	Wheeler County Emergency Management	Rural Fire Districts, City Fire Departments, CWPP Local Coordinating Group ODF, BLM, USFS	Short Term / High Priority	X		X	X	X	X		New Action. ODF has some of these materials and others are available from other sources.	

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
WF#11	Conduct fire prevention programs in schools.	Wheeler County Emergency Management	County Schools, Gilliam County, Mid-Columbia Fire Prevention Co-op	Medium Term / High Priority	X	X	X	X	X	X	X	New Action	
WF#12	Provide information about what type of fire resistive plants to use for landscaping.	Wheeler County Emergency Management	OSU Extension Service	Short Term / Medium Priority	X			X				New Action. Dovetails with Drought (DR) Mitigation Action #1	
Windstorm													
WDS#1	Make available to county residents and the public information regarding windstorms.	Wheeler County Emergency Management	County Court, Cities of Fossil, Mitchell and Spray, Utilities, Media, ODOT, and American Red Cross	Ongoing		X	X	X	X	X	X	No Action	Retained
Winter Storm													
WTS#1	Educate farmers about ways to protect livestock from the effects of winter storms.	Wheeler County	OSU Extension, Oregon Dept. of Agriculture	Ongoing	X		X	X	X	X	X	No Action	Retained
WTS#2	Make available to county residents and the public information regarding winter storms.	Wheeler County Emergency Management	County Court, County Road Dept., ODOT, American Red Cross, FEMA, National Weather Service, Cities of Fossil, Mitchell, and	Ongoing		X	X	X	X	X	X	No Action	Retained

2019 Action Item	2019 Action Item Title	Coordinating Organization	Partner Organizations (Internal and External)	Timeline / Priority	Alignment with Goals			Applicable Jurisdiction				Status & Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
			Spray and Citizens										
WTS#3	Identify county resident and families with home weatherization needs (LMI) and seek funding assistance for repairs.	Wheeler County Planning Department	Wheeler County Emergency Management, Cities.	Short Term	X			X				New Action	

Chapter 5:

Plan Implementation and Maintenance

This section details the formal process that will ensure that the Wheeler County multi-jurisdictional Natural Hazards Mitigation Plan remains an active and relevant document. The plan implementation and maintenance process includes a schedule for monitoring and evaluating the Plan annually, as well as producing an updated plan every five years. Finally, this section describes how the County and participating jurisdictions will integrate public participation throughout the plan maintenance and implementation process.

Implementing the Plan

After the Plan is locally reviewed and deemed complete, the Wheeler County Emergency Management Coordinator submits it to the State Hazard Mitigation Officer at Oregon Emergency Management. Oregon Emergency Management submits the plan to the Federal Emergency Management Agency (FEMA--Region X) for review. This review addresses the federal criteria outlined in the FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA, the County will adopt the plan via resolution. At that point the County will gain eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds. Following County adoption, the participating jurisdictions should adopt the plan via resolution.

Convener

The Emergency Management Department will be responsible for overseeing the implementation and maintenance of the plan. There will be joint conveners from the Emergency Management and partners as listed in the Mitigation Action Commentaries and other sections of the plan, depending on what action may be implemented. The emergency management personnel will work closely with the emergency management personnel from the other two counties in the region, Gilliam County and Sherman County. The individual mayors shall be the convener for the cities of Fossil, Mitchell and Spray. All three county Natural Hazards Mitigation Plans provide the following:

- Steering Committee meeting dates, times, locations, agendas, and member notification;
- Documented outcomes of Committee meetings;
- They serve as a communication conduit between the Steering Committee and key plan stakeholders;
- They identify emergency management-related funding sources for natural hazard mitigation projects; and

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

Coordinating Body

The Steering Committee will serve as the Coordinating Body for the mitigation plan and will be responsible for the following tasks:

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

MEMBERS

The following organizations were represented and served on the Steering Committee during the development of the Wheeler County multi-jurisdictional Natural Hazards Mitigation Plan:

- City of Fossil
- City of Mitchell
- City of Spray
- Wheeler County Emergency Management Department
- Wheeler County Fire & Rescue
- Wheeler County Planning Department
- Wheeler County Judge
- Wheeler County Commission
- Wheeler County Sheriff's Office

To make the coordination and review of Wheeler County multi-jurisdictional Natural Hazard Mitigation Plan as broad and useful as possible, the coordinating body will engage additional stakeholders and other relevant hazard mitigation organizations and agencies to implement the identified action items. Specific organizations have been identified as either internal or external partners on the individual mitigation actions found in Chapter 4 and Appendix A.

Plan Maintenance

Plan maintenance is a critical component of the natural hazard mitigation plan. Proper maintenance of the plan ensures that this plan will maximize the County's and city/special district's efforts to reduce the risks posed by natural hazards. The Steering Committee and local staff are responsible for implementing this process, in addition to maintaining and updating the plan through a series of meetings outlined in the maintenance schedule below.

Semi-Annual Meetings

The Committee will meet twice a year to complete the following tasks. During the first meeting, the Committee will:

- Review existing action items to determine appropriateness for funding;
- Educate and train new members on the plan and mitigation in general;
- Identify issues that may not have been identified when the plan was developed; and
- Prioritize potential mitigation projects using the methodology described below.

During the second meeting of the year, the Committee will:

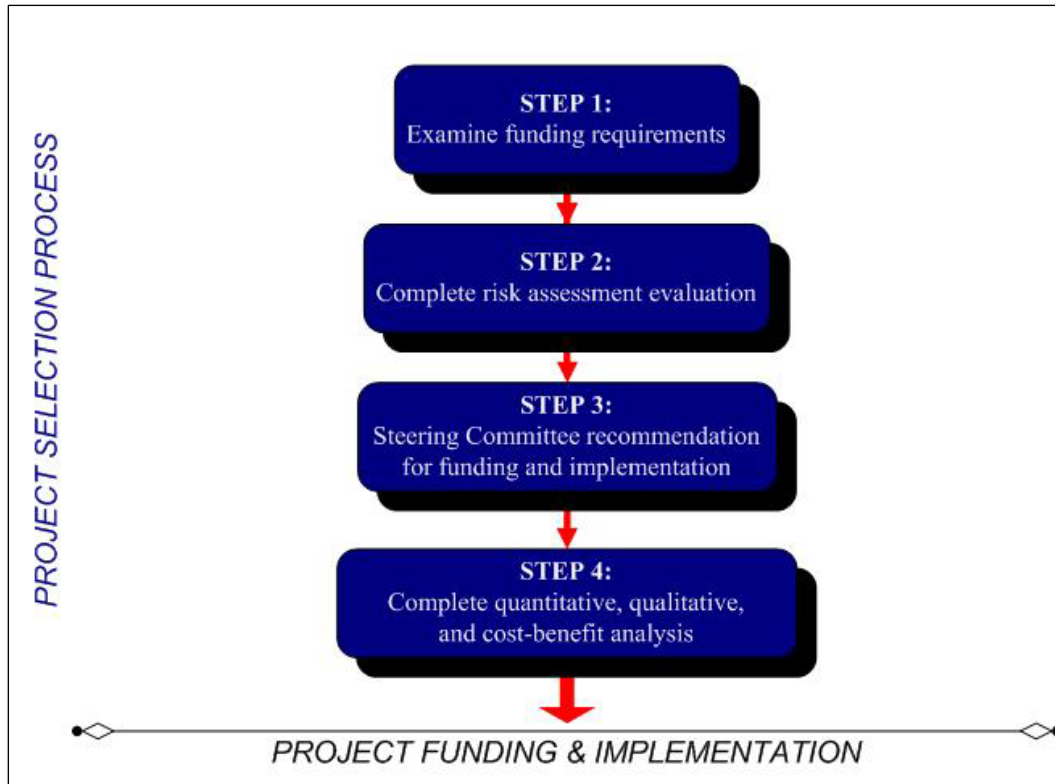
- Review existing and new risk assessment data;
- Discuss methods for continued public involvement; and
- Document successes and lessons learned during the year.

The Wheeler County Emergency Manager (convener) will be responsible for documenting the outcome of these semi-annual meetings. The process the Steering Committee (Coordinating Body) will use to prioritize mitigation projects is detailed in the section below. The plan's format allows the county and participating jurisdictions to review and update sections when new data becomes available. New data can be easily incorporated, resulting in a natural hazards mitigation plan that remains current and relevant to the participating jurisdictions.

PROJECT PRIORITIZATION PROCESS

The Disaster Mitigation Act of 2000 requires that jurisdictions identify a process for prioritizing potential actions. Potential mitigation activities often come from a variety of sources; therefore the project prioritization process needs to be flexible. Projects may be identified by committee members, local government staff, other planning documents, or the risk assessment. Figure 5.1 illustrates the project development and prioritization process. When the actions are reviewed and considered for implementation, the following process will be used.

Figure 5.1: Action Item and Project Prioritization Process



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

Step 1: Examine funding requirements

The first step in prioritizing the plan’s action items is to determine which funding sources are open for application. Several funding sources may be appropriate for the county’s proposed mitigation projects. Examples of mitigation funding sources include but are not limited to: FEMA’s Pre-Disaster Mitigation competitive grant program (PDM), Flood Mitigation Assistance (FMA) program, Hazard Mitigation Grant Program (HMGP), National Fire Plan (NFP), Community Development Block Grants (CDBG), local general funds, and private foundations, among others. Please see Appendix E: *Grant Programs* for a more comprehensive list of potential grant programs.

Because grant programs open and close on differing schedules, the coordinating body will examine upcoming funding streams’ requirements to determine which mitigation activities would be eligible. The coordinating body may consult with the funding entity, Oregon Emergency Management, or other appropriate state or regional organizations about project eligibility requirements. This examination of funding sources and requirements will happen during the coordinating body’s semi-annual plan maintenance meetings.

Step 2: Complete risk assessment evaluation

The second step in prioritizing the plan’s action items is to examine which hazards the selected actions are associated with and where these hazards rank in terms of community risk. The coordinating body will determine whether or not the plan’s risk assessment supports the implementation of eligible mitigation activities. This determination will be

based on the location of the potential activities, their proximity to known hazard areas, and whether community assets are at risk. The coordinating body will additionally consider whether the selected actions mitigate hazards that are likely to occur in the future, or are likely to result in severe / catastrophic damages.

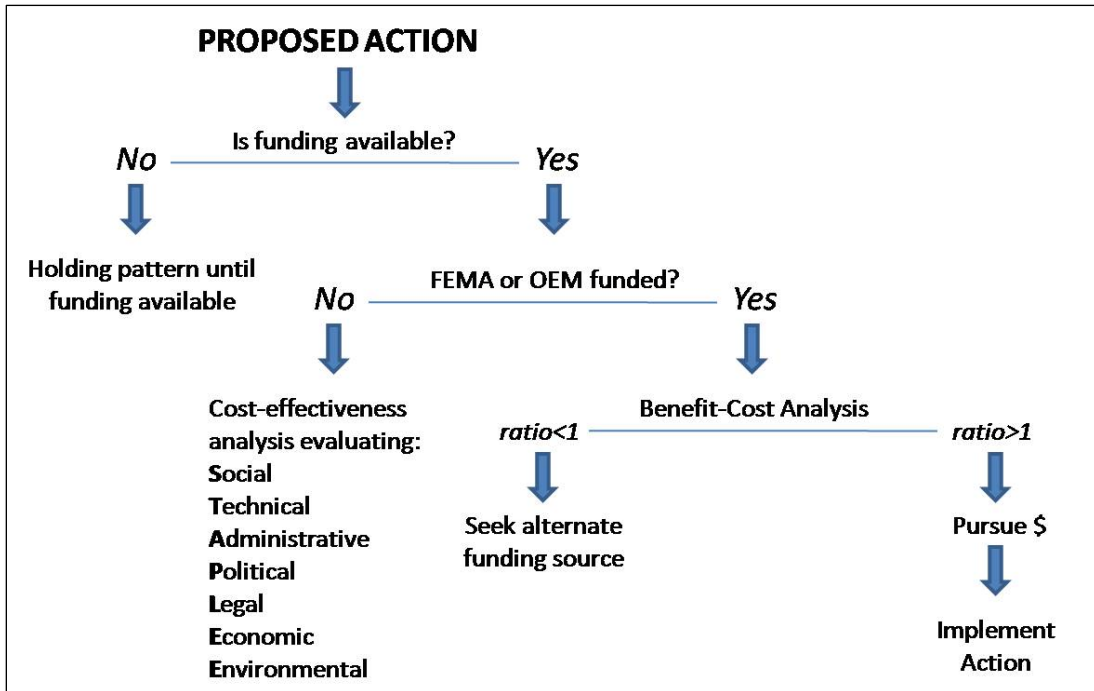
Step 3: Committee recommendation

Based on the steps above, the coordinating body will recommend which mitigation activities should be moved forward. If the coordinating body decides to move forward with an action, the coordinating organization designated in the action item commentaries (Appendix A) will be responsible for taking further action and, if applicable, documenting success upon project completion. The coordinating body will convene a meeting to review the issues surrounding grant applications and to share knowledge and/or resources. This process will afford greater coordination and less competition for limited funds.

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

The fourth step is to identify the costs and benefits associated with the selected natural hazard mitigation strategies, measures or projects. Two categories of analysis that are used in this step are: (1) benefit/cost analysis, and (2) cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity assists in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards provides decision makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Figure 5.2 shows decision criteria for selecting the appropriate method of analysis.

Figure 5.2: Benefit Cost Decision Criteria



Source: Community Service Center’s Partnership for Disaster Resilience at the University of Oregon, 2010.

If the activity requires federal funding for a structural project, the Committee will use a Federal Emergency Management Agency-approved cost-benefit analysis tool to evaluate the appropriateness of the activity. A project must have a benefit/cost ratio of greater than one in order to be eligible for FEMA grant funding.

For non-federally funded or nonstructural projects, a qualitative assessment will be completed to determine the project’s cost effectiveness. The committee will use a multivariable assessment technique called STAPLE/E to prioritize these actions. STAPLE/E stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Assessing projects based upon these seven variables can help define a project’s qualitative cost effectiveness. The STAPLE/E technique has been tailored for use in natural hazard action item prioritization by the Partnership for Disaster Resilience at the University of Oregon’s Community Service Center. See Appendix D: *Economic Analysis* for a description of the STAPLE/E evaluation methodology.

Continued Public Involvement & Participation

The participating jurisdictions are dedicated to involving the public directly in the continual reshaping and updating of the Wheeler County multi-jurisdictional Natural Hazard Mitigation Plan. Although members of the Steering Committee represent the public to some extent, the public will also have the opportunity to continue to provide feedback about the Plan.

Public participation was incorporated into every stage of the plan update process. All meetings were open to the public. There were small numbers from the public in

attendance, but their input was appreciated and valued. Other forms of public involvement during the update process included:

- Having a booth at the county’s signature public event, the annual Wheeler County Fair and Rodeo. Community members learned about the plan from staff and asked questions.
- Posting chapters of the draft plan on the Wheeler County Emergency Services Department Website for comment.
- Posting notices in the County newspaper, the Wheeler County News, inviting the public to comment on draft chapters and participate in the planning process.
- Posting a link to the hazards opinion survey in multiple locations, including: the Wheeler County website, the Wheeler County Facebook page, the City of Mitchell’s Facebook page, the City of Fossil’s Facebook page and on the online version of the Wheeler County News.

New stakeholders and the public will be encouraged to attend the quarterly update meetings of the plan and to volunteer on subcommittees for fund raising, hazard project work, identification of new stakeholders, and revisions and re-assessment of identified hazards and action plans.

In addition to the involvement activities listed above, the final, adopted version of the county’s multi-jurisdictional Natural Hazard Mitigation Plan will be available on the Wheeler County Emergency Management website. A hardcopy copy of the plan will also be made available for the public at Fossil City Hall, Mitchell City Hall, and Spray City Hall.

Five-Year Review of Plan

This plan will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. The Wheeler County Natural Hazards Mitigation Plan will be due to for an update in 2024. The convener will be responsible for organizing the coordinating body to address plan update needs. The coordinating body will be responsible for updating any deficiencies found in the plan, and for ultimately meeting the Disaster Mitigation Act of 2000’s plan update requirements.

The following ‘toolkit’ can assist the convener in determining which plan update activities can be discussed during regularly-scheduled plan maintenance meetings, and which activities require additional meeting time and/or the formation of sub-committees.

Table 5.1: Natural Hazards Mitigation Plan Update Toolkit

Question	Yes	No	Plan Update Action
Is the planning process description still relevant?			Modify this section to include a description of the plan update process. Document how the planning team reviewed and analyzed each section of the plan, and whether each section was revised as part of the update process. (This toolkit will help you do that).
Do you have a public involvement strategy for the plan update process?			Decide how the public will be involved in the plan update process. Allow the public an opportunity to comment on the plan process and prior to plan approval.
Have public involvement activities taken place since the plan was adopted?			Document activities in the "planning process" section of the plan update
Are there new hazards that should be addressed?			Add new hazards to the risk assessment section
Have there been hazard events in the community since the plan was adopted?			Document hazard history in the risk assessment section
Have new studies or previous events identified changes in any hazard's location or extent?			Document changes in location and extent in the risk assessment section
Has vulnerability to any hazard changed?			Document changes in vulnerability in the risk assessment section
Have development patterns changed? Is there more development in hazard prone areas?			Document changes in vulnerability in the risk assessment section
Do future annexations include hazard prone areas?			Document changes in vulnerability in the risk assessment section
Are there new high risk populations?			Document changes in vulnerability in the risk assessment section
Are there completed mitigation actions that have decreased overall vulnerability?			Document changes in vulnerability in the risk assessment section
Did the plan document and/or address National Flood Insurance Program repetitive flood loss properties?			Document any changes to flood loss property status
Did the plan identify the number and type of existing and future buildings, infrastructure, and critical facilities in hazards areas?			1) Update existing data in risk assessment section, or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Did the plan identify data limitations?			If yes, the plan update must address them: either state how deficiencies were overcome or why they couldn't be addressed
Did the plan identify potential dollar losses for vulnerable structures?			1) Update existing data in risk assessment section, or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Are the plan goals still relevant?			Document any updates in the plan goal section
What is the status of each mitigation action?			Document whether each action is completed or pending. For those that remain pending explain why. For completed actions, provide a 'success' story.
Are there new actions that should be added?			Add new actions to the plan. Make sure that the mitigation plan includes actions that reduce the effects of hazards on both new and existing buildings.
Is there an action dealing with continued compliance with the National Flood Insurance Program?			If not, add this action to meet minimum NFIP planning requirements
Are changes to the action item prioritization, implementation, and/or administration processes needed?			Document these changes in the plan implementation and maintenance section
Do you need to make any changes to the plan maintenance schedule?			Document these changes in the plan implementation and maintenance section
Is mitigation being implemented through existing planning mechanisms (such as comprehensive plans, or capital improvement plans)?			If the community has not made progress on process of implementing mitigation into existing mechanisms, further refine the process and document in the plan.

Source: Oregon Partnership for Disaster Resilience (2010).

Appendix A: Mitigation Action Item Commentaries

Multi-Hazard

- 1) Complete an inventory of public buildings that may be particularly vulnerable to natural hazards in Wheeler County.

Status & Explanation: *No action.*

Retain, Delete and/or Modify: *Retain.*

Timeline: *Short Term.*

Priority: *High.*

- 2) Seek funding for the implementation of priority projects that reduce the vulnerability of critical public facilities in Wheeler County.

Status & Explanation: *No action. Timeline has been changed from Long Term to Short Term.*

Retain, Delete and/or Modify: *Retain.*

Timeline: *Short Term*

Priority: *High*

- 3) Work with utilities operating in Wheeler County to establish tree-pruning programs around transmission lines and trunk distribution lines.

Status & Explanation: *This is a routine task that is done on a regular basis.*

Retain, Delete and/or Modify: *Retain.*

Timeline: *Routine*

Priority: *High*

- 4) Reduce the effects of natural hazards on existing utility lines.

Status & Explanation: *This is a routine task that is done on a regular basis.*

Retain, Delete and/or Modify: *Retain.*

Timeline: *Routine*

Priority: *High*

- 5) Develop and maintain a comprehensive impact database on severe natural hazard events in Wheeler County.

Status & Explanation: *No action.*

Retain, Delete and/or Modify: *Retain.*

Timeline: *Routine*

Priority: *Medium*

- 6) Seek funding for generators and satellite telephones for critical facilities.

Status & Explanation: *No action.*

Retain, Delete and/or Modify: *Retain.*

Timeline: *Short Term*

Priority: *Medium*

- 7) Identify opportunities to reduce existing barriers to interagency cooperation and work together to reduce risk and loss from natural hazards.

Status & Explanation: *This is a routine task that is done on a regular basis.*

Retain, Delete and/or Modify: *Retain.*

Timeline: *Routine*

Priority: *Medium*

- 8) Secure funding to improve the infrastructure that will increase the capacity and availability of water in order to protect the City of Fossil from the natural hazards (i.e. drought, wildfire, etc.) that occur on an annual basis.

Status & Explanation: *Fossil has not developed new wells since the 2014 NHMP Update.*

Retain, Delete and/or Modify: *Retain*

Timeline: *Long Term*

Priority: *High*

- 9) Develop a multi-faceted educational program to educate residents about this plan and the natural hazards identified within. This effort may utilize print and electronic media, including but not limited to: newsletters, social media platforms such as Facebook, radio, television, internet blogs, videos, podcasts, and presentations to local civic and business groups.

Status & Explanation: *New Action for the 2019 Plan Update. Lots of educational resources are available from FEMA, ODF, OEM, etc. Contact OEM for guidance.*

Retain, Delete and/or Modify:

Timeline: *Short Term*

Priority: *High*

- 10) Increase by 25% the number of people in Wheeler County signed up for the Everbridge Frontier Regional Emergency Notification System.

Status & Explanation: *New Action for the 2019 Plan Update.*

Retain, Delete and/or Modify:

Timeline: *Short Term*

Priority: *High*

- 11) Obtain financial assistance and/or regulatory support for low-income residents and renters who are vulnerable to extreme heat and/or diminished air quality to install air conditioning systems.

Status & Explanation: *New Action for the 2019 Plan Update.*

Retain, Delete and/or Modify:

Timeline: *Short Term*

Priority: *Low*

- 12) Invest in and promote rainwater collection systems in public, residential, and commercial properties.

Status & Explanation: *New Action for the 2019 Plan Update.*

Retain, Delete and/or Modify:

Timeline: *Short Term*

Priority: Low

- 13) Invest in and promote community gardens and local food production.

Status & Explanation: New Action for the 2019 Plan Update.

Retain, Delete and/or Modify:

Timeline: Short Term

Priority: Low

- 14) Consider requiring new development to include onsite rainwater storage and/or emergency drinking water storage tanks. Include water storage solutions in seismic retrofit projects for schools and other public buildings.

Status & Explanation: New Action for the 2019 Plan Update.

Retain, Delete and/or Modify:

Timeline: Medium Term

Priority: Low

- 15) Invest in and promote solar and other alternative energy in public, residential, and commercial properties.

Status & Explanation: New Action for the 2019 Plan Update.

Retain, Delete and/or Modify:

Timeline: Long Term

Priority: Low

- 16) Develop hazard-specific evacuation plans that consider likely impacts to bridges, other key transportation infrastructure and lifelines.

Status & Explanation: New Action for the 2019 Plan Update.

Retain, Delete and/or Modify:

Timeline: Medium Term

Priority: Medium

Multi-Hazard #1

Action Item:		Alignment with Plan Goals:	
Complete an inventory of public buildings that may be particularly vulnerable to natural hazards in Wheeler County.		Goal 1: Safety of life and property. Goal 2: Increased cooperation and collaboration between groups and agencies	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Wheeler County is vulnerable to a number of natural hazards that can affect public facilities. Each natural hazard can pose significant risks to public facilities. An inventory of public facilities that are vulnerable to natural hazards will aide in identifying the level of vulnerability and mitigate the risk to them. ▪ The Disaster Mitigation Act of 2000 requires communities to identify vulnerability to natural hazards, and recommends identifying the types and numbers of buildings and infrastructure that could be affected by hazards [201.6(c)(2)(ii)(A)]. This inventory of public facilities that are vulnerable to natural hazards will allow the County to meet this requirement. ▪ The three incorporated cities in Wheeler County –Fossil, Mitchell, and Spray- have limited resources and rely on the county for certain services and public facilities. Because the cities rely so heavily upon the County to provide services, this action is considered to be a multi-jurisdictional action because it benefits both the County and all the participating cities. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ A review of the analysis of critical infrastructure in Chapter 3: Risk Assessment will serve as a good starting point for this mitigation action. ▪ The cities should coordinate with the county to identify critical facilities in their communities and seek funding for mitigation projects that will reduce risk in each community. ▪ Utilize findings in DOGAMI's <i>Statewide Seismic Needs Assessment Using Rapid Visual Screening (RVS) Reports</i>. They are located at this link: http://www.oregongeology.com/sub/projects/rvs/default.htm ▪ Consult with the State of Oregon National Flood Insurance Coordinator to better understand the vulnerability of the critical public facilities in Wheeler County to flooding. ▪ Utilize the Statewide Landslide Information Database for Oregon (SLIDO) to get information on landslide risk for specific properties. https://gis.dogami.oregon.gov/maps/slido/ ▪ The Oregon Wildfire Risk Explorer is an excellent database of information that can offer insights on the risk of wildfires in Wheeler County and across the state. https://gis.dogami.oregon.gov/maps/slido/ ▪ Prioritize facilities based on vulnerability. 			
Coordinating Organization:			
Wheeler County Emergency Management			
Internal Partners: 2019 Wheeler County, County NHMP Steering Committee, Cities of Fossil, Mitchell and Spray		External Partners: DOGAMI, OEM, FEMA	
Potential Funding Sources: FEMA Pre Disaster Mitigation Grant Program		Priority: High	Timeline: Short Term (1-3 years)

Multi-Hazard #2

Action Item:		Alignment with Plan Goals:	
Seek funding for the implementation of priority projects that reduce the vulnerability of critical public facilities in Wheeler County.		Goal 1: Safety of life and property. Goal 2: Increased cooperation and collaboration between groups and agencies	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Wheeler County is vulnerable to a number of natural hazards that can affect public facilities. Each natural hazard can pose significant risks. Seeking funding for those priority projects identified in this plan and through the plan maintenance process will aide in reducing the risk to them. ▪ The three incorporated cities in Wheeler County –Fossil, Mitchell, and Spray- have limited resources and rely on the county for certain services and public facilities. Because the cities rely so heavily upon the County to provide services, this action is considered to be a multi-jurisdictional action because it benefits both the County and all the participating cities. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Completion of Multi-Hazard Mitigation Action #1 should precede this action. ▪ Review the FEMA document <i>Hazard Mitigation Assistance Guidance: Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, and Flood Mitigation Assistance Program. February 27, 2015</i>. This document provides information on how to apply for FEMA mitigation grants ▪ Consult with the Oregon Department of Emergency Management on applying for FEMA grant funds. 			
Coordinating Organization:			
Wheeler County Emergency Management			
Internal Partners: 2019 Wheeler County, County NHMP Steering Committee, Cities of Fossil, Mitchell and Spray		External Partners: DOGAMI; OEM; FEMA	
Potential Funding Sources: FEMA Pre Disaster Mitigation Grant Program		Priority: High	Timeline: Short Term

Multi-Hazard #3

Action Item:		Alignment with Plan Goals:	
Work with utilities operating in Wheeler County to establish ongoing tree-pruning programs around transmission lines and trunk distribution lines.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ In certain natural hazards, such as severe weather, windstorms, and winter storms, electric utilities can be severely affected. ▪ Falling trees and limbs have the potential to damage buildings and infrastructure, block roadways, and down overhead power lines, causing electric power failures. Tree pruning will help reduce this risk. ▪ To effectively coordinate tree-pruning efforts, community members and utilities should establish agreed upon tree-pruning programs that will help reduce the risk that trees will damage buildings and utilities. ▪ The three incorporated cities in Wheeler County –Fossil, Mitchell, and Spray- have limited resources and rely on the county for certain services and public facilities. Because the cities rely so heavily upon the County to provide services, this action is considered to be a multi-jurisdictional action because it benefits both the County and all the participating cities. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ The incorporated cities, County and the utilities should coordinate activities and leverage existing resources ▪ Identify tree-pruning programs other communities have successfully implemented. ▪ Meet with utilities to discuss tree pruning programs and implementation measures. ▪ Conduct public outreach on this effort through appropriate channels such as utility bill inserts or other methods. 			
Coordinating Organization:			
Columbia Basin Cooperative; Columbia Power Cooperative			
Internal Partners: Wheeler County; Wheeler County Emergency Management; Cities of Fossil, Mitchell, and Spray		External Partners:	
Potential Funding Sources: This is a routine program that should be included in existing agency and utility cooperative budgets.		Priority: High	Timeline: Routine (an action that is done on a regular basis)

Multi-Hazard #4

Action Item: MH#4		Alignment with Plan Goals:	
Reduce the effects of natural hazards on existing utility lines.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Wheeler County is highly vulnerable to a number of natural hazards including severe weather and winter storms. ▪ During winter storms, ice can weight down power lines so that those lines droop to the ground in places where power poles are spaced too far apart. ▪ The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on existing buildings and infrastructure [201.6(c)(3)(ii)]. Supporting and encouraging utility providers to use hazard resistant construction methods for new utility construction reduce damage to utilities and buildings. ▪ The three incorporated cities in Wheeler County – Fossil, Mitchell and Spray - have limited resources and rely on the county for certain services and public facilities. Because the cities rely so heavily upon the County to provide services, this action is considered to be a multi-jurisdictional action because it benefits both the County and all the participating cities. The cities and the County services as well as local businesses all rely on the supply of power to the communities. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ See Multi-Hazard #3 ▪ Seek funding to intersperse new power poles between existing poles where extra-long spans have created service provision issues in the past. ▪ Develop an asset management system with up to date pole inventories and that tracks open and completed work flows will assist in getting systems back online and in communicating with work crews and customers when an event occurs. 			
Coordinating Organization:			
Columbia Basin Cooperative; Columbia Power Cooperative			
Internal Partners: Wheeler County; Wheeler County Emergency Management; Cities of Fossil, Mitchell, and Spray		External Partners:	
Potential Funding Sources: Seek FEMA Pre-Disaster Mitigation (PDM) grant funds. Following a Presidentially declared disaster, the Co-op may seek funds through FEMA’s Hazard Mitigation Grant Program (HMGP)		Priority: High	Timeline: Routine

Multi-Hazard #5

Proposed Action Item: MH#5		Alignment with Plan Goals:	
Develop and maintain a comprehensive impact database on severe natural hazard events in Wheeler County.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Maintaining a database of severe natural hazard events in Wheeler County will allow decision makers to better understand patterns and changes in how natural hazards are impacting the County over time. ▪ A better understanding of this will help decision makers come to better decisions on where to invest limited resources and what hazards should be a higher priority when seeking outside funding. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Identify a responsible agency to collect natural hazards information to help establish and maintain baseline and historic records of hazard events; ▪ Utilize the data in the current Wheeler County Natural Hazard Mitigation Plan (NHMP); ▪ Utilize the data from other sources identified in the current NHMP; ▪ Document future events including impacts and losses; ▪ Identify public infrastructure and facilities subject to closures due to snowfall and ice hazards during winter storms; and ▪ Develop partnerships between utility providers and county and city public works agencies to document known hazard areas and minimize risks. 			
Coordinating Organization:			
Wheeler County			
Internal Partners: Wheeler County Planning Department; GIS; Cities of Fossil, Mitchell, and Spray		External Partners: National Weather Service; National Oceanic and Atmospheric Administration (NOAA); ODOT; Oregon Climate Service; Overhead Utilities	
Potential Funding Sources: grant funding sources may be available for this, but it is more likely that this be included in regular County and city budgets as this should be a routine action.		Priority: Medium	Timeline: Routine

Multi-Hazard #6

Proposed Action Item: MH#6		Alignment with Plan Goals:	
Seek funding for generators and satellite telephones for critical facilities.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ The Steering Committee identified the need for generators at these critical facilities: schools, medical centers and pump houses. ▪ Generators serve as an insurance policy for when power is down and allow critical facilities to continue operating until power is restored. ▪ The Steering Committee identified the need for emergency services to have satellite phones. ▪ A diversified communication system is critical during a natural disaster. If phone lines and radio towers are not functioning, a satellite phone backup system provides a reliable way for emergency responders to communicate with each other and with the broader community. ▪ Case study: when Hurricane Maria hit Puerto Rico, the Federal Emergency Management Agency, made satellite phones to all of Puerto Rico's towns and cities, more than half of which were cut off following Hurricane Maria's landfall on Wednesday. 1,360 of the island's 1,600 cellphone towers were downed, and 85 percent of above-ground and underground phone and internet cables were knocked out. With roads blocked and phones dead, satellite phone communication was critical to the recovery effort 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Identify all critical facilities without generators ▪ Prioritize need for generators at critical facilities ▪ Determine what facilities and staff need satellite communication ▪ Generators and related equipment (e.g., hook-ups) are eligible under the HMGP and PDM provided that they are cost-effective, contribute to a long-term solution to the problem they are intended to address, and meet other program eligibility criteria, which include the following: ▪ PDM Program: Generators and/or related equipment purchases (e.g., generator hook-ups) are eligible when the generator directly relates to the hazards being mitigated and is part of a larger project. (FEMA website: https://www.fema.gov/hmgrp-appeal-keywords/9133) 			
Coordinating Organization:			
Wheeler County Emergency Management			
Internal Partners: Cities of Fossil, Mitchell, and Spray		External Partners:	
Potential Funding Sources: FEMA PDM Grants.		Priority: Medium	Timeline: Short Term

Multi-Hazard #7

Action Item:		Alignment with Plan Goals:	
Identify opportunities to reduce existing barriers to interagency cooperation and work together to reduce risk and loss from natural hazards.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ There is a clear need to create interagency agreements to help reduce barriers to collaboration. ▪ The county and city governments in Wheeler County and the surrounding counties are typically limited in staff and resources and would benefit from the economies of scale that interagency collaboration could provide. ▪ Gilliam, Wheeler and Wheeler Counties often work together various projects already and have identified similar mitigation actions. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Develop interagency agreements to better coordinate risk reduction activities within the County and within the three county area. ▪ Identify opportunities to work together to leverage limited resources on commonly identified projects. ▪ Consider holding a joint annual plan maintenance meeting with surrounding counties to discuss natural hazards and how best to implement existing mitigation actions. 			
Coordinating Organization:			
Wheeler County Emergency Management			
Internal Partners: Cities of Fossil, Mitchell, and Spray		External Partners: Surrounding Counties, Cities and Special Districts (Fire, Schools, Soil and Water Conservation)	
Potential Funding Sources: This is a routine action and should be included in regular budgeting.		Priority: Medium	Timeline: Routine

Multi-Hazard #8

Proposed Action Item: MH#8		Alignment with Plan Goals:	
Secure funding to improve infrastructure that will increase the capacity and availability of water in order to protect the City of Fossil from the natural hazards (i.e. drought, wildfire, etc.) that occur on an annual basis.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Current water availability is restrictive and inadequate, which annually leaves the City of Fossil in a vulnerable position and susceptible to natural hazards such as drought and wildfire. ▪ The current water source has decreased by more than 50-percent according to a yearly well log analysis completed by Tenneson Engineering. ▪ The City of Fossil annually restricts water usage throughout the city because of drought conditions. ▪ There is currently a high potential for the loss of life, personal property, businesses, schools, medical facilities, senior living facilities, as well as the overall economic solvency of the City of Fossil if a significant drought or wildfire were to occur. ▪ The City of Fossil completed a risk assessment in May 2012, and it was determined that the probability and vulnerability to drought and wildfire hazards are HIGH. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ An Aquifer Storage and Recovery project is the next plan for the City of Fossil. This plan will store excess water in a below ground aquifer during times of excess flows, October thru May. Then the City will pump out the stored water in the aquifer during times of excess demand, June thru September. This plan will improve water quality throughout the year and quantity of water during the summer months. This project will help the City with water restrictions in the summer. 			
Coordinating Organization:		City of Fossil	
Internal Partners: Wheeler County Emergency Management		External Partners: DEQ; Watermaster Office District 21; Engineers; Contractors; OEM; Army Corps of Engineers; FEMA	
Potential Funding Sources: Federal Emergency Management Hazard Mitigation Assistance; Army Corps of Engineers; Rural Utilities		Priority: High	Timeline: Long Term
Estimated cost: \$750,000.00			
Form Submitted by:	City of Fossil		
Action Item Status:	New Action Item		

Multi-Hazard # 9

Action Item:		Alignment with Plan Goals:	
Develop a multi-faceted educational program to educate residents about this plan and the natural hazards identified within. .		<p>Goal 1: Safety of life and property</p> <p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Education and awareness programs are one of the four types of mitigation actions identified by FEMA. ▪ Ongoing outreach continues the discussion with the community about hazards and risks, builds support for implementation of mitigation activities, and informs the outreach strategy for the next plan update process. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ The outreach activities conducted during the planning process are a good source of ideas for how to continue to involve stakeholders and the public during plan maintenance and implementation. ▪ Consider repeating successful outreach events annually. ▪ Other examples of activities for continued public participation include: periodic presentations on the plan’s progress to elected officials, schools, or other community groups; annual questionnaires or surveys; postings on social media and email lists; and interactive websites. ▪ Assigning the responsibility for coordinating these activities to a staff member in each jurisdiction may assist in building capabilities in the various jurisdictions. 			
Coordinating Organization: Wheeler County Emergency Management			
Internal Partners: Wheeler County, Cities of Fossil, Mitchell and Spray		External Partners: Other stakeholders as appropriate for each hazard (example: ODF and Fire Districts for fire, DOGAMI for landslides, etc.)	
Potential Funding Sources: FEMA PDM grants are generally not available for education and awareness programs. Tap into existing education programs funded through other organizations for specific hazards (example: ODF for wildfire, USGS for earthquakes, etc.) Other potential funding sources include:		Priority: High	Timeline: Short Term

Multi-Hazard # 10

Action Item:		Alignment with Plan Goals:	
Increase by 25% the number of people in Wheeler County signed up for the Everbridge Frontier Regional Emergency Notification System (aka Frontier Regional 911).		Goal 1: Safety of life and property Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Frontier Regional 911 is a regional dispatch center covering Gilliam, Jefferson, Wheeler and Wheeler Counties. ▪ Residents will get alerts about emergencies and other important community news by signing up for the Emergency Alert Program. ▪ The system enables Frontier to provide residents with critical information quickly in a variety of situations, such as severe weather, unexpected road closures, missing persons and evacuations of buildings or neighborhoods. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Encourage residents to visit the Frontier Regional 911 webpage and sign up. It is easy to sign up and it is free. ▪ Advertise how and where to sign up in the Wheeler County Newspaper, on the County website and Facebook page and in direct mailers. 			
Coordinating Organization: Wheeler County Emergency Management			
Internal Partners: Wheeler County, Cities of Fossil, Mitchell and Spray.		External Partners:	
Potential Funding Sources: This is a low cost action that should be covered within the regular county and city budgets.		Priority: High	Timeline: Short term

Multi-Hazard # 11

Action Item:		Alignment with Plan Goals:	
Obtain financial assistance and/or regulatory support for low-income residents and renters who are vulnerable to extreme heat and/or diminished air quality to install air conditioning systems.		<p>Goal 1: Safety of life and property</p> <p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Extreme Heat often results in the highest number of annual deaths among all weather-related hazards. In most of the United States, extreme heat is defined as a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees. In extreme heat, evaporation is slowed and the body must work extra hard to maintain a normal temperature. This can lead to death by overworking the human body. Remember that: <ul style="list-style-type: none"> ▪ Extreme heat can occur quickly and without warning. ▪ Older adults, children, sick, and overweight individuals are at greater risk from extreme heat. ▪ Extreme heat events are expected to increase in frequency, duration, and intensity due to continued warming temperatures. ▪ In Wheeler County, the frequency of hot days with temperatures at or above 90°F is projected to increase on average by 29 days (with a range of 11 to 39 days) by the 2050s under the higher emissions scenario compared to the historical baseline. ▪ In Wheeler County, the temperature of the hottest day of the year is projected to increase by 8°F (with a range of 3 to 12°F) by the 2050s under the higher emissions scenario compared to the historical baseline. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Low income home energy assistance and HVAC programs are not eligible for FEMA PDM grants. ▪ There are many funding options available through state and federal programs, some of these include the following: <ul style="list-style-type: none"> ▪ Oregon Housing and Community Services Energy and Weatherization Programs ▪ US Department of Agriculture’s Very Low Income Housing Repair Program, Community Facilities Grant Program ▪ US Department of Energy Weatherization Assistance Program ▪ US Department of Housing and Urban Development Public Housing Capital Fund 			
Coordinating Organization: Wheeler County			
Internal Partners: Wheeler County Emergency Management, Cities of Fossil, Mitchell and Spray.		External Partners: relevant State and Federal agencies.	
Potential Funding Sources: See Ideas for Implementation above.		Priority: Low	Timeline: Short Term

Multi-Hazard # 12

Action Item:	Alignment with Plan Goals:	
Invest in and promote rainwater collection systems in public, residential, and commercial properties.	Goal 1: Safety of life and property Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:		
<p>A rainwater harvesting system collects water from roofs and is piped to a storage tank where it is can then be used for a variety of things, including: drinking and cooking, laundry, bathing, flushing toilets, watering plants, composting, and fire protection. Designs range from a simple rain barrel at the bottom of a downspout to extensive cistern systems.</p> <p>Because of the efforts in Oregon to conserve water, the Building Codes Division has approved the use of rainwater harvesting systems as an alternate method to the state plumbing code. Information about the rainwater harvesting statewide alternate method is available at www.bcd.oregon.gov.</p>		
Ideas for Implementation:		
<p>New filtration and treatment technologies make rainwater harvesting relatively easy. Rainwater harvesting systems can be installed in existing buildings or incorporated into new construction.</p> <p>A basic rainwater collection system includes a roof, gutters or roof drains, and a piping system to convey the water to and from a storage tank or cistern. Storage tanks can be inside or outside, above or below ground, or partially above and partially below ground.</p> <p>Basements can be good locations for storage tanks as the water will be gravity fed and protected from freezing. In some instances a separate structure is used to enclose the tank and equipment, which will increase the roof surface catchment area. Many rainwater collection systems, as well as individual components, are available commercially.</p> <p>Guidance on implementing a rain harvesting system can be obtained from the Oregon Department of Consumer and Business Services, Building Codes Division.</p>		
Coordinating Organization: Wheeler County Extension Service		
Internal Partners: Wheeler County Emergency Management, Cities of Fossil, Mitchell and Spray.	External Partners:	
Potential Funding Sources: USDA Conservation Innovation Grants, private foundations such as the Gates foundation.	Priority: Low	Timeline: Short Term

Multi-Hazard # 13

Action Item:		Alignment with Plan Goals:	
Invest in and promote community gardens and local food production.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Provides a reliable food source during times of natural disasters where access to local grocery stores is limited or cut off for a period of time; ▪ Improves stewardship practices of small acreage landowners improves soil and water quality and conservation; ▪ Facilitate farmers knowing other farmers which builds whole community resiliency. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Collaborate with the Wheeler County Extension Service (the local office of the OSU Extension Service). ▪ The Extension Service offers two programs 1) a Home Food Safety and Preservation Program and 2) a Small Farms Program that are directly related to this mitigation action. 			
Coordinating Organization: Wheeler County Extension Service			
Internal Partners: Wheeler County, Cities of Fossil, Mitchell, and Spray.		External Partners:	
Potential Funding Sources: contact the local OSU Extension office for information on grant sources, US Department of Agriculture (USDA).		Priority: Low	Timeline: Short Term

Multi-Hazard # 14

Action Item:		Alignment with Plan Goals:	
Consider requiring new development to include onsite rainwater storage and/or emergency drinking water storage tanks. Include water storage solutions in seismic retrofit projects for schools and other public buildings.		<p>Goal 1: Safety of life and property</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ A rainwater harvesting system collects water from roofs and is piped to a storage tank where it is can then be used for a variety of things, including: drinking and cooking, laundry, bathing, flushing toilets, watering plants, composting, and fire protection. Designs range from a simple rain barrel at the bottom of a downspout to extensive cistern systems. ▪ Because of the efforts in Oregon to conserve water, the Building Codes Division has approved the use of rainwater harvesting systems as an alternate method to the state plumbing code. Information about the rainwater harvesting statewide alternate method is available at www.bcd.oregon.gov. ▪ This mitigation action could be funded as part of future seismic retrofit projects. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ New filtration and treatment technologies make rainwater harvesting relatively easy. Rainwater harvesting systems can be installed in existing buildings or incorporated into new construction. ▪ A basic rainwater collection system includes a roof, gutters or roof drains, and a piping system to convey the water to and from a storage tank or cistern. Storage tanks can be inside or outside, above or below ground, or partially above and partially below ground. ▪ Basements can be good locations for storage tanks as the water will be gravity fed and protected from freezing. In some instances a separate structure is used to enclose the tank and equipment, which will increase the roof surface catchment area. Many rainwater collection systems, as well as individual components, are available commercially. ▪ Guidance on implementing a rain harvesting system can be obtained from the Oregon Department of Consumer and Business Services, Building Codes Division. 			
Coordinating Organization: Wheeler County Planning Department			
Internal Partners: Wheeler County Emergency Management, the cities of Fossil, Mitchell and Spray.		External Partners:	
Potential Funding Sources: USDA Conservation Innovation Grants, private foundations such as the Gates foundation.		Priority: Low	Timeline: Medium Term

Multi-Hazard # 15

Action Item:	Alignment with Plan Goals:
<p>Invest in and promote solar and other alternative energy in public, residential, and commercial properties.</p>	<p>Goal 1: Safety of life and property Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>
Rationale for Proposed Action Item:	
<ul style="list-style-type: none"> ▪ Many of the natural hazards that Wheeler County is most at risk of can cause short and long term disruptions to the electrical grid and other non-renewable energy sources. ▪ Sustainable emergency preparedness is a growing focus of natural hazard mitigation planning. ▪ With the growing frequency and severity of emergencies, coupled with the interdependence of all of us living on the “grid,” it is more important than ever before to communally foster a culture of preparedness and self-reliance. ▪ Alternative energy sources such as solar, wind and battery power are proven sources of reliable energy in past natural disasters. For example, after Hurricane Maria hit Puerto Rico, solar powered battery systems were deployed throughout the island. The batteries can be paired with solar arrays already in place on the islands in order to run micro grids until the main energy grid is repaired and fully operational. 	
Ideas for Implementation:	
<ul style="list-style-type: none"> ▪ Consider setting up an emergency solar and/or wind powered power generation system to power appliances and store in batteries. ▪ Battery-stored backup power – this allows you to continue operating lights, refrigerators and other appliances, fans, and communications during a power outage. These systems can connect to renewable sources of energy, like solar panels and small-scale wind generators, to help the batteries stay charged during an emergency. You can also recharge many of these battery systems with diesel generators. The length of time you will be able to draw electricity from your batteries will depend on the size of your battery bank. Emergency mobile battery backup power systems can power cell phones and lights for a relatively short period of time (for example, 700–1,500 watt hours). Pre-wired solar-powered battery backup systems offer more power output for longer periods of time (example, 5,000–10,000 watt hours). ▪ Solar power - solar power can provide a portion of daily primary power as well as reliable backup power during an emergency. Solar panels are typically installed on the roofs of homes or work facilities. Battery systems can recharge using solar power. As the solar panels generate energy during the day, any excess energy not used by the home or office can be stored for use at night, on rainy days, or during power outages. ▪ Wind power—a small-scale wind electric system (such as residential or institutional) can help homeowners, small business owners, and public facilities generate their own energy for onsite use. 	
Coordinating Organization: Wheeler County	
<p>Internal Partners: Wheeler County Planning, County Emergency Management,</p>	<p>External Partners: Oregon Department of Energy, Energy Trust of Oregon</p>

Cities of Fossil, Mitchell and Spray		
Potential Funding Sources: FEMA PDM Grants, US Department of Energy Rural Utilities Service Electric Program, EPA's Rural Energy for America Program (REAP), Oregon Department of Energy Renewable Energy Development (RED) grants.	Priority: Low	Timeline: Long Term

Multi-Hazard # 16

Action Item:		Alignment with Plan Goals:	
Develop hazard-specific evacuation plans that consider likely impacts to bridges, other key transportation infrastructure and lifelines.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> A wide variety of emergencies may cause an evacuation. In some instances you may have a day or two to prepare, while other situations might call for an immediate evacuation. Planning ahead is vital to ensuring that you can evacuate quickly and safely, no matter what the circumstances. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Review existing county and city emergency plans to evaluate how they address evacuation. Seek out ideas from existing emergency and evacuation plans in other jurisdictions. For example, coastal communities in Oregon typically have well thought out evacuation plans due to the tsunami risk. Discuss ideas with local fire, police and road agency staff at the bi-annual plan maintenance meetings Determine how best to disseminate the key information from the plan to county residents. 			
Coordinating Organization: Wheeler County Emergency Management			
Internal Partners: Wheeler County Road Department, county and local police, fire districts.		External Partners: ODOT, Oregon Department of Emergency Management	
Potential Funding Sources: FEMA mitigation grants		Priority: Medium	Timeline: Medium term

Drought

- 1) Make available to county residents and the public information regarding droughts.

Status & Explanation: Blend this action in with MH #9.

Retain, Delete and/or Modify: Modified.

Timeline: Short term

Priority: High

- 2) Promote the planting of native and drought-resistant plants that require less water during drier months.

Status & Explanation: New action for the 2019 Plan Update.

Retain, Delete and/or Modify:

Timeline: Short term

Priority: High

- 3) Provide water conservation education to kids in schools.

Status & Explanation: New action for the 2019 plan update.

Retain, Delete and/or Modify:

Timeline: Short term

Priority: Moderate

- 4) Develop a Drought Emergency Plan

Status & Explanation: New action for the 2019 Plan Update.

Retain, Delete and/or Modify:

Timeline: Long term

Priority: Low

- 5) Consider requiring water conservation during drought conditions.

Status & Explanation: New action for the 2019 Plan Update.

Retain, Delete and/or Modify:

Timeline: Medium term

Priority: Low

Drought # 1

Action Item:	Alignment with Plan Goals:
<p>Make available to county residents and the public information regarding droughts.</p>	<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>
Rationale for Proposed Action Item:	
<ul style="list-style-type: none"> ▪ Drought occurs when rain, snow and other precipitation are lower than average for an extended period of time. Oregonians are familiar with drought, but future climate changes are likely to increase the duration and effects. ▪ The health impacts of drought are numerous and far reaching. Some drought-related health effects are experienced in the short-term and can be directly observed and measured. However, the slow rise or chronic nature of drought can result in longer term, indirect health risks that are not always easy to anticipate or monitor. ▪ Drought situations increase the risk of fire hazards. ▪ Drought situations may cause visibility hazards due to airborne particulates. ▪ Drought situations cause critical water shortages for humans, animals and vegetation. ▪ Drought conditions, as represented by low spring snowpack, low summer soil moisture, and low summer runoff, are projected to become more frequent in Wheeler County by the 2050's compared to the historical baseline.¹ ▪ By the end of the 21st century, summer low flows are projected to decrease in the Blue Mountain region; the Upper John Day sub-basin is at high risk for summer water shortage associated with low streamflow. 	
Ideas for Implementation:	
<ul style="list-style-type: none"> ▪ The internet has a wide array of free information on drought, climate change and their impacts. A few resources of note include: the Oregon Governor's drought website; the Oregon Water Resource Department: Drought Watch; CDC's drought and health website; and the Oregon Health Authority Climate Change web portal. ▪ Information can be made available to residents through K-12 schools, senior centers, at community events and on existing county and city websites and social media sites. 	
Coordinating Organization:	<p>Wheeler County Emergency Management</p>
<p>Internal Partners: County Court, Public Works, Cities of Fossil, Mitchell, and Spray</p>	<p>External Partners: Oregon Department of Agriculture, OSU Extension, Cattle Association, Soil and Water Conservation District, Oregon Dept. of Forestry, Oregon Dept. of Fish and Wildlife, Oregon Water Resources Department, Oregon Health Authority.</p>

¹ Future Climate Projections Wheeler County, Oregon Climate Change Research Institute, August 2018.

Potential Funding Sources: Much of the information is free (or a nominal fee) from government agencies	Priority: High	Timeline: Short Term
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Drought # 2

Proposed Action Item: DR#1		Alignment with Plan Goals:	
Promote the planting of native and drought-resistant plants that require less water during drier months.		Goal 1: Safety of life and property Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<p>Across the western US, mountain snowpack is projected to decline leading to reduced summer soil moisture in mountainous environments (Gergel et al., 2017). In parts of Eastern Oregon, summer soil moisture is projected to increase on average, but the range of projected changes is large and depends on the models' projected change in precipitation, with some models projecting increases and others decreases (Gergel et al., 2017).</p> <p>Climate change is expected to result in lower summer stream flows in snow dominated basins across the Pacific Northwest as snowpack melts off earlier due to warmer temperatures and summer precipitation decreases (Dalton et al., 2017).</p> <p>Drought situations increase the risk of fire hazards. They can also cause visibility hazards, and critical water shortages for humans, animals and vegetation.</p> <p>The three incorporated cities in Wheeler County –Fossil, Mitchell and Spray- have limited resources and rely on the county for certain services and public facilities. Because the cities rely so heavily upon the County to provide services, this action is considered to be a multi-jurisdictional action because it benefits both the County and all the participating cities.</p>			
Ideas for Implementation:			
Encourage drought-tolerant landscape design through measures such as:			
<ul style="list-style-type: none"> ▪ Incorporating drought tolerant or <i>xeriscape</i> practices into landscape ordinances to reduce dependence on irrigation. Xeriscape is a style of landscape design requiring little or no irrigation or other maintenance and is typically used in arid regions. ▪ Providing incentives for xeriscaping. ▪ Using permeable surfaces in construction to reduce runoff and promote groundwater recharge. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: Cities of Fossil, Mitchell and Spray		External Partners:	
Potential Funding Sources: State and Federal Grants (see Appendix E: Grant Programs)		Priority: Low	Timeline: Short Term

Drought # 3

Proposed Action Item: DR#1		Alignment with Plan Goals:	
Provide water conservation education to kids in schools.		Goal 1: Safety of life and property Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
Educating children about the value and methods used to conserve water will stay with them for a lifetime which is especially important as droughts are likely to become more prevalent over time in Wheeler County. They are also likely to take this information home and share with their parents and siblings.			
Ideas for Implementation:			
Schools should work with the County Emergency Manager and the Soil and Water Conservation District to discuss ways to integrate water conservation into lesson plans and other school events and literature. Many online resources exist as well, such as on the Oregon Department of Education website.			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: Fossil Charter School, Mitchell School District, Spray School District		External Partners:	
Potential Funding Sources: State and Federal Grants (see Appendix E: Grant Programs)		Priority: Moderate	Timeline: Short term

Drought # 4

Proposed Action Item: DR#1		Alignment with Plan Goals:	
Develop a Drought Emergency Plan		<p>Goal 1: Safety of life and property</p> <p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Drought is a slow-onset hazard that can last for months or years. As a hazard, it has the potential to impact many aspects of life, including two of our most important needs: drinking water and food. Because of the long duration of droughts, the impacts last for years and can ripple through a community over time. Severe droughts are projected for the coming decades and may increase incidences of other events, like wildfires. Drought will affect the viability of communities and the economy across the nation. ▪ Drought was ranked at the 2nd most important natural hazard in Wheeler County. Preparing a countywide plan to deal with droughts will establish an action plan to reduce their risk. 			
Ideas for Implementation:			
<p>Review current Emergency Operations Plan (EOP) to identify existing plan for drought, if any.</p> <p>Consider integrating drought into the future updates of the County EOP, Comprehensive Plan and other existing policies and plans.</p> <p>Include non-agency staff such as local utilities, farmers, and the OSU Extension Service in helping develop the plan.</p> <p>Review existing State of Oregon Drought Emergency Plan for ideas on content, funding and to ensure consistency the County plan is consistent. (https://www.oregon.gov/oem/Documents/2015_OR_EOP_IA_01_drought.pdf)</p>			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: Wheeler County Planning		External Partners:	
Potential Funding Sources: State and Federal Grants (see Appendix E: Grant Programs)		Priority: Low	Timeline: Long Term

Drought # 5

Proposed Action Item: DR#1		Alignment with Plan Goals:	
Consider require water conservation during drought conditions		Goal 1: Safety of life and property Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<p>Across the western US, mountain snowpack is projected to decline leading to reduced summer soil moisture in mountainous environments (Gergel et al., 2017). In parts of Eastern Oregon, summer soil moisture is projected to increase on average, but the range of projected changes is large and depends on the models' projected change in precipitation, with some models projecting increases and others decreases (Gergel et al., 2017).</p> <p>Climate change is expected to result in lower summer stream flows in snow dominated basins across the Pacific Northwest as snowpack melts off earlier due to warmer temperatures and summer precipitation decreases (Dalton et al., 2017).</p> <p>Drought situations increase the risk of fire hazards. They can also cause visibility hazards, and critical water shortages for humans, animals and vegetation.</p> <p>The three incorporated cities in Wheeler County –Fossil, Mitchell and Spray- have limited resources and rely on the county for certain services and public facilities. Because the cities rely so heavily upon the County to provide services, this action is considered to be a multi-jurisdictional action because it benefits both the County and all the participating cities.</p>			
Ideas for Implementation:			
<p>Developing an ordinance to restrict the use of public water resources for non-essential usage, such as landscaping, washing cars, filling swimming pools, etc. ▪</p> <p>Adopting ordinances to prioritize or control water use, particularly for emergency situations like firefighting.</p>			
Coordinating Organization:		Wheeler County	
Internal Partners: County Emergency Management, Cities of Fossil, Mitchell and Spray.		External Partners:	
Potential Funding Sources: This is a low cost action that should be covered within the regular county and city budgets.		Priority: Low	Timeline: Medium Term

Earthquake

- 1) Make available to county residents and the public information regarding earthquakes.

Status & Explanation: *Blend this action with MH #9*

Retain, Delete and/or Modify: *Modified*

Timeline: *Short term*

Priority: *Low*

- 2) Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency (FEMA) to seismically retrofit critical facilities with a high collapse potential rate by the Department of Geology and Mineral Industries (DOGAMI).

Status & Explanation: *New action for the 2019 Plan Update.*

Retain, Delete and/or Modify:

Timeline: *Long term*

Priority: *Moderate*

Earthquake #1

Action Item:		Alignment with Plan Goals:	
Make available to county residents and the public information regarding earthquakes.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Earthquakes, while not common in Wheeler County, do occur. ▪ Wheeler County is most susceptible to crustal earthquakes, with less potential for impacts from subduction, intraplate, and events associated with renewed volcanic activity. ▪ This suggests Wheeler County can most likely expect shorter duration events with low levels of ground shaking and limited liquefaction (Region 5 Profile; DOGAMI). There are no identified faults located in Wheeler County, but there are several in the surrounding area including neighboring counties of Gilliam, Morrow, Grant and Crook. ▪ Earthquakes happen without warning and may cause fires and damage roads, landslides, and structure damage. ▪ Many structures in Wheeler County were built prior to modern building codes and are made of unreinforced masonry (URM) which are more likely to suffer damage in an earthquake than more modern steel reinforced structures. A few URM buildings in Wheeler County that are also critical infrastructure include the County Courthouse, the Fossil Elementary School and the Spray School. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Register for and participate in the annual Great Oregon Shakeout. The Great Oregon Shake Out is an annual opportunity to practice how to be safer during big earthquakes. ▪ Search websites for existing brochures and information on earthquake preparedness. A few of these include: the Oregon Office of Emergency Management, DOGAMI, USGS and FEMA. ▪ Include information on earthquake preparedness on County and City websites and social media. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court; Fire Departments; Cities of Fossil, Mitchell, and Spray		American Red Cross	
Potential Funding Sources: This is a low cost action that should be covered within the regular county and city budgets. Much of the information on earthquake preparedness is available online at no cost.		Priority: High	Timeline: Short Term

Earthquake #2

Action Item:		Alignment with Plan Goals:	
Make available to county residents and the public information regarding earthquakes.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Earthquakes, while not common in Wheeler County, do occur. ▪ Wheeler County is most susceptible to crustal earthquakes, with less potential for impacts from subduction, intraplate, and events associated with renewed volcanic activity. ▪ This suggests Wheeler County can most likely expect shorter duration events with low levels of ground shaking and limited liquefaction (Region 5 Profile; DOGAMI). There are no identified faults located in Wheeler County, but there are several in the surrounding area including neighboring counties of Gilliam, Morrow, Grant and Crook. ▪ Earthquakes happen without warning and may cause fires and damage roads, landslides, and structure damage. ▪ Many structures in Wheeler County were built prior to modern building codes and are made of unreinforced masonry (URM) which are more likely to suffer damage in an earthquake than more modern steel reinforced structures. A few URM buildings in Wheeler County that are also critical infrastructure include the County Courthouse, the Fossil Elementary School and the Spray School. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Register for and participate in the annual Great Oregon Shakeout. The Great Oregon Shake Out is an annual opportunity to practice how to be safer during big earthquakes. ▪ Search websites for existing brochures and information on earthquake preparedness. A few of these include: the Oregon Office of Emergency Management, DOGAMI, USGS and FEMA. ▪ Include information on earthquake preparedness on County and City websites and social media. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court; Fire Departments; Cities of Fossil, Mitchell, and Spray		American Red Cross	
Potential Funding Sources: This is a low cost action that should be covered within the regular county and city budgets. Much of the information on earthquake preparedness is available online at little to no cost.		Priority: High	Timeline: Short Term

Flood

- 1) Make available to county residents and the public information regarding floods.

Status & Explanation: *Blend this action in with MH #9.*

Retain, Delete and/or Modify: *Modified*

Timeline: *Short term*

Priority: *High*

- 2) Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.

Status & Explanation: *Coordinating organization shifted to the Wheeler County Planning Department.*

Retain, Delete and/or Modify: *Modified*

Timeline: *Short term*

Priority: *High*

- 3) Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency (FEMA) to construct, install, and maintain a “Flash Flood Warning System” that has been designed to protect lives and property in the City of Mitchell.

Status & Explanation: *Not completed. Timeline and priority shifted to Short Term / High Priority*

Retain, Delete and/or Modify: *Retain*

Timeline: *Short term*

Priority: *High*

- 4) Secure funding to implement proposed solutions from a drainage study to improve the three drainage basins and facilities that are currently inadequate, undersized, and poorly maintained in the City of Spray.

Status & Explanation: *Not completed. Timeline and priority shifted to Short Term / High Priority.*

Retain, Delete and/or Modify: *Retain*

Timeline: *Short term*

Priority: *High*

- 5) Coordinate with the State Floodplain Coordinator and the Department of Land Conservation and Development (DLCD) to update the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for Wheeler County and the incorporated cities participating in the Nation Flood Insurance Program (NFIP) and Risk Map.

Status & Explanation: *Wheeler County, the City of Fossil, and the City of Mitchell participate in the Nation Flood Insurance Program (NFIP). Flood Insurance Rate Maps (FIRMs) for Wheeler County are current as of July 17, 1989; FIRMs for the City of Fossil are current as of May 4, 1989; FIRMs for the City of Mitchell are current as of April 17, 1989; and FIRMs for the City of Spray are current as of August 16, 1989.*

Retain, Delete and/or Modify: *Retain*

Timeline: *Routine*

Priority: *High*

Flood #1

Action Item:	Alignment with Plan Goals:
<p>Make available to county residents and the public information regarding floods.</p>	<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>
<p>Rationale for Proposed Action Item:</p>	
<ul style="list-style-type: none"> ▪ Wheeler County is subject to a variety of flood conditions that include: spring run-off from melting snow, intense warm rain during the winter months, ice-jam flooding, local flash flooding, and flooding associated with the breaching of natural debris dams. ▪ Flash floods waters can move at a very fast speed. Walls of water can reach heights of 10 to 20 feet or more and generally carry large amounts of debris with them. While the possibility of a flash flood is always present, historically the likelihood of a flash flood is the greatest during the months of June and July. ▪ Although not as notable as flash floods, the most common flood condition in the county is associated with warm rain during the winter months. Rain-on-snow floods occur during the winter months and have come to be associated with La Niña events, a three to seven year cycle of cool, wet weather. Brief, cool, moist weather conditions are generally followed by a system of warm, moist air from tropical latitudes. The intense warm rain associated with this system quickly melts foothill and mountain snow. Some of the most devastating flooding events in Oregon are associated with these events. ▪ All of Wheeler County is subject to a flood hazard. Primary flood sources in Wheeler County are the John Day River, Bridge Creek, and Keyes Creek. The City of Mitchell has historically experienced flash flooding from Bridge Creek. ▪ The hazard is primarily located with the 100 year and 500 year flood zones on the FEMA flood insurance rate maps. A 100 year flood is a flood event that has a 1% probability of occurring in any given year. A 500 year flood is a flood event that has a 0.2% probability if occurring in any given year. Base flood elevations have also been determined for the 100 year flood zone. The extent of the hazard can be viewed spatially on the flood hazard maps (FIRM). 	
<p>Ideas for Implementation:</p>	
<ul style="list-style-type: none"> ▪ Encourage residents to know types of flood risk in your area. Visit FEMA’s Flood Map Service Center for information. ▪ Encourage residents to sign up for your community’s warning system. The Emergency Alert System (EAS) and National Oceanic and Atmospheric Administration (NOAA) Weather Radio also provide emergency alerts. ▪ Publish and disseminate information on evacuation routes, shelter plans, and flash flood response plans. ▪ Encourage residents to gather supplies in case they have to leave immediately, or if services are cut off. ▪ Educate residents about purchasing or renewing a flood insurance policy. It typically takes up to 30 days for a policy to go into effect and can protect the life you’ve built. Homeowner’s policies do 	

<p>not cover flooding. Get flood coverage under the National Flood Insurance Program (NFIP)</p> <ul style="list-style-type: none"> ▪ Encourage residents to keep important documents in a waterproof container. Create password-protected digital copies. ▪ Encourage residents to protect your property. Move valuables to higher levels. Declutter drains and gutters. Install check valves. Consider a sump pump with a battery. 		
Coordinating Organization:	Wheeler County Emergency Management	
Internal Partners:	External Partners:	
County Court; Fire Departments; Cities of Fossil, Mitchell, and Spray	American Red Cross	
Potential Funding Sources: This is a low cost action that should be covered within the regular county and city budgets. Much of the information on flooding preparedness is available online at little to no cost.	Priority: High	Timeline: Short Term

Flood #2

Proposed Action Item: FL#2		Alignment with Plan Goals:	
Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ The National Flood Insurance Program provides communities federally backed flood insurance to homeowners, renters, and business owners, provided that communities develop and enforce adequate floodplain management ordinances. The benefits of adopting NFIP standards for communities are a reduced level of flood damage in the community and stronger buildings that can withstand floods. According to the NFIP, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance. ▪ The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Continued participation in the NFIP will help reduce the level of flood damage to new and existing buildings in communities while providing homeowners, renters and business owners additional flood insurance protection. ▪ The CAV is a scheduled visit to a community participating in the NFIP for the purpose of: 1) Conducting a comprehensive assessment of the community's floodplain management program; 2) assisting the community and its staff in understanding the NFIP and its requirements; and 3) assisting the community in implementing effective flood loss reduction measures when program deficiencies or violations are discovered. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Actively participate with DLCD and FEMA during Community Assistance Visits. ▪ Conduct an assessment of the floodplain ordinances to ensure they reflect current flood hazards and situations, and meet NFIP requirements. ▪ The cities should coordinate with the county to ensure that floodplain ordinances and NFIP regulations are maintained and enforced. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: County Court, Planning Department; Cities of Fossil, Mitchell, and Spray;		External Partners: DLCD, OEM, FEMA	
Potential Funding Sources: This is a low cost action that should be covered within the regular county and city budgets.		Priority: High	Timeline: Short Term

Flood #3

Action Item:		Alignment with Plan Goals:	
Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency (FEMA) to construct, install, and maintain a “Flash Flood Warning System” that has been designed to protect lives and property in the City of Mitchell.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ The City of Mitchell, Oregon, has historically been ravaged by three catastrophic flash flood events that have claimed lives and caused property damage. Other, less than catastrophic flash floods have created significant damage have occurred over the past 50 years as well. These events have happened (and will again) without any warning at all and represent an extreme risk for the loss of life and property. ▪ A “Flash Flood Warning System” has been designed that will provide sufficient warning to the city to immediately evacuate the downtown areas that would be most likely affected. ▪ The effects of a flash flood event would be, (as in the past) but not limited to: power failure, water system failure, communications failure, all transportation to and from the city (including Highway 26), and the failure of the six bridges that span Bridge Creek from Mitchell to the Painted Hills (Burnt Ranch Road). Additionally, the U.S. Post Office and many other downtown buildings including residences and businesses are potentially at risk. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ The City of Mitchell should seek funding from FEMA and the U.S. Army Corps of Engineers. ▪ Coordinate activities with the Wheeler County Emergency Manager. ▪ Identify the likely structures at risk of flooding. 			
Coordinating Organization:		City of Mitchell	
Internal Partners: Wheeler County Emergency Management		External Partners: OEM, FEMA.	
Potential Funding Sources: Federal Emergency Management Agency, Army Corps of Engineers, Oregon Regional Solutions, Business Oregon.		Priority: High	Timeline: Short Term

Flood #4

Action Item:		Alignment with Plan Goals:	
Secure funding to implement proposed solutions from a drainage study to improve the three drainage basins and facilities that are currently inadequate, undersized, and poorly maintained in the City of Spray.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ The City of Spray received a grant from the Oregon Department of Transportation to do a drainage study. ▪ Ferguson Surveying & Engineering completed a drainage study for the City of Spray in February 2012. The following is a list of critical issues that need to be addressed: <ul style="list-style-type: none"> • Most of the city streets do not have curbs or gutters and storm water collects in puddles along the streets and in the driveways and yards of the residents of Spray. • The creek beds that carry the runoff water through the city are poorly maintained and have silted over the years. Therefore, they do not have adequate area to carry potential storm flows. • There are several cross pipes that carry the water under State Highway 19. All of the pipes are undersized and poorly maintained (i.e. debris and silt in the inlets and pipes themselves). • Water from Drainage Area 2 runs off the hillside into the Spray Rodeo Arena and the football field and continues, uncontrolled, through the heart of the city; creating numerous problems. ▪ The “Drainage Study, City of Spray” from 2012 is not included in this Wheeler County Natural Hazards Mitigation Plan Update. It can be obtained from the City of Spray or the Oregon Department of Land Conservation and Development. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Seek funding through the Oregon Department of Transportation, Oregon Emergency Management, and/or the Federal Emergency Management Agency’s Hazard Mitigation Assistance Grant Programs to implement the proposed solutions of a drainage study to improve the three drainage basins in the City of Spray. 			
Coordinating Organization:		City of Spray	
Internal Partners: Wheeler County Emergency Management		External Partners: Ferguson Surveying & Engineering; OEM; ODOT; FEMA; U.S. Army Corps of Engineers	
Potential Funding Sources: Oregon Department of Transportation; Oregon Emergency Management; Federal Emergency Management Agency		Priority: High	Timeline: Short Term

Flood #5

Action Item:		Alignment with Plan Goals:	
Coordinate with the State Floodplain Coordinator and the Department of Land Conservation and Development (DLCD) to update the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for Wheeler County and the incorporated cities participating in the Nation Flood Insurance Program (NFIP) and Risk Map.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Wheeler County, the City of Fossil, and the City of Mitchell participate in the Nation Flood Insurance Program (NFIP). ▪ Flood Insurance Rate Maps (FIRMs) for Wheeler County are current as of July 17, 1989; FIRMs for the City of Fossil are current as of May 4, 1989; FIRMs for the City of Mitchell are current of April 17, 1989; and FIRMs for the City of Spray are current as of August 16, 1989. ▪ As of September 11, 2018 there were 11 National Flood Insurance Program (NFIP) policies in force with a total value of \$969,400. Between 1978 and September 11, 2018 there were four NFIP claims; three in the City of Fossil and one in Wheeler County, with a total payment of \$10,236. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Contact the National Flood Insurance Program (NFIP) Coordinator at the Oregon Department of Land Conservation and Development for assistance. 			
Coordinating Organization:		Wheeler County Planning Department	
Internal Partners: County Emergency Management; Cities of Grass Valley, Rufus, and Wasco;		External Partners: DLCD	
Potential Funding Sources: This is a low cost action that should be covered within the regular county and city budgets.		Priority: High	Timeline: Routine

Landslide/Debris Flow

- 1) Make available to county residents and the public information regarding landslides/debris flows.

Status & Explanation: *Blend this action in with MH #9.*

Retain, Delete and/or Modify: *Modified*

Timeline: *Short term*

Priority: *High*

- 2) Develop education and public outreach to engage adjacent landowners to improve slope management practices.

Status & Explanation: *Blend this action in with MH #9.*

Retain, Delete and/or Modify: *Modified*

Timeline: *Short term*

Priority: *High*

- 3) Blend this action in with MH #9

Status & Explanation: *New Action for the 2019 Plan Update.*

Retain, Delete and/or Modify:

Timeline: *Medium term*

Priority: *Moderate*

Landslide/Debris Flow #1

Action Item:	Alignment with Plan Goals:
<p>Make available to county residents and the public information regarding landslides/debris flows.</p>	<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>
<p>Rationale for Proposed Action Item:</p>	
<ul style="list-style-type: none"> ▪ Landslides occur in all U.S. states and territories and can be caused by a variety of factors including earthquakes, storms, volcanic eruptions, fire and by human modification of land. Landslides can occur quickly, often with little notice and the best way to prepare is to stay informed about changes in and around your home that could signal that a landslide is likely to occur. ▪ In a landslide, masses of rock, earth or debris move down a slope. Debris and mud flows are rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or “slurry.” They can flow rapidly, striking with little or no warning at avalanche speeds. They also can travel several miles from their source, growing in size as they pick up trees, boulders, cars and other materials. ▪ Most slope failures in Wheeler County are complex combinations of these distinct types, but the generalized groupings provide a useful means for framing discussion of slide characteristics, identification methods, and potential mitigation alternatives. These basic types are combined with the type of geologic material to form the common landslide names such as debris flow and rock fall. ▪ Some landslides can move at rapid rates and thus pose life threats. These are commonly channelized debris flows, debris avalanches, and rock falls. These types of rapidly moving landslides are common throughout the region, especially along U.S. Highway 26 corridor between Mitchell and Prineville (Deschutes County). ▪ Approximately 80-percent of the main corridors in the county are susceptible to landslides. Areas with particular concern include: <ul style="list-style-type: none"> • U.S. Highway 26 between Mitchell and Prineville • Oregon Route 19 between Spray, Fossil and Condon (Gilliam County) • Oregon Route 207 between Mitchell and Richmond • Oregon Route 218 between Fossil and Antelope (Wasco County). 	
<p>Ideas for Implementation:</p>	
<ul style="list-style-type: none"> ▪ Educate the public in regards to what to do if they come across a landslide or debris flow. ▪ Develop interagency agreements to cut through the red tape and develop a uniform set of rules. ▪ Educate the public on better ways to provide drainage and structural improvements to reduce economic losses. ▪ Educate the public to pay attention to weather broadcasts and potential hazard warnings. ▪ Access existing resources online from the Oregon Department of Geology and Mineral Industries and FEMA. 	

Coordinating Organization:	Wheeler County Emergency Management	
Internal Partners: County Court; County Public Works; County Road Department; Cities of Fossil, Mitchell, and Spray; ODOT; School Districts; Medical Clinic	External Partners: DOGAMI, FEMA, Mid-Columbia Bus Company; American Red Cross	
Potential Funding Sources: This is a low cost action that should be covered within the regular county and city budgets.	Priority: High	Timeline: Short Term

Landslide/Debris Flow #2

Action Item:	Alignment with Plan Goals:	
Develop education and public outreach to engage adjacent landowners to improve slope management practices.	<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:		
<ul style="list-style-type: none"> ▪ Landslides are one of the most common and devastating natural hazards in the Pacific Northwest and the damage they cause is almost never covered by insurance. ▪ Landslides can take human life, however, even a few inches of slope movement can disrupt septic, sewer, and water lines and crack foundations, severely damaging or destroying your home. 		
Ideas for Implementation:		
<ul style="list-style-type: none"> ▪ A good starting point is in consulting the “Homeowner’s Guide to Landslides” which is available on the DOGAMI website. ▪ Make this guide available to residents in Wheeler County via the County and City websites. 		
Coordinating Organization:	Wheeler County Emergency Management	
Internal Partners: County Court, County Public Works, County Road Dept., Cities of Fossil, Mitchell, and Spray, ODOT, School Districts, Medical Clinic.	External Partners: DOGAMI, American Red Cross	
Potential Funding Sources: This is a low cost action that should be covered within the regular county and city budgets.	Priority: High	Timeline: Short Term

Landslide/Debris Flow #3

Action Item:		Alignment with Plan Goals:	
Explore low-cost mitigation options, such as maintenance of slide fences, ditches and other drainage facilities.		<p>Goal 1: Safety of life and property</p> <p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> Sometimes relatively low cost and simple actions are all that is needed to greatly reduce the risk of landslides. 			
Ideas for Implementation:			
There are four basic strategies to mitigate for a particular landslide:			
<ul style="list-style-type: none"> Stabilization: Typical landslide stabilization measures include grading the unstable portion of the slope to a lower gradient, construction of rock buttresses and retaining walls, and drainage improvements. With the exception of drainage improvements, stabilization measures are typically moderate to high cost, but provide a long-term solution with low, long-term maintenance costs. Cessation of adverse human activities by diverting storm water away from steep slopes, maintaining appropriate native vegetation, and properly disposing of debris off-site are also considered measures that would improve stability. Protection: Protection measures for landslides primarily focus on containment and/or diversion of the moving debris. Such measures include walls, berms, ditches and catchment basins, which can be low to moderate in cost. However, considerable long-term maintenance costs are often associated with these measures to clean out and dispose of accumulated debris Avoidance: Avoidance measures constitute a permanent solution to a landslide hazard. Measures include realignment away from the slope, relocation of the facility, tunnels and elevated structures that allow passage of debris beneath the facility. The typically high cost of these measures is offset by the elimination of further landslide-related maintenance costs and exposure to landslide risk. Maintenance and monitoring: Maintenance and monitoring measures may involve proactive cleanout of available catchment areas, routine observation and assessment of slope conditions, landslide-warning (slide) fences, monitoring slope and weather instrumentation and preemptive closures. Generally, these measures are relatively low cost and can be highly effective in reducing public exposure to slide risk. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: County Public Works, County Road Dept., Cities of Fossil, Mitchell, and Spray		External Partners: ODOT	
Potential Funding Sources: None identified.		Priority: Moderate	Timeline: Medium Term

Volcanic Event

- 1) Make available to county residents and the public information regarding volcanic events.

Status & Explanation: *Blend this action in with MH #9.*

Retain, Delete and/or Modify: *Modified*

Timeline: *Short term*

Priority: *High*

- 2) Evaluate the county's Emergency Operations Plan with regard to preparing for a volcanic event.

Status & Explanation: *New Action for the 2019 Plan Update. If an eruption occurred, ash fallout from Cascade volcanoes could potentially affect the entire county. However, there is virtually no risk from lahars, debris, or pyroclastic flows in Wheeler County*

Retain, Delete and/or Modify:

Timeline: *Long term*

Priority: *Low.*

Volcanic Event #1

Action Item:		Alignment with Plan Goals:	
Make available to county residents and the public information regarding volcanic events.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ The main concern in this county from an erupting volcano will be the ash fallout. ▪ Understanding of a hazard risks, empowers the public to use their resources more effectively to prepare for it. ▪ With limited agency resources available, it is necessary for the residents and general public to be able to respond. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Consult the Central Cascades Volcano Coordination Plan. ▪ Discuss what to expect and do if a volcano erupts, with children in school. ▪ Have information regarding volcanoes readily available to residents of the county and general public. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: County Court; Public Health; Cities of Fossil, Mitchell, and Spray; Medical Clinic; School Districts		External Partners: Media; OEM; DEQ; American Red Cross; USGS	
Potential Funding Sources: This is a low cost action that should be covered within the regular county and city budgets.		Priority: High	Timeline: Short Term

Volcanic Event #2

Action Item:		Alignment with Plan Goals:	
Evaluate the county's Emergency Operations Plan with regard to preparing for a volcanic event		Goal 1: Safety of life and property Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ The County Emergency Operations Plan (EOP) should contain a section on volcanic hazards. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Consider including an evaluation of the County EOP a part of the bi-annual maintenance meetings for the Wheeler County NHMP. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: County Court; Public Health; Cities of Fossil, Mitchell, and Spray; Medical Clinic; School Districts		External Partners: Media; OEM; DEQ; American Red Cross; USGS	
Potential Funding Sources: This is an action that should be covered within the regular county and city budgets.		Priority: High	Timeline: Short Term

Wildfire

- 1) Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to reduce wildland fire risk in Wheeler County.

Status & Explanation: *While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy.*

Retain, Delete and/or Modify: *Retained*

Timeline: *Routine*

Priority: *Routine*

- 2) Conduct risk assessment activities with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to assess areas in the county at risk to wildland fires.

Status & Explanation: *While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy.*

Retain, Delete and/or Modify: *Retained*

Timeline: *Routine*

Priority: *Routine*

- 3) Coordinate information and outreach activities with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to promote fire prevention and risk reduction.

Status & Explanation: *While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy.*

Retain, Delete and/or Modify: *Retained*

Timeline: *Routine*

Priority: *Routine*

- 4) Work with the Community Wildfire Protection Plan (CWPP) Local Coordinating Group to implement fuel reduction strategies to reduce the risk to wildland fires.

Status & Explanation: *While this a routine mitigation action, it is a critical part of the County's wildfire resilience strategy.*

Retain, Delete and/or Modify: *Retained*

Timeline: *Routine*

Priority: *Routine*

- 5) Make available to county residents and the public information regarding wildfires.

Status & Explanation: *Blend this action in with MH #9.*

Retain, Delete and/or Modify: *Modified*

Timeline: *Short term*

Priority: *High*

- 6) Provide Wheeler County Road Department with fire-fighting training and equipment

Status & Explanation: *No Action.*

Retain, Delete and/or Modify: *Retained*

Timeline: *Short term*

Priority: High

- 7) Work with ODF, USFS, BLM, and local fire districts to develop a "lessons learned" assessment of the 2018 wildfire season.

Status & Explanation: 2018 was the largest wildfire season on record in Wheeler County. Assess if existing wildfire protection practices worked. What did and what didn't? What types of pre-disaster efforts would have made a difference?

Retain, Delete and/or Modify: New Action

Timeline: Routine

Priority: Routine

- 8) Develop seasonal paid county firefighter positions which would provide wildfire Initial Attack in the summer months within the county.

Status & Explanation: Perhaps collaborate with adjacent counties on this to create economies of scale.

Retain, Delete and/or Modify: New Action.

Timeline: Medium Term

Priority: Moderate

- 9) Create an "Emergency Fund Application" process through the county. Identify and coordinate a means to request emergency funds from the county court in large fire events.

Status & Explanation: New Action.

Retain, Delete and/or Modify:

Timeline: Medium Term

Priority: Moderate

- 10) Complete a road, culvert, and stream crossing assessment to address existing situations which could result in problems for evacuation of residents and limit fire apparatus response during a wildfire situation.

Status & Explanation: ODF has some of these materials and others are available from other sources.

Retain, Delete and/or Modify: New Action

Timeline: Short term

Priority: High

- 11) Assist Rural Fire Protection Districts and City Fire Departments in upgrading their firefighting equipment, facilities and training as needed. This can be done by means of application of RFA/VFA or other Grants, obtaining FEPP equipment from ODF, obtaining training from BLM or other agencies, etc.

Status & Explanation: New Action.

Retain, Delete and/or Modify:

Timeline: Short term

Priority: High

- 12) Distribute fire prevention literature and material to home owners and campers. -Handout "Living with Fire" and "Beyond the Flames" brochures

Status & Explanation: *New Action.*

Retain, Delete and/or Modify:

Timeline: *Medium Term*

Priority: *High*

- 13)** Place fire prevention signs at strategic locations. Develop a county-wide fire prevention sign plan in cooperation with State Parks, US Army Corp of Engineers and the BLM to identify type of signs, locations, maintenance schedule, etc.

Status & Explanation: *Dovetails with Drought (DR) Mitigation Action #1.*

Retain, Delete and/or Modify: *New Action*

Timeline: *Short term*

Priority: *Medium*

Wildfire #1

Action Item:	Alignment with Plan Goals:
<p>Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to reduce wildland fire risk in Wheeler County.</p>	<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>
<p>Rationale for Proposed Action Item:</p>	
<ul style="list-style-type: none"> ▪ 2018 was the worst wildfire season on record for Wheeler County. ▪ The probability of a future WUI fire is high and the county’s vulnerability to a WUI fire is also high. Coordinating mitigation activities with the Wheeler County CWPP Local Coordinating Group will ensure effective implementation of actions that will reduce the high level of fire risk. ▪ As the representative body for agencies involved in wildland fire risk reduction in Wheeler County, the Local Coordinating Group is responsible for the following: <ul style="list-style-type: none"> • Providing oversight to activities related to the Wheeler County CWPP; • Ensuring representation and coordination among different coordinating group members; • Developing and refining goals for fire protection in Wheeler County; and • Developing a long-term structure for sustaining efforts of the Wheeler County CWPP. Coordinating with the Local Coordinating Group on wildland fire mitigation activities will ensure effective implementation of projects and avoid duplication of wildland fire risk reduction activities. ▪ Wheeler County Communities at risk include the incorporated cities of: Fossil, Mitchell and Spray as well as unincorporated communities: Richmond, Twickenham, and Winlock. 	
<p>Ideas for Implementation:</p>	
<ul style="list-style-type: none"> ▪ Coordinate wildland fire risk reduction activities with the Local Coordinating Group to assist them in accomplishing the following activities: ▪ Access and utilize federal funding to ensure continued federal funding for fuels reduction. ▪ Set realistic expectations for reducing wildland fire risk. This will provide attainable goals for the public to achieve and increase public awareness about wildland fire risk. ▪ Coordinate priorities for funding that will provide equitable distribution of funding and achieve appropriate landscape treatment. ▪ Promote visible projects and program successes to increase awareness among the public about wildland fire risk reduction. ▪ Find funding to support efforts that will lead to increased funding to implement programs. ▪ Identify incentives for fire protection and community participation to increase citizen participation in wildland fire risk reduction. ▪ Engage insurance companies to provide insurance industry investment in activities. ▪ Promote local investment in property, infrastructure, and business to increase economic development. ▪ Strengthen emergency management, response, and evacuation plans ▪ Coordinate emergency management efforts with the Local Coordinating Group, county government, and local fire districts. 	

<ul style="list-style-type: none"> Outline strategies and activities for public outreach in emergency management. 		
Coordinating Organization:	Wheeler County; CWPP Local Coordinating Group	
Internal Partners: County Court; County Road Department; Wheeler County Fire Defense Board; Cities of Fossil, Mitchell, and Spray; Community and County leaders ; Citizens	External Partners: ODF; USFS Umatilla and Ochoco	
Potential Funding Sources: Oregon Department of Forestry Wildland-Urban Interface grants, Oregon Forest Land Protection Fund, and other funding, FEMA PDM grants.	Priority: Routine	Timeline: Routine

Wildfire #2

Action Item:	Alignment with Plan Goals:	
<p>Conduct risk assessment activities with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to assess areas in the county at risk to wildland fires.</p>	<p>Goal 2: Increased cooperation and collaboration between groups and agencies Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:		
<ul style="list-style-type: none"> ▪ The probability of a future WUI fire is high and the county’s vulnerability to a WUI fire is also high. Coordinating mitigation activities with the Wheeler County CWPP Local Coordinating Group will ensure effective implementation of actions that will reduce the high level of fire risk. ▪ As the representative body for agencies involved in wildland fire risk reduction in Wheeler County, the Local Coordinating Group is responsible for the following: <ul style="list-style-type: none"> • Providing oversight to activities related to the Wheeler County CWPP; • Ensuring representation and coordination among different coordinating group members; • Developing and refining goals for fire protection in Wheeler County; and • Developing a long-term structure for sustaining efforts of the Wheeler County CWPP. Coordinating with the Local Coordinating Group on wildland fire mitigation activities will ensure effective implementation of projects and avoid duplication of wildland fire risk reduction activities. ▪ Wheeler County Communities at risk include the incorporated cities of: Fossil, Mitchell and Spray as well as unincorporated communities: Richmond, Twickenham, and Winlock. 		
Ideas for Implementation:		
<ul style="list-style-type: none"> ▪ Develop wildland fire risk assessment strategies that will encourage public involvement and homeowners. ▪ Work with partners to develop risk assessment programs. Components could include: <ul style="list-style-type: none"> • Determining what the assessments of communities would include and who would be responsible for conducting them. • Determining if there is a need to prioritize at-risk communities based on vulnerability and begin the program in the most vulnerable; highest priority communities first. • Identifying and developing the most appropriate methods of communication to reach at-risk homeowners. • Identify hazardous fuels treatment projects. • Identify funding sources to pay for risk assessment programs. 		
Coordinating Organization:	CWPP Local Coordinating Group	
<p>Internal Partners: Wheeler County; County Court; Wheeler County Fire Defense Board; Sheriff; Cities of Fossil, Mitchell, and Spray; Community and County leaders.</p>	<p>External Partners: ODF; USFS Umatilla and Ochoco</p>	
<p>Potential Funding Sources: Oregon Department of Forestry Wildland-Urban Interface grants, Oregon Forest Land Protection Fund, and other funding, FEMA PDM grants.</p>	<p>Priority: Routine</p>	<p>Timeline: Routine</p>

Wildfire #3

Action Item:	Alignment with Plan Goals:	
<p>Coordinate information and outreach activities with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to promote fire prevention and risk reduction.</p>	<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:		
<ul style="list-style-type: none"> ▪ The probability of a future WUI fire is high and the county’s vulnerability to a WUI fire is also high. Coordinating mitigation activities with the Wheeler County CWPP Local Coordinating Group will ensure effective implementation of actions that will reduce the high level of fire risk. ▪ The Wheeler County Community Wildfire Protection Plan was adopted by the County Court and is the official plan for reducing wildfire risk in the county. ▪ Coordinating this plan and the CWPP is important to increasing the resiliency of Wheeler County to wildfires. 		
Ideas for Implementation:		
<ul style="list-style-type: none"> ▪ The Local Coordinating Group is to provide guidance for all elements of planning and implementation of the Wheeler County Community Wildfire Protection Plan. The Local Coordinating Group will continue to provide oversight through review of the plan and meetings with the local agencies and interested parties. ▪ The Local Coordinating Group is mandated to meet regularly per the guidance in the adopted CWPP. ▪ The bi-annual maintenance meetings for this NHMP should be coordinated with the CWPP to share information and, perhaps, meet as one body to create synergies between the groups. As a practical matter, given the relatively small population base of Wheeler County, the two groups are likely to be composed of many of the same people. It makes sense to integrate the two groups where appropriate. ▪ One goal of the CWPP is Information and Outreach. Table 5.1 of the CWPP lists a number of action items that should be considered when implemented this NHMP action item. 		
Coordinating Organization:	CWPP Local Coordinating Group	
<p>Internal Partners: Wheeler County; County Court; Wheeler County Fire Defense Board; Sheriff; Cities of Fossil, Mitchell, and Spray; Community and County leaders.</p>	<p>External Partners: ODF; USFS Umatilla and Ochoco; NPS</p>	
<p>Potential Funding Sources: This is an action that should be covered within the regular county and city budgets.</p>	<p>Priority: Routine</p>	<p>Timeline: Routine</p>

Wildfire #4

Action Item:	Alignment with Plan Goals:
<p>Work with the Community Wildfire Protection Plan (CWPP) Local Coordinating Group to implement fuel reduction strategies to reduce the risk to wildland fires.</p>	<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>
<p>Rationale for Proposed Action Item:</p>	
<ul style="list-style-type: none"> ▪ In a self-completed hazard analysis, the probability for a future WUI fire is high (that the county would be likely to have a major WUI fire event in the next 10-35 years) and that the county’s vulnerability to a WUI fire is also high. Working with the CWPP Local Coordinating Group to implement fuel reduction strategies will ensure a coordinated effort to reduce the overall risk to wildland fire. ▪ The Wheeler County Community Wildfire Protection Plan identified fuel reduction as an objective to reduce risk to wildland fire. Communities or homes that reduce sources of fuel for fire, such as woodpiles and low hanging trees or shrubs can greatly reduce their property’s risk to fire damage. ▪ The premiere local example program is the Deschutes Forest Collaborative Project. There are a local leader in innovative wildfire management. ▪ Other example programs: <ul style="list-style-type: none"> ○ Grant County, NM – “Grant County WILDLAND-URBAN INTERFACE Landowner Assistance Program”: Provides cost-sharing between the State (70%) and the landowner (30%) for fuels treatments ○ Summit County, CO – 2002 Economic Action Program NFP Grant funds cost-share thinning and recycling of wastes ○ Humboldt and Del Norte Counties, CA – Free chipping for residents through the Community Chipping Program ○ Helena, MT – Project Impact Homeowner Assistance Program: A cost-share program to clear defensible space ▪ The three incorporated cities in Wheeler County – Fossil, Mitchell and Spray - have limited resources and rely on the county for certain services and public facilities. Because the cities rely so heavily upon the County to provide services, this action is considered to be a multi-jurisdictional action because it benefits both the County and all the participating cities. ▪ Wheeler County Communities at risk include the incorporated cities of: Fossil, Mitchell and Spray as well as unincorporated communities: Richmond, Twickenham, and Winlock. 	
<p>Ideas for Implementation:</p>	
<ul style="list-style-type: none"> ▪ The Wheeler County CWPP has a number of action items related to fuels reduction. Coordinating the implementation of this action with the CWPP is prudent. ▪ Identify funding sources or cost-sharing strategies to help pay for fuel treatment projects. ▪ Identify fuels treatment projects on lands using the risk assessment data. ▪ Identify strategies for coordinating fuels treatment projects at a landscape scale. ▪ Provide special need citizens with an opportunity to participate in programs. ▪ Develop long-term strategies for maintenance of fuels reduction 	

- Focus strategic planning for hazardous fuels treatment projects on evacuation routes/corridors (County Roads, FS Roads, State Highways, Public Access Roads, Private Drives).
- Promote information and outreach through all fuels reduction programs to ensure strong community involvement in fuels reduction and wildland fire prevention projects.
- Develop a method for determining community values and concerns about various fuel treatment options.
- Develop a method that can translate the community values, concerns, and input regarding various fuel treatment options into recommended options appropriate for the community.
- Engage local fire chiefs, ODF, and the US Forest Service personnel to do site visits to “hot spots”.

Coordinating Organization:		CWPP Local Coordinating Group	
Internal Partners:		External Partners:	
Wheeler County; County Court; Wheeler County Fire Defense Board; Sheriff; Cities of Fossil, Mitchell, and Spray; Community and County leaders		ODF; USFS Umatilla and Ochoco; NPS	
Potential Funding Sources: Oregon Department of Forestry Wildland-Urban Interface grants, Oregon Forest Land Protection Fund, and other funding, FEMA PDM grants.		Priority: Routine	Timeline: Routine

Wildfire #5

Action Item:		Alignment with Plan Goals:	
Make available to county residents and the public information regarding wildfires.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Residents need to know of the existence of the County Wildfire Protection Plan. ▪ Those responsible for protection need to know where water sources are in the county ▪ Those responsible for protection must ensure that evacuation routes are in good repair and accessible. ▪ Those responsible for protection need to be sure Mutual Aid Agreements are in place as appropriate. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Residents should be told that there are many resources available to learn about and prepare for wildfires in Wheeler County. ▪ The Oregon Department of Forestry's Fire Program is a multifaceted program to deal with wildfires in Oregon. Residents of Wheeler County should be educated about such things as: fire prevention, wildfire urban land interface fuel reduction and funding available to reduce fuel around structures, and where to access current information once a fire starts. ▪ Information on wildfires, wildfire prevention, forest management activities in the county and other related information should be posted on the County website, County social media, in the local newspaper and in direct mailers to all county residents on a regular basis. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: Sheriff; Cities of Fossil, Mitchell, and Spray; Fire Districts; County Public Works		External Partners: Oregon Department of Forestry; American Red Cross; Humane Society; Utilities; BLM; USFS; State Fire Marshall; Oregon Department of Fish & Wildlife, FEMA	
Potential Funding Sources: This is a collaborative effort that includes local, state and federal partners. Seek funding through partner agencies as well as grants from FEMA.		Priority: High	Timeline: Short Term

Wildfire #6

Action Item:		Alignment with Plan Goals:	
Provide Wheeler County Road Department with fire-fighting training and equipment.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ In a self-completed hazard analysis, the probability for a future WUI fire is high (that the county would be likely to have a major WUI fire event in the next 10-35 years) and that the county's vulnerability to a WUI fire is also high. Coordinating information and outreach activities with the Wheeler CWPP Local Coordinating Group will ensure the county and the Group will conduct an effective public outreach campaign to promote fire prevention and risk reduction activities. ▪ A community's response capabilities can have a significant impact on the impact wildfire has on a community. Wheeler County's Road Department currently lacks adequate training and equipment. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Identify appropriate training for Road Department staff. ▪ Seek funding to support training. ▪ Identify appropriate funding sources for the purchase of firefighting equipment such as fire pants, shirts, fire shelters, and web gear. DHS' Assistance to Firefighters Grant. 			
Coordinating Organization:		Wheeler County Road Department	
Internal Partners: Wheeler County, Fire Districts		External Partners: State Fire Marshall; BLM; USFS	
Potential Funding Sources: DHS' Assistance to Firefighters Grant, FEMA PDM grants, consult the USDA website "Rural Fire Department Resources for Local Officials" https://www.nal.usda.gov/ric/rural-fire-department-resources-local-officials#FPA		Priority: High	Timeline: Short Term

Wildfire #7

Action Item:		Alignment with Plan Goals:	
Work with ODF, USFS, BLM, and local fire districts to develop a "lessons learned" assessment of the 2018 wildfire season.		<p>Goal 1: Safety of life and property.</p> <p>Goal 2: Increased cooperation and collaboration between groups and agencies.</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education.</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ The 2018 fire season was the worst on record for Wheeler County. ▪ Lessons learned will help identify successes and failures. ▪ Lessons learned will identify recommendations to improve future performance. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Utilize the bi-annual NHMP maintenance meetings and/or the regular Community Wildfire Protection Plan (CWPP) Local Coordinating Group to conduct a lessons learned exercise/workshop. 			
Coordinating Organization:		CWPP Local Coordinating Group	
Internal Partners: County Emergency Management, Wheeler County, County Court, Wheeler County Fire Defense Board, Sheriff, Cities of Fossil, Mitchell and Spray		External Partners: ODF, USFS Umatilla and Ochoco, BLM	
Potential Funding Sources: This is an action that should be covered within the regular county and city budgets.		Priority: Routine	Timeline: Routine

Wildfire #8

Action Item:		Alignment with Plan Goals:	
Develop seasonal paid county firefighter positions which would provide wildfire Initial Attack in the summer months within the county. Improve Fire Department volunteer recruitment and retention on a county wide basis.		Goal 1: Safety of life and property. Goal 2: Increased cooperation and collaboration between groups and agencies.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ 2018 was the worst wildfire season on record in Wheeler County. ▪ The Jennie’s Peak Fire alone consumed over 45,956 acres – <u>which is more than half the size of the entire City of Portland.</u> ▪ In a self-completed hazard analysis, the probability for a future WUI fire is high (that the county would be likely to have a major WUI fire event in the next 10-35 years) and that the county’s vulnerability to a WUI fire is also high. ▪ A community’s response capabilities can have a significant impact on the impact wildfire has on a community. Wheeler County’s local firefighting capability is currently all volunteer and lacks adequate training and equipment. ▪ Seasonal staff would bring trained personnel to the county focused solely on the counties biggest natural hazard threat. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Identify the total staffing need for the County and when the seasonal staff will be needed; ▪ Coordinate with the Oregon Department of Forestry on logistics and funding. ▪ Involve local county leadership, state elected officials and the members of the CWPP Local Coordinating Group in developing and advocating for this program. ▪ Seek synergies and economies of scale by partnering with surrounding counties. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: Wheeler County Commission, the Cities of Fossil, Mitchell and Spray, CWPP Local Coordinating Group		External Partners: ODF, USFS, Surrounding Counties, State elected officials.	
Potential Funding Sources: explore State and Federal funding opportunities with ODF, USFS, and Bureau of the Interior. Contact the Oregon Regional Solutions representative for ideas.		Priority: Moderate	Timeline: Medium Term

Wildfire #9

Action Item:		Alignment with Plan Goals:	
Assist Rural Fire Protection Districts and City Fire Departments in upgrading their firefighting equipment, facilities and training as needed.		Goal 1: Safety of life and property. Goal 2: Increased cooperation and collaboration between groups and agencies.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ In order to effectively respond to wildfires in Wheeler County, it is critical that the organizations, staff and volunteers have adequate equipment, facilities and training. ▪ Wildfire is the #1 natural hazard risk to Wheeler County. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Consult the USDA’s “Rural Fire Department Resources for Local Officials” webpage for information and funding sources available to rural fire departments. https://www.nal.usda.gov/ric/rural-fire-department-resources-local-officials#TR ▪ Multiple federal and private funding sources are available for equipment and training. ▪ Coordinate with ODF on obtaining equipment as it becomes available. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: Rural Fire Districts, City Fire Departments, CWPP Local Coordinating Group		External Partners: ODF, BLM, USFS	
Potential Funding Sources: See Ideas for Implementation above.		Priority: Moderate	Timeline: Medium

Wildfire #10

Action Item:		Alignment with Plan Goals:	
Distribute fire prevention literature and material to home owners and visitors.		Goal 1: Safety of life and property. Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ The 2018 fire season was the worst on record for Wheeler County. ▪ Every year a growing number of people are living where wildfires are a real risk. In 2018 more than 58,000 fires burned nearly nine million acres across the U.S. More than 25,000 structures were destroyed, including 18,137 residences and 229 commercial structures. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Consult with the Oregon Department of Forestry. ODF's Keep Oregon Green program has been a source of information on wildfire prevention in Oregon for many decades. ▪ The National Firewise Protection Association is another prime source of free and for purchase NFPA's Firewise USA program teaches people how to adapt to living with wildfire and encourages neighbors to work together and take action now to prevent losses. ▪ Post literature on the County and city websites, place in mailers to county residents, make information available to visitors via area lodging, State Parks and local businesses. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: Rural Fire Districts, City Fire Departments, CWPP Local Coordinating Group, local businesses, the cities of Fossil, Mitchell and Spray.		External Partners: ODF, USFS, BLM, the Oregon Regional Solutions office, Travel Oregon, Oregon State Parks.	
Potential Funding Sources: See Ideas for Implementation above. Also consult with Travel Oregon, the local Oregon Regional Solutions staff person, and Oregon State Parks to discuss.		Priority: High	Timeline: Short

Wildfire #11

Action Item:		Alignment with Plan Goals:	
Conduct fire prevention programs in schools.		<p>Goal 1: Safety of life and property</p> <p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Teaching school age children about the risks of wildfire, the benefits of prevention and how to go about reducing the risk of wildfire provides a foundation of knowledge that they will take with them as they become adults. ▪ School are children also bring information home to share with the parents and siblings, increasing that knowledge base. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Consult with the Oregon Department of Forestry. ODF's Keep Oregon Green program has been a source of information on wildfire prevention in Oregon for many decades. ▪ The National Firewise Protection Association (NFPA) is another prime source of free and for purchase NFPA's Firewise USA program teaches people how to adapt to living with wildfire and encourages neighbors to work together and take action now to prevent losses. ▪ Partner with the Mid-Columbia Fire Prevention Co-Op (or other) for team teaching once a year within the county and they are limited to what few resources they currently have to conduct other small prevention efforts. ▪ Other resources that may be utilized would be the use of Gilliam County Fire Prevention Trailer, having a budget for prevention materials (stickers, plastic helmets, pencils, etc.), the ability to teach older grades fire extinguisher use and other similar activities. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: County School Districts		External Partners: ODF, NFPA, Gilliam County, Mid-Columbia Fire Prevention Co-op	
Potential Funding Sources: Much of the literature identified above is available at no charge, contact the Oregon Department of Education and ODF to discuss potential funding sources.		Priority: High	Timeline: Medium Term

Wildfire #12

Action Item:		Alignment with Plan Goals:	
Provide information about what type of fire resistive plants to use for landscaping.		Goal 1: Safety of life and property Goal 2: Increased cooperation and collaboration between groups and agencies Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ As homeowners continue to build in the wild and urban interface, they must take special precautions to protect their homes. ▪ One way to do this is to create a defensible space around the home, and one important factor can be using fire-resistant plants in landscaping. ▪ Actions to create a defensible space do not ensure that your home will survive a wildfire, they substantially increase the chances. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ The OSU Extension Service offers information and advice on this topic. They have a guidebook called <i>Fire-Resistant Plants for Home Landscapes</i> that is available for a small fee. ▪ The OSU Extension Service also has a guide to xeriscaping in the high desert. Xeriscaping is water-smart gardening. It incorporates native plants which use less water which has the added benefit in this drought prone area. The guidebook is titled <i>An Introduction to Xeriscaping in the High Desert and Pictorial Plant Guide for Central and Eastern Oregon</i>. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners:		External Partners: OSU Extension Service	
Potential Funding Sources: Consult with the OSU Extension Service, ODF and Wheeler County.		Priority: Medium	Timeline: Short Term

Windstorm

- 1) Make available to county residents and the public information regarding windstorms.

Status & Explanation: No Action.

Retain, Delete and/or Modify:

Timeline: Routine

Priority: Routine

Windstorm #1

Proposed Action Item: WDS#1		Alignment with Plan Goals:	
Make available to county residents and the public information regarding windstorms.		Goal 2: Increased cooperation and collaboration between groups and agencies Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Every fall and winter, windstorms cause extensive damage, including the loss of electricity throughout the Pacific Northwest. By preparing ahead of time, Wheeler County can save lives and reduce the damage caused by windstorms and other weather-related hazards. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Survey information available from FEMA and the State of Oregon on the types of educational materials already that already exist. ▪ Contact your local emergency management office or the Portland-based National Weather Service office to find out what types of storms are most likely to occur in your community. ▪ Assemble an emergency kit and make a family communication plan. ▪ If residents have a home generator, make sure they know how to use it safely. Improper use of a generator can cause carbon monoxide poisoning. ▪ Find out who in Wheeler County might need special assistance, such as the elderly, disabled, and non-English speaking neighbors. ▪ Advise residents to know what emergency plans are in place at their workplace, school and daycare center. ▪ Encourage residents to conduct a home safety evaluation to find out which nearby trees could fall in a windstorm. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: County Court; Cities of Fossil, Mitchell, and Spray		External Partners: Utilities; Media; ODOT; American Red Cross	
Potential Funding Sources: This is an action that should be covered within the regular county and city budgets.		Priority: Routine	Timeline: Routine

Winter Storm

- 1) Educate farmers about ways to protect livestock from the effects of winter storms.

Status & Explanation: *No Action.*

Retain, Delete and/or Modify:

Timeline: *Routine*

Priority: *Routine*

- 2) Make available to county residents and the public information regarding winter storms.

Status & Explanation: *No Action.*

Retain, Delete and/or Modify:

Timeline: *Routine*

Priority: *Routine*

Winter Storm #1

Proposed Action Item: WTS#1		Alignment with Plan Goals:	
Educate farmers about ways to protect livestock from the effects of winter storms.		Goal : Safety of life and property Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Wheeler County vulnerability rating for winter storms is high. In addition, Wheeler County has a high probability to winter storms. By encouraging farmers to better protect their livestock from winter storms, impacts to the local economy can be minimized. ▪ According to the Wheeler County Community Profile, 20% of employees work in the Agriculture industry in the County. ▪ The Disaster Mitigation Act of 2000 requires communities to identify a comprehensive range of specific mitigation actions and projects for each hazard [201.6(c)(3)(ii)]. Protecting important community assets from winter storms is important. ▪ The three incorporated cities in Wheeler County – Fossil, Mitchell, and Spray - have limited resources and rely on the county for certain services and public facilities. The cities should coordinate with the county to encourage farmers to protect livestock, establishing a unified countywide effort to reduce the impacts on the agricultural based economy. ▪ 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Wheeler County should partner with Oregon State University Extension Service and the Oregon Department of Agriculture for this effort. ▪ Installation of snow fences to reduce drifting snow on roads and paths, which could block access to barns, feed and water. ▪ Horses and livestock should have a shelter where they can be protected from wind, snow, ice and rain. ▪ Grazing animals should have access to a protected supply of food and non-frozen water. 			
Coordinating Organization:		Wheeler County	
Internal Partners:		External Partners: OSU Extension; Oregon Department of Agriculture	
Potential Funding Sources: Seek out funding opportunities from the Oregon Dept. of Agriculture and OSU Extension Service.		Priority: Routine	Timeline: Routine

Winter Storm #2

Proposed Action Item: WTS#2		Alignment with Plan Goals:	
Make available to county residents and the public information regarding winter storms.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies</p> <p>Goal 3: Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> ▪ Winter Storms increase the risk of down communication and power lines. ▪ Winter Storms can increase the risk of driving on roads. ▪ Winter Storms can increase the risk of low visibility on roads. ▪ Winter Storms can increase the risk of trees and tree limbs on homes. ▪ Winter Storms can increase the risk of running out of household supplies. ▪ Winter Storms can increase the risk of personal and vehicle accidents and injuries. ▪ The three incorporated cities in Wheeler County –Fossil, Mitchell and Spray-have limited resources and rely on the county for certain services and public facilities. Because the cities rely so heavily upon the County to provide services, this action is considered to be a multi-jurisdictional action because it benefits both the County and all the participating cities. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> ▪ Educate the public on what to do in a winter storm. ▪ A few sources of information on preparing for winter storms include the Oregon Health Authority, the Center for Disease Control, and FEMA: https://www.ready.gov/winter-weather. 			
Coordinating Organization:		Wheeler County Emergency Management	
Internal Partners: County Court; County Road Department; Cities of Fossil, Mitchell, and Spray		External Partners: ODOT; American Red Cross; FEMA; National Weather Service	
Potential Funding Sources: This is an action that should be covered within the regular county and city budgets.		Priority: Routine	Timeline: Routine

Appendix B: City Addenda

Purpose

This document serves as the City of Fossils Addendum to the Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan (MNHMP, NHMP). This addendum supplements information contained in Section I: Basic Mitigation Plan of this NHMP, which serves as the foundation for this jurisdiction's addendum, and Section II: Mitigation Resources, which provides additional information. This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Plan Process, Participation, and Adoption

This section of the NHMP addendum addresses 44 CFR 201.6(c)(5), *Plan Adoption*, and 44 CFR 201.6(a)(3), *Participation*.

This project is funded through the Federal Emergency Management Agency's (FEMA) FY16 Pre-Disaster Mitigation Competitive Grant Program. After funding was awarded in July 2017 to DLCD for two PDM 16 grants (PDMC-PL-10-2016-003 and PDMC-PL-10-2016-005), a regional kickoff meeting for all eight counties involved in the PDM 16 grants was held on July 18, 2017.

To be eligible to receive certain pre- and post-disaster natural hazard mitigation funds from FEMA, local governments must have a current, FEMA-approved NHMP. NHMPs must be updated and re-approved every five years. By developing this addendum to the Wheeler County NHMP, locally adopting it, and having it approved by FEMA, the City of Fossil will regain eligibility for FEMA Hazard Mitigation, Pre-Disaster Mitigation, and Flood Mitigation Assistance grant program funds.

The Wheeler County NHMP, and City of Fossil Addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The project Steering Committee guided the process of developing the plan. For more information on the composition of the Steering Committee see Appendix C: *Planning and Public Process*.

The Wheeler County Emergency Manager is the designated local convener and will take the lead in implementing, maintaining, and updating the addendum to the NHMP in collaboration with the Steering Committee members.

The City's addendum reflects decisions made at the Wheeler County NHMP Steering Committee meetings and during subsequent work and communication with the NHMP Project Manager.

Public participation was achieved with the establishment of the Steering Committee, which was comprised of officials representing different organizations and sectors. The Steering Committee was closely involved throughout the development of the plan and served as the local oversight body for the plan's development. In addition, community members outside of the Steering Committee were provided an opportunity for comment via the plan review process.

The Wheeler County NHMP was approved by FEMA on December 13, 2019 and the Fossil addendum was adopted via resolution on December 10, 2019. This NHMP is effective through December 12, 2024.

Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

During the 2019 Wheeler County NHMP update process the County and Steering Committees re-evaluated the existing Mitigation Action Items. Following the review, mitigation actions were updated, noting what accomplishments had been made, and whether the actions were still relevant and if existing language needed to change. New action items were identified at this time. The City's priority actions are listed below in Table FS-1 Fossil Priority Action Items. For the complete list of actions see Appendix A.

Because this is the first formal addendum for the City of Fossil, all of the 2019 mitigation actions were created during this update to the county NHMP.

Table FS-1 Fossil Priority Action Items

Action Item #	Description	Managing Department/ Agency	Timeline	Potential Funding Source(s)
MH #8	Secure funding to improve infrastructure that will increase the capacity and availability of water in order to protect the City of Fossil from the natural hazards (i.e. drought, wildfire, etc.) that occur on an annual basis.	City of Fossil	LT (8-10 years)	State or federal grants
FL #5	Coordinate with the State Floodplain Coordinator and the Department of Land Conservation and Development (DLCD) to update the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for Wheeler County and the incorporated cities participating in the Nation Flood Insurance Program (NFIP) and Risk Map.	Wheeler County Planning Department	Routine	This is a low cost action that should be covered within the regular county and city budgets.
WF #1	Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to reduce wildland fire risk in Wheeler County.	Wheeler County; CWPP Local Coordinating Group	Routine	Oregon Department of Forestry Wildland-Urban Interface grants, Oregon Forest Land Protection Fund, and other funding, FEMA PDM grants.
WF #5	Make available to county residents and the public information regarding wildfires.	Wheeler County Emergency Management	High	This is a collaborative effort that includes local, state and federal

partners. Seek funding through partner agencies as well as grants from FEMA.

WF #10	Distribute fire prevention literature and material to home owners and visitors.	Wheeler County Emergency Management	High	See Ideas for Implementation in Mitigation Action Commentary WF #10, Appendix A. Also consult with Travel Oregon, the local Oregon Regional Solutions staff person, and Oregon State Parks to discuss.
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MH = Multi-Hazard, FL = Flood, WF = Wildfire.

Plan Implementation and Maintenance

The City Council will be responsible for adopting the City of Fossil addendum to the Wheeler County NHMP. This addendum designates a coordinating body and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county’s multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The county steering committee will convene on a semi-annual basis and will provide opportunities for the cities to report on NHMP implementation and maintenance during their meetings. The Wheeler County Emergency Manager will serve as the convener and will be responsible for assembling the steering committee (coordinating body). The steering committee will be responsible for:

- Identifying new risk assessment data;
- Reviewing status of mitigation actions;
- Identifying new actions; and
- Seeking funding to implement the city’s mitigation strategy (actions).

The convener will also remain active in the county’s implementation and maintenance process.

Implementation through Existing Programs

Many of the recommendations in the Natural Hazards Mitigation Plan are consistent with the goals and objectives of the city's existing plans and policies. Where possible, the City of Fossil will implement the NHMP's recommended actions through existing plans and policies. Plans and policies already in existence have support from local residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented.

Fossil's acknowledged comprehensive plan is the Fossil Comprehensive Plan, which was most recently updated in 2003. The City implements the plan through the City Zoning Ordinances. Fossil currently has the following plans, programs, and policies that relate to natural hazard mitigation.

Table FS-2 Legal and Regulatory Resources Available for Hazard Mitigation

Regulatory Tool	Name	Effects on Hazard Mitigation
Plans	City of Fossil Comprehensive Plan (2001)	The City of Fossil should incorporate the Wheeler County Natural Hazards Mitigation Plan mitigation actions into the City Comprehensive Plan. This will help identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the natural hazards mitigation plan’s action items through existing plans and policies increases their likelihood of being supported and getting updated, and maximizes the cities resources..
	Wheeler County Community Wildfire Protection Plan (2006) ¹	<p>The plan is a result of a county-wide effort initiated to identify and prioritize wildfire hazards and to develop a strategy to reduce those hazards. The plans assists the county, the communities within the county, and the fire districts in making them eligible and securing grants and/or other funding sources to treat hazardous fuel situations and to better prepare residents for wildfires that may occur. It includes a strategy with action projects which, when implemented, will decrease the potential for large wildfires in the county and reduce the potential loss of property values and threat to human life.</p> <p>The Community Wildfire Protection Plan (CWPP) is intended to be adopted for incorporation within the Wheeler County Natural Hazards Mitigation Plan. The CWPP contains goals and actions that seek to minimize the risk of wildfire hazards to the county.</p>
	Wheeler County Emergency Operations Plan (2012)	<p>The Emergency Operations Plan (EOP) is an all-hazard plan that describes how Wheeler County will organize and respond to emergencies and disasters in the community. Response to emergencies in order to maximize the safety of the public and to minimize property damage is a primary responsibility of government. It is the goal of Wheeler County that responses to such conditions are conducted in the most organized, efficient, and effective manner possible. To aid in accomplishing this goal, Wheeler County has incorporated the principles of the National Incident Management System (NIMS) and Incident Command System (ICS) into emergency operations, plans, and ongoing activities.</p> <p>The EOP attempts to be all-inclusive in combining the following four phases of emergency management.</p> <ul style="list-style-type: none"> ·Mitigation: activities that eliminate or reduce the vulnerability to disasters; ·Preparedness: activities that governments, organizations, and individuals develop to save lives and minimize

¹ 2019 Wheeler County CWPP in draft form as of September 17, 2019.

damage;
 ·Response: activities that prevent loss of lives and property and provide emergency assistance; and
 ·Recovery: short- and long-term activities that return all systems to normal or improved standards.

The NHMP is concerned with mitigation and preparedness. The EOP should incorporate the Wheeler County Natural Hazards Mitigation Plan mitigation actions where appropriate.

Wheeler County
 Transportation Plan
 (2001)

The Wheeler County Transportation System Plan documents the County, Cities, and ODOT’s priority programs that are to be carried forward for funding and implementation over the next 20 years. The TSP builds consensus among the Cities within Wheeler County, the County and ODOT on the transportation needs and priority projects for the communities, and is based on input from local citizens, stakeholders, staff and appointed and elected officials. The County has prioritized building livable, connected communities. The TSP is intended to be flexible to respond to changing community needs and revenue sources over the next 20 years.

Transportation systems are important in evacuating and responding to natural disasters. Mitigation actions that focus on strengthening transportation systems should be incorporated into the Wheeler County Transportation System Plan.

Table FS-3 Administrative and Technical Resources for Hazard Mitigation

Staff/Personnel Resources	Department/Division Position
Four City Council members and Mayor ²	Elected Office
Director of Public Works	Full time City employee
City Recorder	Full time City employee
Library Aide	Full time City employee

² City Councilors in Fossil also serve as City Commissioner for the various City departments, including Water, Parks, Ambulance Board, Sewer, Streets and Planning.

Table FS-4 Financial Resources for Hazard Mitigation

Financial Resources	Effect on Hazard Mitigation
General funds	Yes
Authority to levy taxes for specific purposes	Yes
Incur debt through general obligation bonds	No
Grants (state)	Yes
Collected fees: Water, sewer, host fees, Windmill SIP fees	No

Note: See Appendix E – Grant Programs for additional financial resources.

Continued Public Participation

Keeping the public informed of the city’s efforts to reduce the city’s risk to future natural hazards events is important for successful plan implementation and maintenance. The city is committed to involving the public in the plan review and updated process.

Plan Maintenance

The Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community’s demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

Phase 1: Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.

Phase 2: Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.

Phase 3: Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein and within and Chapter 2: *Community Profile* and Chapter 3: *Risk Assessment*. The risk assessment process is graphically depicted in Figure FS-1 below. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

Figure FS-1 Understanding Risk



Source: FEMA Local Mitigation Planning Handbook, 2013.

Community Asset Identification

This section provides information on city specific assets. For additional information on the characteristics of Fossil, in terms of geography, environment, population, demographics, employment and economics, as well as housing and transportation see Chapter 2: *Community Profile*. Many of these community characteristics can affect how natural hazards impact communities and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation.

Community Characteristics

The City of Fossil is located in north-central Wheeler County along Highway 19, in an area of rolling hills of rangeland and forests. Highway 19 is a main north-south route through the county connecting Fossil to Condon (Gilliam County) to the north and Spray to the south. Fossil is at an elevation of 2,673 feet.³ The climate is characterized by dry, warm summers and cold, relatively dry winters that can receive significant snowfall. The average monthly temperatures range from 45-85 degrees in July, and 24-41 degrees in January. The city receives approximately 15.9 inches of rain and 14 inches of snow each year⁴. The wettest months are typically November and December.

Fossil is the county seat, and contains most of the county services, including the courthouse, small grocery store, a gas station, a US Post Office, the Wheeler High School and Grade School, the County Sheriff, Health Department and Emergency Management Office. The nearest gas station is in Biggs Junction, 18 miles to the north.

Economy

The median household income in Fossil is \$28,250 which is lower than that of Wheeler County as a whole (\$33,403) and significantly lower than the state average of \$53,270. The unemployment rate in the city is 13.0%.⁵ There are 161 people over the age of 16 employed in the city (43%). Of these, 85 are in the private sector, while 38 are government workers and 17 are self-employed. The construction industry employs the most people (22.1%), followed by public administration (14.3%), and recreation, accommodation and food services (12.9%).

Population Characteristics

The total population of Fossil is 473 people.⁶ The median age is 56.1 and 32.0% of the Fossil population is over 65 years old, while just 18.6% is under 18 years old. Almost a fifth of the population (19.2%) lives below the federal poverty level.⁷ It should be noted that Census data can be inaccurate at the small city level.

There are 272 housing units in the city of which 231 are occupied. Of the 231, 156 are owner occupied, while 75 are rentals. 90.8% of the population has lived in the same house as at least 4 years indicating high stability. The majority of houses in Fossil were built before 1979 (81.9%) and 51.8% were built before 1939. Only 9 new housing units have been built in Fossil since the year 2000. The average household size in Fossil is under 2 people.⁸ 78.3% of housing units are heated by two sources: electricity (35.9%) and fuel oil/kerosene (42.4%).

A few conclusions that can be drawn from this data include:

- Fossil is one of the poorest towns in Oregon. It will be harder than many other towns in Oregon for residents to prepare and recover from a natural disaster.

³ [Oregon Blue Book, retrieved May 15, 2018. https://sos.oregon.gov/blue-book/Pages/local/cities/e-k/fossil.aspx](https://sos.oregon.gov/blue-book/Pages/local/cities/e-k/fossil.aspx)

⁴ Western Regional Climate Center, NCDC Monthly Tabular Data, 1923-2018.

⁵ American Fact Finder 2017 (5-Year Estimates), U.S. Census Bureau

⁶ American Fact Finder 2017 (5-Year Estimates), U.S. Census Bureau

⁷ American Fact Finder 2017 (5-Year Estimates), U.S. Census Bureau

⁸ American Fact Finder 2017 (5-Year Estimates), U.S. Census Bureau

- Housing stock is quite old in Fossil and may be more vulnerable to the impacts of various natural hazards such as winter storms.
- Fossils population is continues to show of a trend of a growing elderly population, often living alone.

This information should be taken into account when developing and prioritizing mitigation actions.

Asset Inventory

Asset inventory is the first step of a vulnerability analysis. Assets that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure.

Table FS-5 Fossil Critical Facilities and Infrastructure

Facility	Facility Type
Asher Clinic	Health Care
Fossil City Hall	City Government
Fossil Elementary School	Education
Fossil Volunteer Fire Department	First Responder
Wheeler County Courthouse	County Government
Wheeler High School	Education
Federal Aviation Administration (FAA) Radar Dome	Regional Aviation Navigation
Rancheria (Rancherie) Rock Lookout	Wildfire Lookout

Source: Wheeler County NHMP Steering Committee, March 2018.

Hazard Analysis

Hazard Analysis Methodology

This NHMP utilizes a hazard analysis methodology that was first developed by FEMA circa 1983, and gradually refined by the Oregon Military Department’s Office of Emergency Management (OEM) over the years.

The methodology produces scores that range from 24 (lowest possible) to 240 (highest possible). Vulnerability and probability are the two key components of the methodology. Vulnerability examines both typical and maximum credible events, and probability endeavors to reflect how physical changes in the jurisdiction and scientific research modify the historical record for each hazard. Vulnerability accounts for approximately 60% of the total score, and probability approximately 40%.

This method provides the jurisdiction with a sense of hazard priorities, or relative risk. It doesn't predict the occurrence of a particular hazard, but it does "quantify" the risk of one hazard compared with another. By doing this analysis, planning can first be focused where the risk is greatest.

In this analysis, severity ratings, and weight factors, are applied to the four categories of history, vulnerability, maximum threat (worst-case scenario), and probability as shown in the table below.

City of Fossil Hazard Analysis

The Wheeler County Steering Committee developed a hazard vulnerability assessment (HVA) for the county as a whole. The City of Fossil is a member of the County Steering Committee and is utilizing the county’s HVA by proxy.

Table FS-6 shows the HVA matrix for Wheeler County showing each hazard listed in order of rank from high to low. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities, but does not predict the occurrence of a particular hazard.

All natural hazards identified and analyzed in this plan that impact the County as a whole also impact the City of Fossil.

Please refer to Chapter 3: Risk Assessment for a review of magnitude, past occurrences and potential impacts of to the community from natural hazards.

Table FS-6 Hazard Analysis Matrix – Fossil

Hazard	History	Probability	Vulnerability	Maximum Threat	Total	Rank	Risk Level
Wildfire	20	70	50	100	240	1	High
Drought	20	70	50	100	240	1	High
Severe Weather	18	70	50	100	238	2	High
Winter Storms	16	70	50	100	236	3	High
Floods	10	70	50	100	226	4	High
Volcanic Event	0	7	50	100	157	5	Medium
Earthquake	0	7	40	90	137	6	Medium
Landslide/Debris Flow	10	35	25	50	120	7	Low
Windstorm	10	35	25	50	120	7	Low

Source: Wheeler County NHMP Steering Committee, 2018.

Please review Chapter 3: Risk Assessment and Appendix H: Future Climate Projections for Wheeler County for additional information on each hazard.

CITY OF MITCHELL

ADDENDUM

Purpose

This document serves as the City of Mitchell's Addendum to the Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan (MNHMP, NHMP). This addendum supplements information contained in Section I: Basic Mitigation Plan of this NHMP, which serves as the foundation for this jurisdiction's addendum, and Section II: Mitigation Resources, which provides additional information. This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Plan Process, Participation, and Adoption

This section of the NHMP addendum addresses 44 CFR 201.6(c)(5), *Plan Adoption*, and 44 CFR 201.6(a)(3), *Participation*.

This project is funded through the Federal Emergency Management Agency's (FEMA) FY16 Pre-Disaster Mitigation Competitive Grant Program. After funding was awarded in July 2017 to DLCD for two PDM 16 grants (PDMC-PL-10-2016-003 and PDMC-PL-10-2016-005), a regional kickoff meeting for all eight counties involved in the PDM 16 grants was held on July 18, 2017.

To be eligible to receive certain pre- and post-disaster natural hazard mitigation funds from FEMA, local governments must have a current, FEMA-approved NHMP. NHMPs must be updated and re-approved every five years. By developing this addendum to the Wheeler County NHMP, locally adopting it, and having it approved by FEMA, the City of Mitchell will regain eligibility for FEMA Hazard Mitigation, Pre-Disaster Mitigation, and Flood Mitigation Assistance grant program funds.

The Wheeler County NHMP, and City of Mitchell Addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The project Steering Committee guided the process of developing the plan. For more information on the composition of the Steering Committee see Appendix C: *Planning and Public Process*.

The Wheeler County Emergency Manager is the designated local convener and will take the lead in implementing, maintaining, and updating the addendum to the NHMP in collaboration with the Steering Committee members.

The City's addendum reflects decisions made at the Wheeler County NHMP Steering Committee meetings and during subsequent work and communication with the NHMP Project Manager.

Public participation was achieved with the establishment of the Steering Committee, which was comprised of county officials representing different organizations and sectors. The Steering Committee was closely involved throughout the development of the plan and served as the local oversight body for the plan's development. In addition, community members outside of the Steering Committee were provided an opportunity for comment via the plan review process.

The Wheeler County NHMP was approved by FEMA on December 13, 2019 and the Mitchell addendum was adopted via resolution on December 17, 2019. This NHMP is effective through December 12, 2024.

Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

During the 2019 Wheeler County NHMP update process the County and Steering Committees re-evaluated the existing Mitigation Action Items. Following the review, mitigation actions were updated, noting what accomplishments had been made, and whether the actions were still relevant and if existing language needed to change. New action items were identified at this time. The City's priority actions are listed below in Table MI-1 Mitchell Priority Action Items. For the complete list of actions see Appendix A.

Because this is the first formal addendum for the City of Mitchell, all of the 2019 mitigation actions were created during this update to the county NHMP.

Table MI-1 Mitchell Priority Action Items

Action Item #	Description	Managing Department/ Agency	Timeline	Potential Funding Source(s)
FL #3	Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency (FEMA) to construct, install, and maintain a “Flash Flood Warning System” that has been designed to protect lives and property in the City of Mitchell.	City of Mitchell	ST (1-3 years)	Federal Emergency Management Agency, Army Corps of Engineers, Oregon Regional Solutions, Business Oregon.
FL #5	Coordinate with the State Floodplain Coordinator and the Department of Land Conservation and Development (DLCD) to update the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for Wheeler County and the incorporated cities participating in the Nation Flood Insurance Program (NFIP) and Risk Map.	Wheeler County Planning Department	Routine	This is a low cost action that should be covered within the regular county and city budgets.
WF #1	Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to reduce wildland fire risk in Wheeler County.	Wheeler County; CWPP Local Coordinating Group	Routine	Oregon Department of Forestry Wildland-Urban Interface grants, Oregon Forest Land Protection Fund, and other funding, FEMA PDM grants.

WF #5	Make available to county residents and the public information regarding wildfires.	Wheeler County Emergency Management	High	This is a collaborative effort that includes local, state and federal partners. Seek funding through partner agencies as well as grants from FEMA.
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WF #10	Distribute fire prevention literature and material to home owners and visitors.	Wheeler County Emergency Management	High	See Ideas for Implementation in Mitigation Action Commentary WF #10, Appendix A. Also consult with Travel Oregon, the local Oregon Regional Solutions staff person, and Oregon State Parks to discuss.
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MH = Multi-Hazard, FL = Flood, WF = Wildfire.

Plan Implementation and Maintenance

The City Council will be responsible for adopting the City of Mitchell addendum to the Wheeler County NHMP. This addendum designates a coordinating body and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county’s multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The county steering committee will convene on a semi-annual basis and will provide opportunities for the cities to report on NHMP implementation and maintenance during their meetings. The Wheeler County Emergency Manager will serve as the convener and will be responsible for assembling the steering committee (coordinating body). The steering committee will be responsible for:

- Identifying new risk assessment data;
- Reviewing status of mitigation actions;
- Identifying new actions; and
- Seeking funding to implement the city’s mitigation strategy (actions).

The convener will also remain active in the county's implementation and maintenance process.

Implementation through Existing Programs

Many of the recommendations in the Natural Hazards Mitigation Plan are consistent with the goals and objectives of the city's existing plans and policies. Where possible, the City of Mitchell will implement the NHMP's recommended actions through existing plans and policies. Plans and policies already in existence have support from local residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented.

Mitchell's acknowledged comprehensive plan is the Mitchell Comprehensive Plan, which was most recently updated in 2007. The City implements the plan through the City Zoning Ordinances. Mitchell currently has the following plans, programs, and policies that relate to natural hazard mitigation.

Table MI-2 Legal and Regulatory Resources Available for Hazard Mitigation

Regulatory Tool	Name	Effects on Hazard Mitigation
Plans	City of Mitchell Comprehensive Plan (1980)	<p>The City of Mitchell should incorporate the Wheeler County Natural Hazards Mitigation Plan mitigation actions into the City Comprehensive Plan. This will help identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the natural hazards mitigation plan’s action items through existing plans and policies increases their likelihood of being supported and getting updated, and maximizes the cities resources..</p>
	Wheeler County Community Wildfire Protection Plan (2006)	<p>The plan is a result of a county-wide effort initiated to identify and prioritize wildfire hazards and to develop a strategy to reduce those hazards. The plans assists the county, the communities within the county, and the fire districts in making them eligible and securing grants and/or other funding sources to treat hazardous fuel situations and to better prepare residents for wildfires that may occur. It includes a strategy with action projects which, when implemented, will decrease the potential for large wildfires in the county and reduce the potential loss of property values and threat to human life.</p> <p>The Community Wildfire Protection Plan (CWPP) is intended to be adopted for incorporation within the Wheeler County Natural Hazards Mitigation Plan. The CWPP contains goals and actions that seek to minimize the risk of wildfire hazards to the county.</p>
	Wheeler County Emergency Operations Plan (2012)	<p>The Emergency Operations Plan (EOP) is an all-hazard plan that describes how Wheeler County will organize and respond to emergencies and disasters in the community. Response to emergencies in order to maximize the safety of the public and to minimize property damage is a primary responsibility of government. It is the goal of Wheeler County that responses to such conditions are conducted in the most organized, efficient, and effective manner possible. To aid in accomplishing this goal, Wheeler County has incorporated the principles of the National Incident Management System (NIMS) and Incident Command System (ICS) into emergency operations, plans, and ongoing activities.</p> <p>The EOP attempts to be all-inclusive in combining the following four phases of emergency management.</p> <ul style="list-style-type: none"> ·Mitigation: activities that eliminate or reduce the vulnerability to disasters; ·Preparedness: activities that governments, organizations, and individuals develop to save lives and minimize damage; ·Response: activities that prevent loss of lives and property and provide emergency assistance; and

	<p>·Recovery: short- and long-term activities that return all systems to normal or improved standards.</p> <p>The NHMP is concerned with mitigation and preparedness. The EOP should incorporate the Wheeler County Natural Hazards Mitigation Plan mitigation actions where appropriate.</p>
Wheeler County Transportation Plan (2001)	<p>The Wheeler County Transportation System Plan documents the County, Cities, and ODOT’s priority programs that are to be carried forward for funding and implementation over the next 20 years. The TSP builds consensus among the Cities within Wheeler County, the County and ODOT on the transportation needs and priority projects for the communities, and is based on input from local citizens, stakeholders, staff and appointed and elected officials. The County has prioritized building livable, connected communities. The TSP is intended to be flexible to respond to changing community needs and revenue sources over the next 20 years.</p> <p>Transportation systems are important is evacuating and responding to natural disasters. Mitigation actions that focus on strengthening transportation systems should be incorporated into the Wheeler County Transportation System Plan.</p>

Table MI-3 Administrative and Technical Resources for Hazard Mitigation

Staff/Personnel Resources	Department/Division Position
Six City Council members and Mayor	Elected Office
City Clerk	Full time City employee

Table MI-4 Financial Resources for Hazard Mitigation

Financial Resources	Effect on Hazard Mitigation
General funds	Yes
Authority to levy taxes for specific purposes	Yes
Incur debt through general obligation bonds	No
Grants (state)	Yes
Collected fees: Water, sewer, host fees, Windmill SIP fees	No

Note: See Appendix E – Grant Programs for additional financial resources.

Continued Public Participation

Keeping the public informed of the city’s efforts to reduce the city’s risk to future natural hazards events is important for successful plan implementation and maintenance. The city is committed to involving the public in the plan review and updated process.

Plan Maintenance

The Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community’s demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

Phase 1: Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.

Phase 2: Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.

Phase 3: Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein and within and Chapter 2: *Community Profile* and Chapter 3: *Risk Assessment*. The risk assessment process is graphically depicted in Figure RU-1 below. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

Figure MI-1 Understanding Risk



Source: FEMA Local Mitigation planning Handbook, 2013.

Community Asset Identification

This section provides information on city specific assets. For additional information on the characteristics of Mitchell, in terms of geography, environment, population, demographics, employment and economics, as well as housing and transportation see Chapter 2: *Community Profile*. Many of these community characteristics can affect how natural hazards impact communities and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation.

Community Characteristics

The City of Mitchell is a small (pop. 135) town located in the southern part of Wheeler County along Highway 26, a major east-west route through Oregon. Mitchell is near Oregon's famous Painted Hills and in the heart of the John Day Fossil Beds National Monument. It is about an hour east of Prineville and 2 hours from Bend, Oregon's largest city east of the Cascades.

Mitchell is at an elevation of 2,894 feet.¹ The climate is characterized by dry, warm summers and cold, relatively dry winters. The City is within the semiarid John Day/Clarno Uplands which forms a ring of dry foothills surrounding the western perimeter of the Blue Mountains. Highly dissected hills, palisades, and colorful ash beds flank the valleys of the John Day River and Crooked River. This region has a continental climate moderated somewhat by marine influence. Juniper woodland has expanded markedly into the sagebrush-grassland during the 20th Century due to a combination of climatic factors, fire suppression, and grazing pressure.

Primarily a residential community, the small commercial businesses cater to local residents and interstate highway travelers.

Economy

The median household income in Mitchell is \$25,625 which is lower than that of Wheeler County as a whole (\$33,563) and significantly lower than the state average of \$56,119². There are 70 people 16 and over in the city of which 29 are in the labor force. Of these, 18 are in the private sector, 7 are government workers and 4 are self-employed. The three largest employers by industry are: Educational services, and health care and social assistance (9); agriculture, forestry, fishing and hunting, and mining (7); and retail trade (4).³

Population Characteristics

The total population of Mitchell is 75 people⁴. 61.3% of the Mitchell population is over 62 years old, and just 6.7% is under 18 years old. The median age in Mitchell is 64.8 years old.⁵

There are 80 housing units in the city of which 47 are occupied. Of the 47, 37 are owner occupied, and 10 are rentals. There are 33 vacant housing units in the city. 50% of the population has lived in the same house 30 or more years, indicating high stability. The majority of houses in Mitchell were built before 1969 (86%) while only 2 total units were built after the year 2000. 32 of the 47 occupied housing units are heated by wood and the rest by electricity.

A few conclusions that can be drawn from this data include:

- The population in Mitchell continues a steady decline, while the median age of 64 is well above the state average of 39.
- Most of the housing units in Mitchell are not built to the latest seismic building codes and may be significantly damaged in an earthquake.

¹ <https://sos.oregon.gov/blue-book/Pages/local/cities/l-r/mitchell.aspx>

² American Community Survey 2017 (5-Year Estimates), US Census Bureau.

³ American Community Survey 2017 (5-Year Estimates), US Census Bureau.

⁴ American Community Survey 2017 (5-Year Estimates), US Census Bureau.

⁵ American Community Survey 2017 (5-Year Estimates), US Census Bureau.

- Most homes in the city are reliant on wood for heat; and
- Household income levels in the city are well below county and state averages.

This information should be taken into account when developing and prioritizing mitigation actions.

Asset Inventory

Asset inventory is the first step of a vulnerability analysis. Assets that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure.

City Government: Community Hall, City Hall and City Park

Water Supply: ground water, springs

Operator: City of Mitchell

Capacity (MGD):* 0.06

Age of Water System: 1986

Wastewater Treatment System: septic system

Hospitals: The nearest hospital is Pioneer Memorial Hospital in Prineville (Crook County), which is approximately 48 miles from the city – over a mountain pass.

Emergency Services: Ambulance Service, Life Flight Network Service

Schools: Mitchell School District (K-12) consists of a school building and adjacent dormitory,

Police: The Oregon State Police Department and the Wheeler County Sherriff's Office, which is located in Fossil, both serve Wheeler County. Two full time Deputies and four Reserve Deputies make up the force for the Wheeler County Sheriff's Office.

Hazard Analysis

Hazard Analysis Methodology

This NHMP utilizes a hazard analysis methodology that was first developed by FEMA circa 1983, and gradually refined by the Oregon Military Department's Office of Emergency Management (OEM) over the years.

The methodology produces scores that range from 24 (lowest possible) to 240 (highest possible). Vulnerability and probability are the two key components of the methodology. Vulnerability examines both typical and maximum credible events, and probability endeavors to reflect how physical changes in the jurisdiction and scientific research modify the historical record for each hazard. Vulnerability accounts for approximately 60% of the total score, and probability approximately 40%.

This method provides the jurisdiction with a sense of hazard priorities, or relative risk. It doesn't predict the occurrence of a particular hazard, but it does "quantify" the risk of one hazard compared with another. By doing this analysis, planning can first be focused where the risk is greatest.

In this analysis, severity ratings, and weight factors, are applied to the four categories of history, vulnerability, maximum threat (worst-case scenario), and probability as shown in the table below.

City of Mitchell Hazard Analysis

The Wheeler County steering committee developed a hazard vulnerability assessment (HVA) for the county as a whole. The City of Mitchell is a member of the County Steering Committee and is utilizing the county’s HVA by proxy.

Table MI-6 shows the HVA matrix for Wheeler County showing each hazard listed in order of rank from high to low. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities, but does not predict the occurrence of a particular hazard.

All natural hazards identified and analyzed in this plan that impact the County as a whole also impact the City of Mitchell.

Please refer to Chapter 3: Risk Assessment for a review of magnitude, past occurrences and potential impacts of to the community from natural hazards.

Table MI-6 Hazard Analysis Matrix – Mitchell

Hazard	History	Probability	Vulnerability	Maximum Threat	Total	Rank	Risk Level
Wildfire	20	70	50	100	240	1	High
Drought	20	70	50	100	240	1	High
Severe Weather	18	70	50	100	238	2	High
Winter Storms	16	70	50	100	236	3	High
Floods	10	70	50	100	226	4	High
Volcanic Event	0	7	50	100	157	5	Medium
Earthquake	0	7	40	90	137	6	Medium
Landslide/Debris Flow	10	35	25	50	120	7	Low
Windstorm	10	35	25	50	120	7	Low

Source: Wheeler County NHMP Steering Committee, 2018.

Please review Chapter 3: Risk Assessment and Appendix H: Future Climate Projections for Wheeler County for additional information on each hazard.

Purpose

This document serves as the City of Spray’s Addendum to the Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan (MNHMP, NHMP). This addendum supplements information contained in Section I: Basic Mitigation Plan of this NHMP, which serves as the foundation for this jurisdiction’s addendum, and Section II: Mitigation Resources, which provides additional information. This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Plan Process, Participation, and Adoption

This section of the NHMP addendum addresses 44 CFR 201.6(c)(5), *Plan Adoption*, and 44 CFR 201.6(a)(3), *Participation*.

This project is funded through the Federal Emergency Management Agency’s (FEMA) FY16 Pre-Disaster Mitigation Competitive Grant Program. After funding was awarded in July 2017 to DLCD for two PDM 16 grants (PDMC-PL-10-2016-003 and PDMC-PL-10-2016-005), a regional kickoff meeting for all eight counties involved in the PDM 16 grants was held on July 18, 2017.

To be eligible to receive certain pre- and post-disaster natural hazard mitigation funds from FEMA, local governments must have a current, FEMA-approved NHMP. NHMPs must be updated and re-approved every five years. By developing this addendum to the Wheeler County NHMP, locally adopting it, and having it approved by FEMA, the City of Spray will regain eligibility for FEMA Hazard Mitigation, Pre-Disaster Mitigation, and Flood Mitigation Assistance grant program funds.

The Wheeler County NHMP, and City of Spray Addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The project Steering Committee guided the process of developing the plan. For more information on the composition of the Steering Committee see Appendix C: *Planning and Public Process*.

The Wheeler County Emergency Manager is the designated local convener and will take the lead in implementing, maintaining, and updating the addendum to the NHMP in collaboration with the Steering Committee members.

The City’s addendum reflects decisions made at the Wheeler County NHMP Steering Committee meetings and during subsequent work and communication with the NHMP Project Manager.

Public participation was achieved with the establishment of the Steering Committee, which was comprised of county officials representing different organizations and sectors. The Steering Committee was closely involved throughout the development of the plan and served as the local oversight body for the plan's development. In addition, community members outside of the Steering Committee were provided an opportunity for comment via the plan review process.

The Wheeler County NHMP was approved by FEMA on December 13, 2019 and the Spray addendum was adopted via resolution on January 22, 2020. This NHMP is effective through December 12, 2024.

Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

During the 2019 Wheeler County NHMP update process the County and Steering Committees re-evaluated the existing Mitigation Action Items. Following the review, mitigation actions were updated, noting what accomplishments had been made, and whether the actions were still relevant and if existing language needed to change. New action items were identified at this time. The City's priority actions are listed below in Table SP-1 Spray Priority Action Items. For the complete list of actions see Appendix A.

Because this is the first formal addendum for the City of Spray, all of the 2019 mitigation actions were created during this update to the county NHMP.

Table SP-1 Spray Priority Action Items

Action Item #	Description	Managing Department/ Agency	Timeline	Potential Funding Source(s)
FL #4	Secure funding to implement proposed solutions from a drainage study to improve the three drainage basins and facilities that are currently inadequate, undersized, and poorly maintained in the City of Spray.	City of Spray	ST (1-3 years)	Oregon Department of Transportation; Oregon Emergency Management; Federal Emergency Management Agency.
FL #5	Coordinate with the State Floodplain Coordinator and the Department of Land Conservation and Development (DLCD) to update the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for Wheeler County and the incorporated cities participating in the Nation Flood Insurance Program (NFIP) and Risk Map.	Wheeler County Planning Department	Routine	This is a low cost action that should be covered within the regular county and city budgets.
WF #1	Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan (CWPP) Local Coordinating Group to reduce wildland fire risk in Wheeler County.	Wheeler County; CWPP Local Coordinating Group	Routine	Oregon Department of Forestry Wildland-Urban Interface grants, Oregon Forest Land Protection Fund, and other funding, FEMA PDM grants.
WF #5	Make available to county residents and the public information regarding wildfires.	Wheeler County Emergency Management	High	This is a collaborative effort that includes local, state and

				federal partners. Seek funding through partner agencies as well as grants from FEMA.
WF #10	Distribute fire prevention literature and material to home owners and visitors.	Wheeler County Emergency Management	High	See Ideas for Implementation in Mitigation Action Commentary WF #10, Appendix A. Also consult with Travel Oregon, the local Oregon Regional Solutions staff person, and Oregon State Parks to discuss.

MH = Multi-Hazard, FL = Flood, WF = Wildfire.

Plan Implementation and Maintenance

The City Council will be responsible for adopting the City of Spray addendum to the Wheeler County NHMP. This addendum designates a coordinating body and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county’s multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The county steering committee will convene on a semi-annual basis and will provide opportunities for the cities to report on NHMP implementation and maintenance during their meetings. The Wheeler County Emergency Manager will serve as the convener and will be responsible for assembling the steering committee (coordinating body). The steering committee will be responsible for:

- Identifying new risk assessment data;
- Reviewing status of mitigation actions;
- Identifying new actions; and
- Seeking funding to implement the city’s mitigation strategy (actions).

The convener will also remain active in the county’s implementation and maintenance process.

Implementation through Existing Programs

Many of the recommendations in the Natural Hazards Mitigation Plan are consistent with the goals and objectives of the city's existing plans and policies. Where possible, the City of Spray will implement the NHMP's recommended actions through existing plans and policies. Plans and policies already in existence have support from local residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented.

Spray's acknowledged comprehensive plan is the Spray Comprehensive Plan, which was most recently updated in 2001. The City implements the plan through the City Zoning Ordinances. Spray currently has the following plans, programs, and policies that relate to natural hazard mitigation.

Table SP-2 Legal and Regulatory Resources Available for Hazard Mitigation

Regulatory Tool	Name	Effects on Hazard Mitigation
Plans	City of Spray Comprehensive Plan (2001)	The City of Spray should incorporate the Wheeler County Natural Hazards Mitigation Plan mitigation actions into the City Comprehensive Plan. This will help identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the natural hazards mitigation plan’s action items through existing plans and policies increases their likelihood of being supported and getting updated, and maximizes the cities resources..
	Wheeler County Community Wildfire Protection Plan (2006)	<p>The plan is a result of a county-wide effort initiated to identify and prioritize wildfire hazards and to develop a strategy to reduce those hazards. The plans assists the county, the communities within the county, and the fire districts in making them eligible and securing grants and/or other funding sources to treat hazardous fuel situations and to better prepare residents for wildfires that may occur. It includes a strategy with action projects which, when implemented, will decrease the potential for large wildfires in the county and reduce the potential loss of property values and threat to human life.</p> <p>The Community Wildfire Protection Plan (CWPP) is intended to be adopted for incorporation within the Wheeler County Natural Hazards Mitigation Plan. The CWPP contains goals and actions that seek to minimize the risk of wildfire hazards to the county.</p>
	Wheeler County Emergency Operations Plan (2012)	<p>The Emergency Operations Plan (EOP) is an all-hazard plan that describes how Wheeler County will organize and respond to emergencies and disasters in the community. Response to emergencies in order to maximize the safety of the public and to minimize property damage is a primary responsibility of government. It is the goal of Wheeler County that responses to such conditions are conducted in the most organized, efficient, and effective manner possible. To aid in accomplishing this goal, Wheeler County has incorporated the principles of the National Incident Management System (NIMS) and Incident Command System (ICS) into emergency operations, plans, and ongoing activities.</p> <p>The EOP attempts to be all-inclusive in combining the following four phases of emergency management.</p> <ul style="list-style-type: none"> ·Mitigation: activities that eliminate or reduce the vulnerability to disasters; ·Preparedness: activities that governments, organizations, and individuals develop to save lives and minimize damage; ·Response: activities that prevent loss of lives and property and provide emergency assistance; and

	<p>·Recovery: short- and long-term activities that return all systems to normal or improved standards.</p> <p>The NHMP is concerned with mitigation and preparedness. The EOP should incorporate the Wheeler County Natural Hazards Mitigation Plan mitigation actions where appropriate.</p>
Wheeler County Transportation Plan (2001)	<p>The Wheeler County Transportation System Plan documents the County, Cities, and ODOT’s priority programs that are to be carried forward for funding and implementation over the next 20 years. The TSP builds consensus among the Cities within Wheeler County, the County and ODOT on the transportation needs and priority projects for the communities, and is based on input from local citizens, stakeholders, staff and appointed and elected officials. The County has prioritized building livable, connected communities. The TSP is intended to be flexible to respond to changing community needs and revenue sources over the next 20 years.</p> <p>Transportation systems are important is evacuating and responding to natural disasters. Mitigation actions that focus on strengthening transportation systems should be incorporated into the Wheeler County Transportation System Plan.</p>

Table SP-3 Administrative and Technical Resources for Hazard Mitigation

Staff/Personnel Resources	Department/Division Position
Six City Council members and Mayor	Elected Office
City Clerk	Full time City employee

Table SP-4 Financial Resources for Hazard Mitigation

Financial Resources	Effect on Hazard Mitigation
General funds	Yes
Authority to levy taxes for specific purposes	Yes
Incur debt through general obligation bonds	No
Grants (state)	Yes
Collected fees: Water, sewer, host fees, Windmill SIP fees	No

Note: See Appendix E – Grant Programs for additional financial resources.

Continued Public Participation

Keeping the public informed of the city’s efforts to reduce the city’s risk to future natural hazards events is important for successful plan implementation and maintenance. The city is committed to involving the public in the plan review and updated process.

Plan Maintenance

The Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community’s demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

Phase 1: Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.

Phase 2: Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.

Phase 3: Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein and within and Chapter 2: *Community Profile* and Chapter 3: *Risk Assessment*. The risk assessment process is graphically depicted in Figure RU-1 below. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

Figure MI-1 Understanding Risk



Source: FEMA Local Mitigation planning Handbook, 2013.

Community Asset Identification

This section provides information on city specific assets. For additional information on the characteristics of Spray, in terms of geography, environment, population, demographics, employment and economics, as well as housing and transportation see Chapter 2: *Community Profile*. Many of these community characteristics can affect how natural hazards impact communities and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation.

Community Characteristics

The City of Spray is a small (pop. 152)¹ town located in the east-central part of Wheeler County along the John Day River, the largest undammed river in the contiguous United States. Spray is a fairly remote town and is about two and half hours by automobile from the cities of Bend, The Dalles and Hermiston.

Spray is at an elevation of 1,801 feet.² The climate is characterized by dry, warm summers and cold, relatively dry winters. The City is within the semiarid John Day/Clarno Uplands which forms a ring of dry foothills surrounding the western perimeter of the Blue Mountains. Highly dissected hills, palisades, and colorful ash beds flank the valleys of the John Day River and Crooked River. This region has a continental climate moderated somewhat by marine influence. Juniper woodland has expanded markedly into the sagebrush-grassland during the 20th Century due to a combination of climatic factors, fire suppression, and grazing pressure.

Primarily a residential community, the small commercial businesses cater to local residents and tourism generated by the John Day River.

Economy

The median household income in Spray is \$24,688 which is lower than that of Wheeler County as a whole (\$33,563) and significantly lower than the state average of \$56,119³. There are 137 people 16 and over in the city of which 34 are in the labor force. Of these, 24 are employed. The three largest employers by industry are: Educational services, and health care and social assistance (11) and finance and insurance, and real estate and rental and leasing (4).⁴

Population Characteristics

46% of the Spray population is over 62 years old, and just 9.8% is under 18 years old. The median age in Spray is 60.6 years old.⁵

There are 94 housing units in the city of which 69 are occupied. Of the 69, 47 are owner occupied, and 22 are rentals. There are 25 vacant housing units in the city. Only 19% of the population has lived in the same house 30 or more years. 50% of residents have occupied their homes only since 2000 or later. Almost all homes in Spray were built before 1979 (89%) while only 2 total units were built after the year 2000. 29 of the 69 occupied housing units are heated by wood, 20 by electricity, and the rest by gas or oil.

A few conclusions that can be drawn from this data include:

- The population in Spray is a fairly remote town, even for NE East Oregon.
- Income levels are low in Spray and the average at is much higher than the state average.
- Homes tend to be older and most were built before current seismic building codes.

¹ American Community Survey 2017 (5-Year Estimates). US Census Bureau.

² <https://sos.oregon.gov/blue-book/Pages/local/cities/s-y/spray.aspx>. Oregon Blue Book, 2019.

³ American Community Survey 2017 (5-Year Estimates), US Census Bureau.

⁴ American Community Survey 2017 (5-Year Estimates), US Census Bureau.

⁵ American Community Survey 2017 (5-Year Estimates), US Census Bureau.

This information should be taken into account when developing and prioritizing mitigation actions.

Asset Inventory

Asset inventory is the first step of a vulnerability analysis. Assets that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure.

Water Supply: ground water

Operator: City of Spray

Capacity (MGD):* N/A

Age of Water System: 1997

Wastewater Treatment System: septic system

* **MGD** = million gallons per day

Wastewater Treatment System: septic system

Hospitals: The nearest hospital is Pioneer Memorial Hospital in Heppner (Morrow County), which is roughly 55 miles away.

Emergency Services: Ambulance Service, Life Flight Network Service

Schools: The Spray School District has a current enrollment of 61 students K-12. The campus includes five separate buildings with three contained classrooms: one houses K-3 and 4-7, one houses 8-12, and the central services building contains the administration offices, cafe, library, and media center.

Police: The Oregon State Police Department and the Wheeler County Sherriff's Office, which is located in Fossil, both serve Wheeler County. Two full time Deputies and four Reserve Deputies make up the force for the Wheeler County Sheriff's Office.

Hazard Analysis

Hazard Analysis Methodology

This NHMP utilizes a hazard analysis methodology that was first developed by FEMA circa 1983, and gradually refined by the Oregon Military Department's Office of Emergency Management (OEM) over the years.

The methodology produces scores that range from 24 (lowest possible) to 240 (highest possible). Vulnerability and probability are the two key components of the methodology. Vulnerability examines both typical and maximum credible events, and probability endeavors to reflect how physical changes in the jurisdiction and scientific research modify the historical record for each hazard. Vulnerability accounts for approximately 60% of the total score, and probability approximately 40%.

This method provides the jurisdiction with a sense of hazard priorities, or relative risk. It doesn't predict the occurrence of a particular hazard, but it does "quantify" the risk of one

hazard compared with another. By doing this analysis, planning can first be focused where the risk is greatest.

In this analysis, severity ratings, and weight factors, are applied to the four categories of history, vulnerability, maximum threat (worst-case scenario), and probability as shown in the table below.

City of Spray Hazard Analysis

The Wheeler County steering committee developed a hazard vulnerability assessment (HVA) for the county as a whole. The City of Spray is a member of the County Steering Committee and is utilizing the county’s HVA by proxy.

Table SP-6 shows the HVA matrix for Wheeler County showing each hazard listed in order of rank from high to low. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities, but does not predict the occurrence of a particular hazard.

All natural hazards identified and analyzed in this plan that impact the County as a whole also impact the City of Spray.

Please refer to Chapter 3: Risk Assessment for a review of magnitude, past occurrences and potential impacts of to the community from natural hazards.

Table SP-6 Hazard Analysis Matrix – Spray

Hazard	History	Probability	Vulnerability	Maximum Threat	Total	Rank	Risk Level
Wildfire	20	70	50	100	240	1	High
Drought	20	70	50	100	240	1	High
Severe Weather	18	70	50	100	238	2	High
Winter Storms	16	70	50	100	236	3	High
Floods	10	70	50	100	226	4	High
Volcanic Event	0	7	50	100	157	5	Medium
Earthquake	0	7	40	90	137	6	Medium
Landslide/Debris Flow	10	35	25	50	120	7	Low
Windstorm	10	35	25	50	120	7	Low

Source: Wheeler County NHMP Steering Committee, 2018.

Please review Chapter 3: Risk Assessment and Appendix H: Future Climate Projections for Wheeler County for additional information on each hazard.

Appendix C:

Planning and Public Process

This appendix describes the changes made to the 2014 Wheeler County Natural Hazards Mitigation Plan (NHMP) during the 2018-2019 update process.

Project Background

Wheeler County collaborated with the Oregon Department of Land Conservation and Development (DLCD) to update the 2014 Wheeler County NHMP. The Disaster Mitigation Act of 2000 requires communities to update their NHMPs every five years to remain eligible for Hazard Mitigation Assistance (HMA) funds through the Pre-Disaster Mitigation (PDM) program, Flood Mitigation Assistance (FMA) program, and the Hazard Grant Mitigation Program (HMGP). Steering Committee members from Wheeler County and participating Cities met to update their NHMP. Participating Cities are the Cities of Fossil (pop. 403), Mitchell (pop. 108), and Spray (pop. 165). Major changes to the 2014 NHMP are documented and summarized in this appendix.

2019 Plan Update Changes

The sections below only discuss *major* changes and additions made to the 2014 Wheeler County NHMP during the 2018-2019 plan update process. Major changes include... replacement or deletion of large portions of text, changes to the plan's organization, and new additions to the plan. If a section is not addressed in this memo, then it can be assumed that no significant changes occurred.

The plan's format and organization have been altered to fit with plan templates provided by OPDR. Table C.1 below lists the 2008 plan section names and the corresponding 2012 section names as updated. This memo will use the 2012 plan update section names to reference any changes, additions, or deletions within the plan.

Table C.1: Changes to Plan Sections

<i>2014 Wheeler County NHMP</i>	<i>2019 Wheeler County NHMP</i>
Volume I: Multi-Jurisdictional Natural Hazards Mitigation Plan	Executive Summary
Executive Summary	Section I: Basic Mitigation Plan
Section 1: Introduction	Chapter 1: Introduction
Section 2: Risk Assessment	Chapter 2: Community Profile
Section 3: Mitigation Strategy	Chapter 3: Risk Assessment
Section 4: Plan Implementation and Maintenance	Chapter 4: Mitigation Strategy
	Chapter 5: Plan Implementation and Maintenance
Volume II: Mitigation Resources	Section II: Mitigation Resources
Appendix A: Action Item Forms	Appendix A: Mitigation Action Item Commentaries
Appendix B: Planning and Public Process	Appendix B: City Addenda
Appendix C: Community Profile	Appendix C: Planning & Public Process
Appendix D: Economic Analysis of Natural Hazards Mitigation Projects	Appendix D: Economic Analysis of Natural Hazard Mitigation Projects
Appendix E: Regional Hazards Mitigation Public Opinion Survey	Appendix E: Grant Programs
Appendix F: Grant Programs	Appendix F: Wheeler County Natural Hazard Mitigation Public Opinion Survey
	Appendix G: Mid-Columbia Regional Natural Hazard Mitigation Public Opinion Survey
Appendix G: Flash Flood Warning Project, City of Mitchell	Appendix H: Future Climate Projections for Wheeler County
Appendix H: Drainage Study, City of Spray	

Front Pages

The plan’s cover has been updated.

Acknowledgements have been updated to include the 2018-19 project partners and planning participants.

The FEMA approval letter, review tool, and County and City resolutions of adoption are included.

Table of Contents

This section provides the overall plan framework for the 2019 NHMP update, including the following sections:

Executive Summary

The 2019 NHMP includes an updated plan summary that provides information about the purpose of natural hazards mitigation planning, key points from the NHMP update process, and describes how the plan will be implemented.

Section I: Basic Mitigation Plan

Chapter 1: Introduction

This section provides a general introduction to natural hazards mitigation planning in Wheeler County. In addition, Section I: Introduction addresses the planning process requirements contained in 44 CFR 201.6(b) thereby meeting the planning process documentation requirement contained in 44 CFR 201.6(c)(1). The section concludes with a general description of how the plan is organized.

Chapter 2: Community Profile

The Community Profile has been updated to include more recent data. Particular emphasis was placed on not just updating the data for the period since the last NHMP was completed, but in adding to it to show a trends over a longer duration. This will allow the reader and decision makers to see patterns emerging in Wheeler County. This can be useful in many ways. For example, the long term trend in the county is toward a continued loss of population, but one that is increasing in age with a continued growth in residents beyond the age of 65. Mitigation actions can be developed and targeted to reflect these demographic changes.

Additionally, Wheeler County's employers are mainly small businesses employing less than 30 people each. Considering the moderate diversity of its economy (though dependent on several basic industries for revenue generation), Wheeler County may experience a difficult time in recovering from a natural disaster than other communities with a more diverse economic base and less unemployment.

It is important to consider what might happen to the economy if the largest revenue generators and employers (education and health services, natural resources and mining and trade, transportation and utilities), were heavily impacted by a disaster. To an extent, and to the benefit of Wheeler County, these particular industries are a mix of basic and non-basic industries, dependent on both external markets and local residents.

Chapter 3: Risk Assessment

The Risk Assessment, consists of three phases: hazard identification, vulnerability assessment, and risk analysis. Hazard identification involves the identification of hazard geographic extent, its intensity, and probability of occurrence. The second phase attempts to predict how different types of property and population groups will be affected by the hazard. The third phase involves estimating the damage, injuries, and costs likely to be incurred in a geographic area over a period of time. Changes to Chapter 3 include the following updates to:

- Hazard characteristics, probability, and vulnerability information.
- Population vulnerability trends and significant statistics.
- National Flood Insurance Program (NFIP) information.

- The Hazard Vulnerability Analysis tool.

Chapter 4: Mitigation Strategy

The 2019 Wheeler County Natural Hazard Mitigation Plan (NHMP) contains a number of action items that have been continued from the 2014 plan, as well as a number of new action items. The timing for action item implementation is broken into Routine (activities that are part of “regular County business” and are currently in process), Short Term (1-3 years), Mid Term (4-7 years) and Long Term (7-10 years).

2018 was one of the worst wildfire seasons on record in Oregon and Wheeler County. In late July, the Jennie’s Peak Fire consumed 45,956 acres of grass land, brush and forest. The Wheeler County NHMP Steering Committee has ranked wildfires as the greatest natural hazard risk to Wheeler County. Not surprisingly, the bulk of the new mitigation action items in this plan update concern wildfires. A number of these new mitigation items come from the current Wheeler County Cooperative Wildfire Protection Plan. Highlighting these in the NHMP brings additional attention to their importance and establishes the ability to fund them through FEMA grants.

Each action item has a corresponding “mitigation action item commentary” that describes the activity, identifies the rationale for the project and potential ideas for implementation, and assigns coordinating and partner organizations. The mitigation action item commentary can assist the community in pre-packaging potential projects for grant funding. These action item commentaries are located in Appendix A.

Hazards are indicated by the following abbreviations;

- MH = Multi-Hazard
- DR = Drought Hazard
- EQ = Earthquake Hazard
- FL = Flood Hazard
- LS = Landslide
- SW/WS = Severe Storm/Winter Storm
- VE = Volcanic Event
- WF = Wildfire
- WD = Windstorm

Chapter 5: Plan Implementation and Maintenance

The Emergency Management Department will be responsible for overseeing the implementation and maintenance of the plan. There will be joint conveners from the Emergency Management and partners as listed in the Mitigation Action Commentaries and other sections of the plan, depending on what action may be implemented. The Mayor (or his/her designee) shall be the convener for each incorporated city.

Plan maintenance is a critical component of the natural hazard mitigation plan. Proper maintenance of the plan ensures that this plan will maximize the County’s and Cities’ efforts to reduce the risks posed by natural hazards. The Steering Committee and local staff are responsible for implementing this plan maintenance process, in addition to maintaining and updating the plan through a series of meetings outlined in the maintenance schedule below.

The Committee will meet on a semi-annual basis to complete the following tasks:

- Review existing action items to determine appropriateness for funding;
- Educate and train new members on the plan and mitigation in general;
- Identify issues that may not have been identified when the plan was developed; and
- Prioritize potential mitigation projects using the methodology described below.

During the second meeting of the year, the Committee will:

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

The Wheeler County Emergency Manager (convener) will be responsible for documenting the outcome of the annual meetings. The plan's format allows the county and participating jurisdictions to review and update sections when new data becomes available. New data can be easily incorporated, resulting in a NHMP that remains current and relevant to the participating jurisdictions.

Section II: Mitigation Resources

Included in this plan are two previous sections that were not in the current NHMP, these include a section on city addenda and future climate projections for Wheeler County.

Appendix A: Mitigation Action Item Commentaries

This appendix provides more detailed information and implementation ideas for each mitigation action. Action items were either updated from the previous plan, discarded, integrated from other existing plans, or created new as part of this plan update. The title of this appendix was also changed to better reflect its intent.

Appendix B: City Addenda

New for this update are city addenda for each of the three incorporated cities in Wheeler County, these include: Fossil, Mitchell and Spray.

Appendix C: Planning & Public Process

This planning and public process appendix reflects changes made to the Wheeler County NHMP and documents the 2018-2019 planning and public process.

Appendix D: Economic Analysis of Natural Hazard Mitigation Projects

This section was reviewed by the staff at DLCD, OEM, and FEMA for accuracy. Minimal updates were made to this section.

Appendix E: Grant Programs

Some of the previously provided resources were deemed unnecessary since this material is covered within the Oregon NHMP. Updates were made to the remaining grant programs and resources.

Appendix F: Wheeler County Natural Hazard Mitigation Public Opinion Survey

The purpose of this survey was to reach as many county residents as possible in the most effective way. It gauged residents overall perception of natural disasters, what assets are most valued, how best to prioritize mitigation actions, and what are the most effective ways of communicating with residents.

The survey was done online from February 20, 2019 through March 21, 2019. A flyer promoting the survey and a link to it were placed on the Wheeler County website, the Wheeler County Facebook page, the Facebook pages for the cities of Fossil and Mitchell, and in the online version of the Wheeler County News. Twenty (20) unique surveys were completed and received. The results of the survey are detailed in the appendix.

Appendix G: Mid-Columbia Regional Natural Hazard Mitigation Public Opinion Survey

The survey results from the 2014 NHMP Update Regional Survey are included. The survey was sent to a large sampling of residents across eight Oregon counties, including Wheeler County. The demographics of Wheeler County have not changed significantly since this survey was completed. It has been included to provide additional information for decision makers in the implementation and maintenance of this plan update.

The purpose of this survey was to gauge the overall perception of natural disasters, determine a baseline level of loss reduction activity for residents in the community, and assess citizen's support for different types of individual and community risk reduction activities.

Data from this survey directly informs the natural hazard planning process. Counties in the Mid-Columbia region can use this survey data to enhance action item rationale and ideas for implementation. Other community organizations can also use survey results to inform their own outreach efforts. Data from the survey provides the counties with a better understanding of desired outreach strategies (sources and formats), a baseline understanding of what people have done to prepare for natural hazards, and desired individual and community strategies for risk reduction.

Appendix H: Future Climate Projects for Wheeler County

This appendix describes predicted changes to weather patterns and natural hazard indicators for Wheeler County and Oregon based on aggregated climate models. Several climate metrics that relate to natural hazards are calculated for historical and mid-21st century periods under two future emissions scenarios that result in varying future temperature increases for the State of Oregon.

Appendix I: Wheeler County Transportation Maps

This appendix is for reference and shows the surface transportation routes in the county. It is broken into three maps and comes from the Oregon Department of Transportation.

Public Participation Process

Wheeler County is dedicated to directly involving the public in the review and update of the natural hazard mitigation plan. Although members of the Steering Committee represent the public, all residents of Wheeler County were also given the opportunity to provide feedback about the Plan.

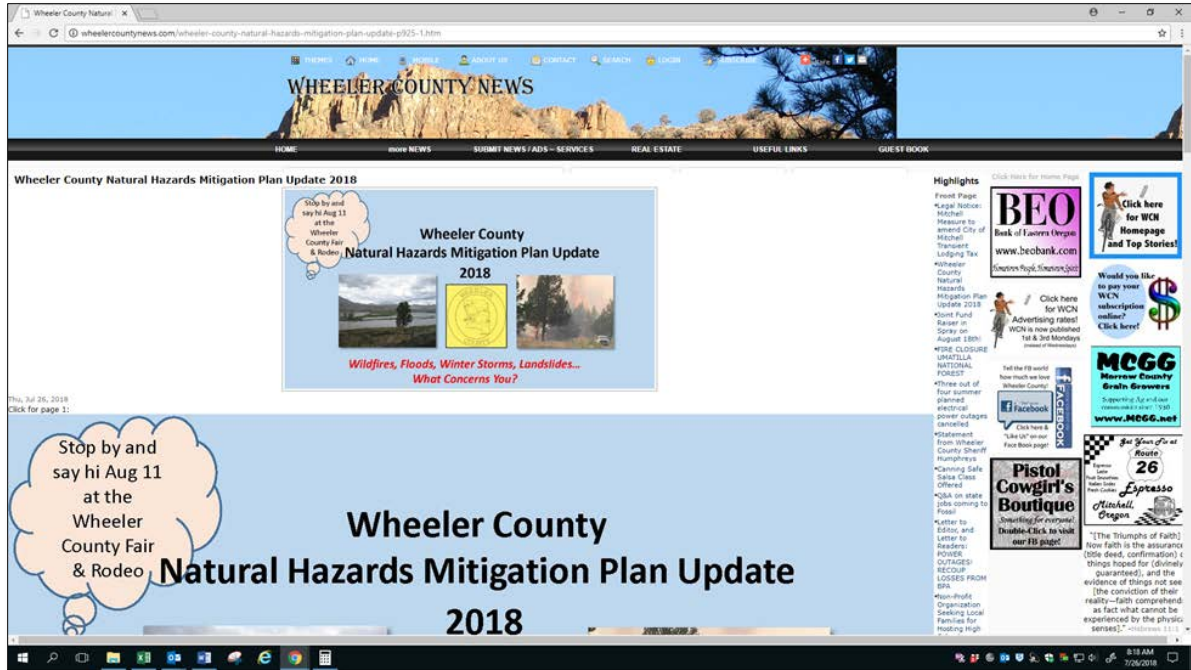
The Wheeler County Emergency Manager made sections of the draft NHMP available via the County Emergency Management's website for public comment on two occasions. Drafts of the updated core planning elements: the Community Profile, Risk Assessment and Mitigation Strategy were each posted for public comment during 30 day windows. In the spring of 2019, a draft copy of the entire updated NHMP was posted online for public comment. A copy of the final draft plan was also provided in hard copy to each of the incorporated cities and was available for public review in the respective municipal building. After FEMA approval, the final NHMP will be posted on the County's Emergency Management website.

Community Involvement and Steering Committee Summary

Wheeler County is Oregon's least populated county with a total population in 2016 of 1,369 people. The population is dispersed across a vast area and many people live outside of the incorporated towns. As such, the community involvement strategy was scaled to reflect this.

Internet and Social Media Communication

At multiple times during the project, Wheeler County and the Wheeler County Newspaper posted the Wheeler County Natural Hazards Mitigation Plan Update flyer on their respective webpages. The screen shot below is from the bi-monthly Wheeler County Newspaper. It is letting residents know about the NHMP just prior to the annual Wheeler County Fair and Rodeo in Fossil, Oregon. Project staff were on hand at the Fair and Rodeo to provide information to attendees about the plan and answer questions.



Screen shot of project flyer on the Wheeler County Newspaper webpage.

Stop by and
say hi Aug 11
at the
Wheeler
County Fair
& Rodeo

Wheeler County Natural Hazards Mitigation Plan Update 2018



Wildfires, Floods, Winter Storms, Landslides... What Concerns You?

Communities are stronger when they recognize the risks from natural hazards and make efforts to prepare for them and to reduce potential damage.

Wheeler County's existing **Natural Hazards Mitigation Plan** (NHMP) was updated in May 2014. NHMPs must be updated every five years.

Now, Wheeler County is collaborating with the Oregon Department of Land Conservation and Development (DLCD) to update the NHMP again. The updated NHMP will continue the County's eligibility for disaster related funding.

"Motivate the public, private sector, and governmental agencies to mitigate against the effects of natural hazards through information and education."

Wheeler County 2014 Natural Hazards Mitigation Plan

A Steering Committee, chaired by the Emergency Manager, is working with DLCD staff to update the NHMP. The NHMP is targeted for completion by August, 2019.



Oregon Department of
Land Conservation
and Development

For more information and to provide comments:

Terry Ignowski, Emergency Manager | Wheeler County

Phone: (541) 763-2380

Email: tignowski@co.wheeler.or.us

Website:

<http://www.wheelercountyoregon.com/emergency-management>

Why engage in natural hazard mitigation planning?

- **To avoid disasters** by reducing or eliminating long-term risk to people, property, and the environment from natural hazards.
- **To maintain eligibility** for disaster related funding.
- **To increase safety and resiliency** by integrating hazard mitigation into the plans, programs, and policies.

Wheeler County’s Natural Hazards

Hazard	Risk Score	Risk Level (H-M-L)
Drought	240	High
Wildfire	240	High
Severe Weather	238	High
Winter Storms	236	High
Floods	226	High
Earthquakes	137	Medium
Volcanic Events	127	Medium
Wind Storms	120	Medium
Landslides	120	Medium

Participation

This is a multi-jurisdictional Natural Hazards Mitigation Plan (NHMP) involving Wheeler County and the City’s of Fossil, Mitchell and Spray.



WheelerCounty flyer 7-3-18

Photo by Oregon DLCD, 2018

Wheeler County Natural Hazard Mitigation Public Opinion Survey

The survey was done online from February 20, 2019 through March 21, 2019. A flyer promoting the survey and a link to it were placed on the Wheeler County website, the Wheeler County Facebook page, the Facebook pages for the cities of Fossil and Mitchell, and in the online version of the Wheeler County News. Twenty (20) unique surveys were completed and received. The results of the survey are detailed in Appendix F.



The flyer features two overlapping speech bubbles at the top: a light green one on the left containing the text "SHARE YOUR VOICE" and a red one on the right containing "WE WANT TO HEAR FROM YOU". Below these is a dark blue horizontal band with the text "Take the Wheeler County Natural Hazards Survey" in white. Underneath is a light blue band with "Survey link:" in bold black, followed by the URL <https://www.surveymonkey.com/r/GMZ3WVT> in blue. The next section is a dark blue band with the text "Wildfires, Floods, Winter Storms, Landslides... What Concerns You?" in white. Below that is a light blue band with the text "Your answers are confidential and will be used to in inform the 2019 Wheeler County Natural Hazards Mitigation Plan Update". At the bottom left is the Wheeler County seal, and at the bottom right is contact information for Terry Ignowski, Emergency Management Coordinator, including his phone number and email address.

SHARE YOUR VOICE

WE WANT TO HEAR FROM YOU

Take the Wheeler County Natural Hazards Survey

Survey link:
<https://www.surveymonkey.com/r/GMZ3WVT>

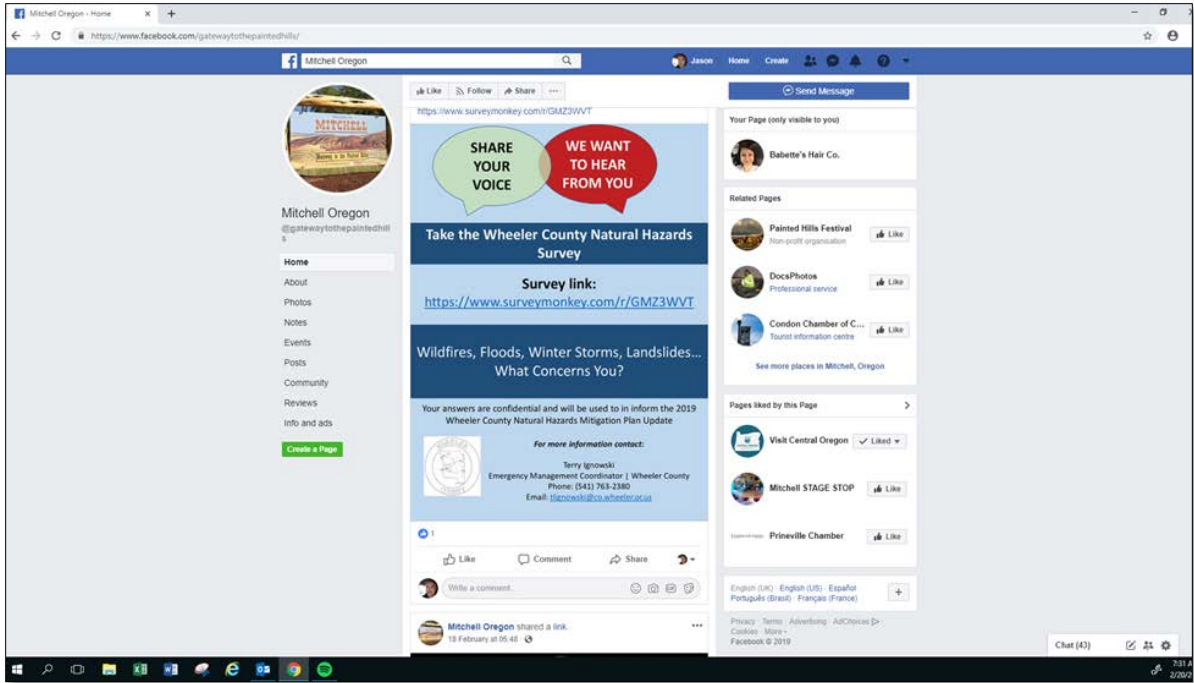
**Wildfires, Floods, Winter Storms, Landslides...
What Concerns You?**

Your answers are confidential and will be used to in inform the 2019
Wheeler County Natural Hazards Mitigation Plan Update

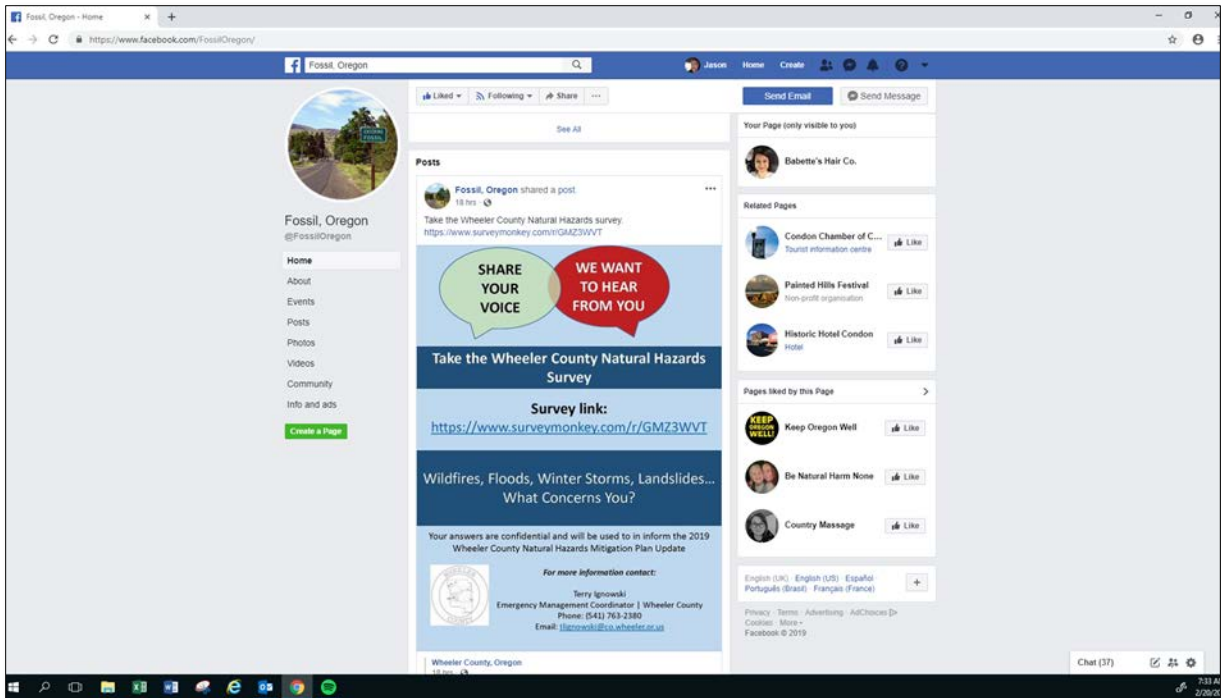
For more information contact:

Terry Ignowski
Emergency Management Coordinator | Wheeler County
Phone: (541) 763-2380
Email: tlignowski@co.wheeler.or.us

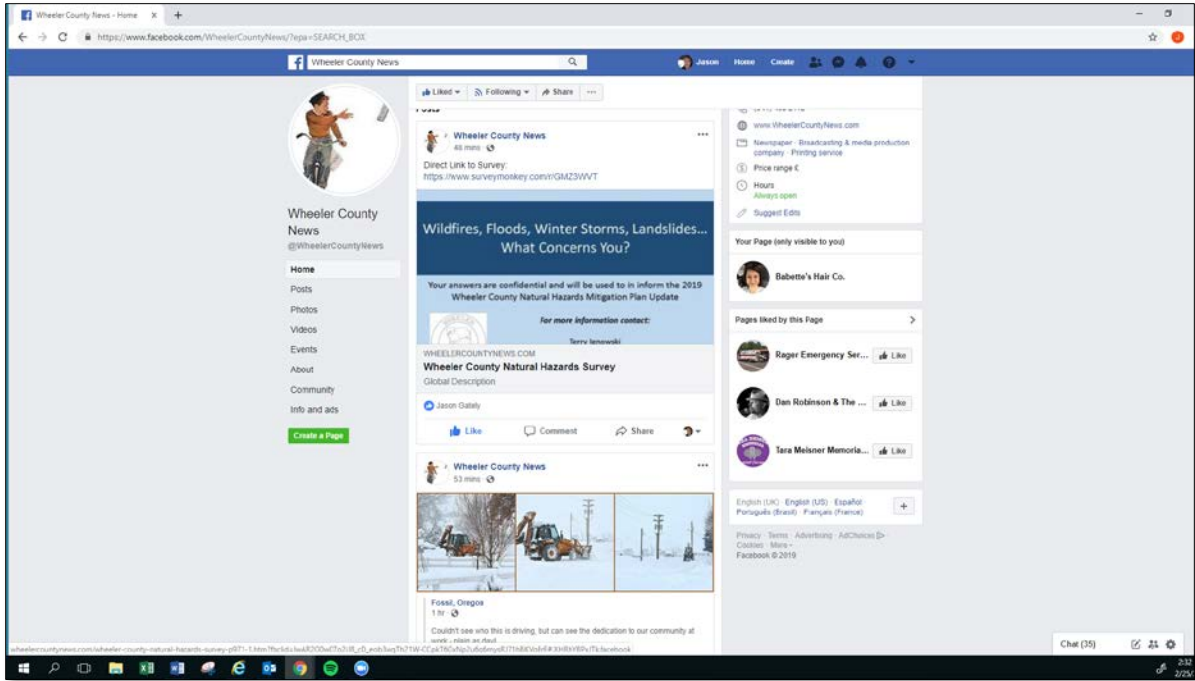
Public Opinion Survey notice and link to the survey instrument.



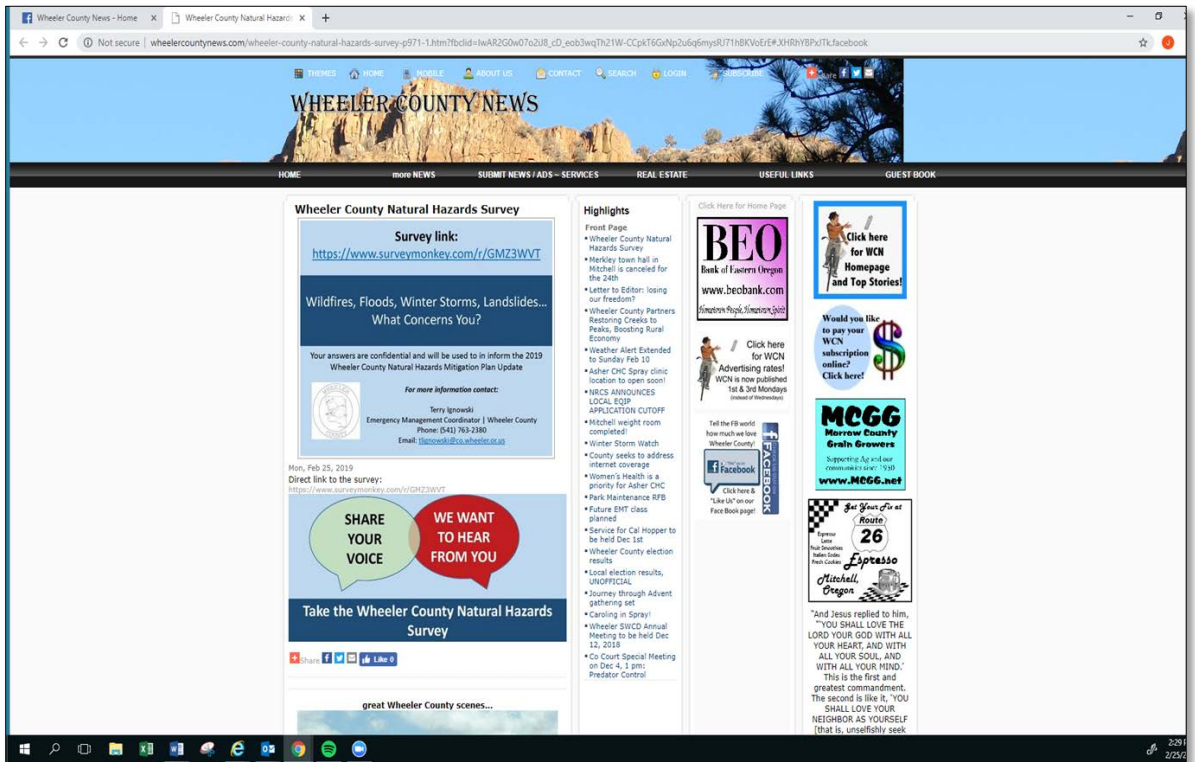
Public Opinion Survey notice and link on *The City of Mitchell* Facebook page.



Public Opinion Survey notice and link on *The City of Fossil* Facebook page.



Public Opinion Survey screen shot on the *Wheeler County News Facebook page*.

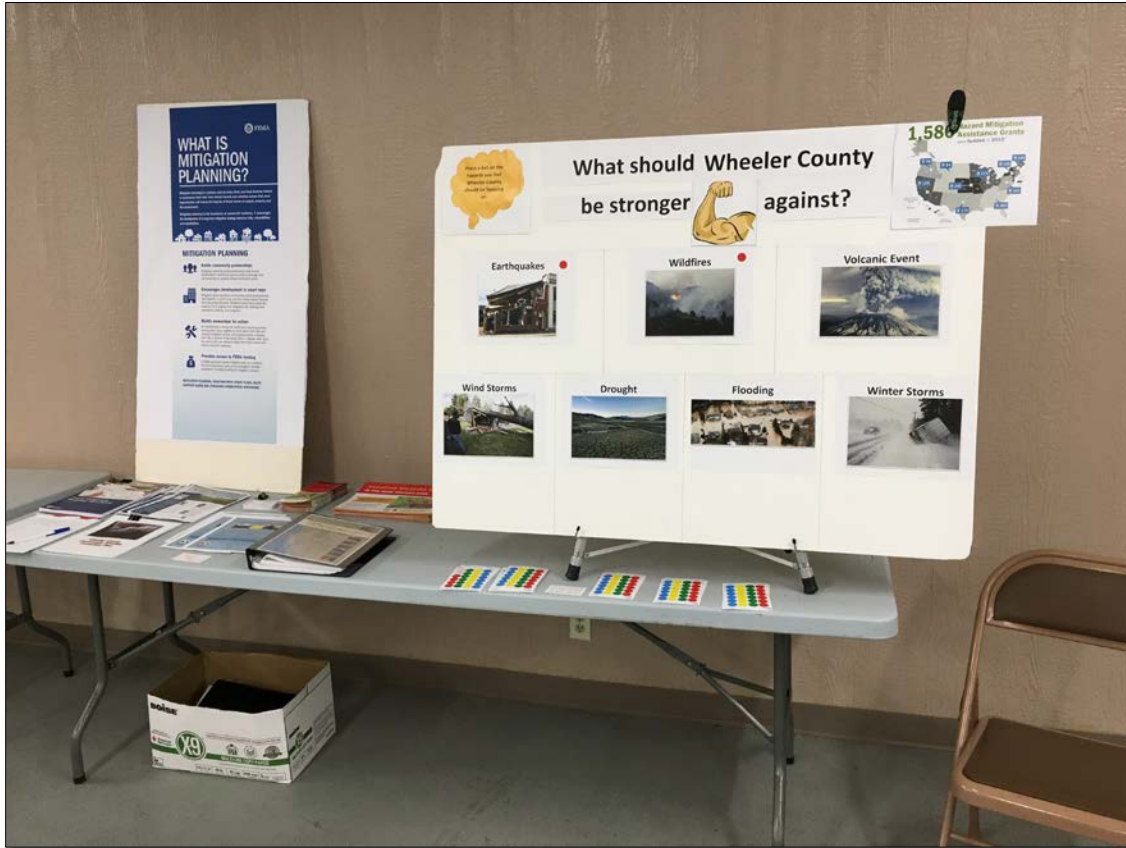


Public Opinion Survey screen shot on the *Wheeler County News page*.

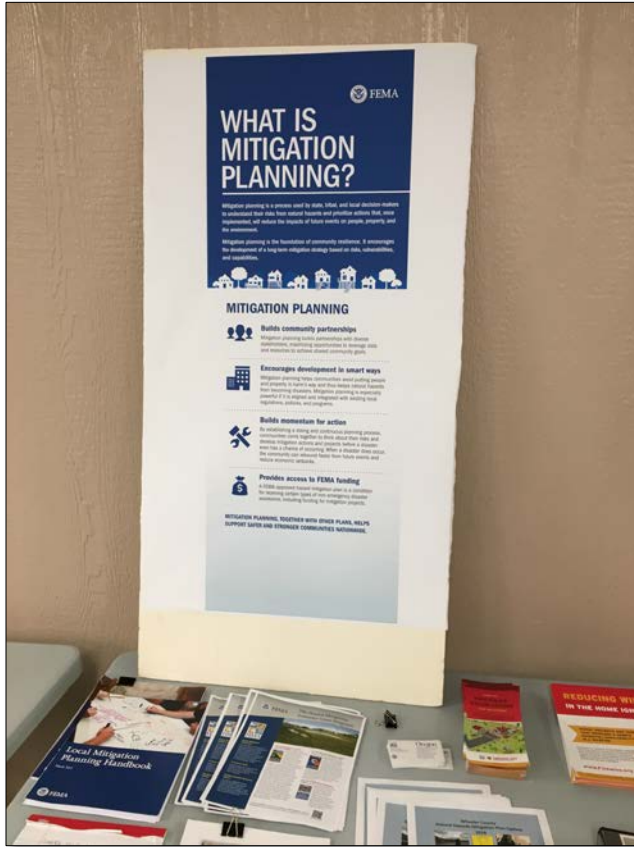
Other Meetings and Outreach Events

The Wheeler County Fair & Rodeo, Fossil, OR.

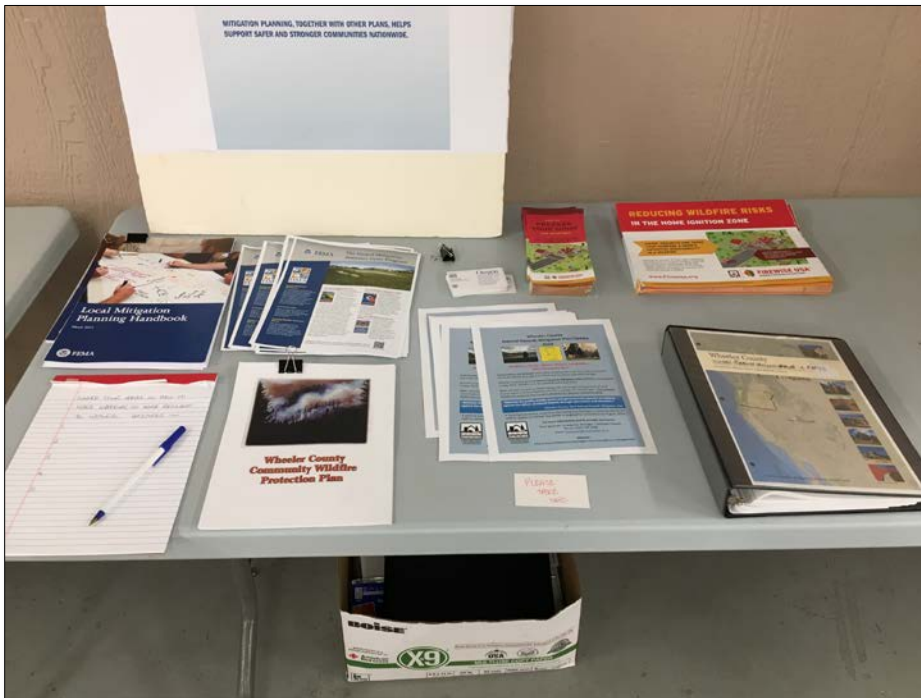
The Annual Wheeler County Fair and Rodeo is the signature public event in the county every year. It is held the first weekend in August at the Wheeler County Fairgrounds in Fossil, Oregon. In 2018, the 2019 NHMP project had a booth at the fair and staff were on hand to provide an overview of the project and to answer questions. Below are a few photos of the information booth.



Wheeler County Fair and Rodeo Information Booth



Wheeler County Fair and Rodeo Information Booth



Wheeler County Fair and Rodeo Information Booth

City of Mitchell City Council

On April 16, 2019, the Wheeler County NHMP Project Manager gave an overview of the NHMP Update to the City of Mitchell City Council. The City of Mitchell (pop. 121) is one of the three incorporated towns in Wheeler County. It also has a history of flash floods from a creek that runs directly through town and then on to the John Day River.

The City is particularly interested in alleviating this threat of flash flooding, while improving its aging water infrastructure. Like many of the smaller towns in Eastern Oregon, Mitchell's population has been aging and declining over the past few decades. A core component of their long-term strategy is to improve the infrastructure of the town and attract tourists to an area famous for multiple outdoor amenities, including the John Day River, the Painted Hills and the John Day Fossil Beds. They would like to leverage the resources of other state and federal agencies to do this which will not only make the town more financially viable, but more resilient to natural hazards.

City of Mitchell Grant Funding Meeting

On April 17, 2019 – the day after the City Council meeting – a group of local and state officials met in Mitchell to brainstorm funding options to improve the town of Mitchell. Some of the mitigation actions proposed in the Wheeler County NHMP are directly related to separate, but complimentary, efforts Mitchell would like to undertake. These include improving their aging water systems to provide adequate capacity and water quality, while ensuring that the system is able to be utilized to fight any fires that may occur in and around the town. Currently, the City does not feel that they have adequate capacity in their reservoir and that the water infrastructure could fail due to its age.

The meeting included the Mayor, the City Council, a representative from Business Oregon, the Oregon Regional Solutions Team, Oregon State Parks and other local residents and businesses. The discussion included identifying funding opportunities from the state and federal government that could be captured and used to improve Mitchell. Attendees expressed great interest in applying for FEMA grants and leveraging that money with funds from other sources to improve the town water systems. Meeting minutes and a list of attendees are included below.

Steering Committee Meetings

The Steering Committee guided the update process through several steps including goal confirmation and prioritization, mitigation action item review and development and information sharing to update the plan and to make the plan as comprehensive as possible.

The NHMP reflects decisions made at the plan update meetings, during subsequent work and communication internally between Steering Committee members and other staff, and externally with DLCD staff.

The following pages provide copies of meeting agendas, meeting notes, and sign-in sheets from Steering Committee meetings. The topics and processes of these meetings are described below.

- March 29, 2018: the Wheeler County Steering Committee met for the first of two meetings. The meeting took place at the Family Services Building in Fossil, Oregon.
- December 10, 2018: the Wheeler County Steering Committee met for the second of two meetings. The meeting took place at the Family Services Building in Fossil, Oregon. The Project Manager attended via conference call due to weather conditions.

Steering Committee Meeting #1, March 23, 2018

Meeting Summary

The goals of this meeting were to introduce the Steering Committee to the NHMP process, plan scope of work and goals, and to complete the Hazard Vulnerability Analysis for the Risk Assessment.

As part of the introductions, Tricia Sears – the original Project Manager from DLCD - asked each person to note their familiarity with Natural Hazards Mitigation Plans (NHMPs) and their participation, if applicable, in NHMPs prior to this one.

The NHMP Info Sheet was distributed and it explained what is a NHMP, what the process involves, and identifies the eight counties funded by the Pre-Disaster Mitigation (PDM) 16 grant to update their NHMPs.

The committee went over the Cost Share Form. In the discussion, they noted that federally funded positions cannot be used for match in the PDM 16 grant. Where the funding partially provided by the federal government, it is possible that a portion of non-federally funded hours could be included. All non-federally funded position hours spent on the grant can be included, as well as resource contributions like photocopying.

An important connection to NHMP work is the relationship with all disciplines, be multi-disciplinary, so we think about how the work we do here can be part of transportation, economics, environmental health, infrastructure/public works, environmental protection, emergency preparedness, land use planning, and other disciplines, and how it can benefit us all in many ways.

Steering Committee (SC) members had concerns about getting funding and attention from organizations that provide funds. Tricia mentioned potential grants, the kinds of assistance available from DLCD and OEM, and that having a FEMA approved NHMP keeps the jurisdiction eligible for grants which include the following:

- **Pre-Disaster Mitigation (PDM) Program:** Provides funding for hazard mitigation planning, and the implementation of mitigation projects *prior* to a disaster event. PDM 16 funds this project.
- **Hazard Mitigation Grant Program (HMGP):** Provides funding to implement long-term hazard mitigation measures after a major disaster declaration.
- **Flood Mitigation Assistance (FMA) Program:** Property owners who participate in the FMA program must have a flood insurance policy on the structure to be mitigated that is current at the time of application and maintained through award.
- **Emergency Management Performance Grant (EMPG):** OEM requires current NHMP as part of performance measure to receive funds.

Information can be found here: <https://www.fema.gov/hazard-mitigation-assistance> (PDM, HMGP, and FMA) and here: <https://www.fema.gov/emergency-management-performance-grant-program> (EMPG).

Tricia noted that as the state and federal agencies become more aware of the local situation when NHMPs are updated, and when people reach out to them with questions and concerns. This is also beneficial to the local jurisdiction.

Tricia provided a short overview of the Intergovernmental Agreement/Scope of Work (IGA/SOW) between DLCD and Wheeler County. The Project Schedule illustrates the timeline of activities for the NHMP and the estimated dates of completion. The Project Schedule will be revised as applicable throughout the NHMP update process. Steering Committee meetings included today's meeting and one in the future that focuses on mitigation actions. Additional meetings can be established as deemed necessary by DLCD staff and the Steering Committee.

In the 2014 NHMP, Wheeler County and the Cities of Mitchell, Fossil, and Spray approved the NHMP, as indicated on the FEMA approval letter dated 10/14/14. The SC agreed they want this to occur again.

Outreach is a key requirement from FEMA in NHMPs. Results of the brainstorm of ideas for the most effective way to reach out to the community include posting information on county and city websites, Facebook, in utility bills, and crafting a Wheeler County and cities specific NHMP flyer. Tricia said she would craft the flyer and provide it to Terry and the SC for review. Tricia noted she would take screen shots of postings on websites and other locations. Wheeler County and all three cities have already posted NHMP related info on their websites. All the outreach efforts that SC members make will be documented in a timeline and included in the NHMP. Please share your activities with Terry and Tricia.

Dave Lentzner, the Oregon Risk MAP Coordinator, described what Risk MAP work is and how it connects with the NHMP update. He noted that there is on-going flood research and map revision work in process across Oregon. He described resources and information available to Wheeler and other counties. He noted that John Day is getting new maps. Most of the studies and information for Wheeler County is from the 1960s and 1970s. Dave asked if they would like to have new maps. The SC said yes. Dave provided a handout called the FEMA Resilience Resource Guide, October 2017.

Tricia and Dave noted that DLCD will continue to work with Wheeler County and the cities after the NHMP update process.

DLCD and the Oregon Climate Change Research Institute (OCCRI) are collaborating on climate change/future changing conditions research. FEMA's requirements for NHMPs include an evaluation and analysis of future changing conditions. OCCRI is looking at these future changing conditions and providing climate information for all eight of the counties in the PDM 16 grants. There will be a report put together that has specific information for each of the counties; it will be available in June. At this meeting, we had a one page handout about the work in process. We had a short discussion of it as a group.

The Steering Committee had a lively discussion of the hazards that impact Wheeler County. They agreed that having one Hazard Vulnerability Analysis for the group was acceptable; it would be efficient and collaborative. All jurisdictions will participate and information for each will be noted, especially if the jurisdiction has a special situation or condition.

To begin the discussion, DLCD staff asked the SC what they thought were their most common and impactful hazards are. The SC said droughts, floods, and wildfire. Minor landslides occur.

For the Hazard Analysis discussion, DLCD provided a document called Significant Historic Hazard Events Tables. This document included tables of significant events for each of Wheeler County's

natural hazards. The tables noted the dates, locations, and a description of the event, identifying if there was a disaster declaration related to it. DLCD staff invited SC members to review and comment on the information; in particular, to add events that had impacted them.

The HVA discussion was lively. Results were similar but different than the 2014 NHMP results. Interestingly, by the end of the discussion the risk score results supported the SC's statement of what they thought were the most impactful hazards. Droughts and wildfire were identified as high level hazards with risk scores of 240, tying for #1 in the risk score rankings. They were closely followed by severe weather with a risk score of 238 for the #2 ranking and winter storms with a risk score of 236 for the #3 ranking. Floods had a risk score of 226 for a #4 ranking. For more details, see the related Hazard Analysis Summary document that Tricia put together.

During this discuss, the SC discussed what is at risk, such as the impacts to people, property, and the environment. They noted that they can take actions to prevent situations, and these are pre-event actions. There are post event actions. They talked about the difficulty of meeting Benefit Cost Analysis (BCA) because of the small population base. There can be ways to look at projects to see how they can meet BCA. They noted that they have looked at ODF information and Firewise Communities information. They cannot qualify. Maybe there are other grants that can be used to achieve what is needed here.

As part of this discussion about hazards and impacts, Tricia noted that in the NHMP update she would like to include success stories. These would be things that have been accomplished; where a problem related to a natural hazards situation was identified and actions were taken to mitigate the problem. The SC was amenable to the idea. They mentioned the 2500 gallon water tanks that they have purchased and placed around the county. Tricia would like to know more about this effort. It was also noted that back-up generators are needed for critical infrastructure.

The SC members had not yet made contributions to the Critical Infrastructure List that was included as part of the meeting materials. The list included information from the 2014 NHMP. It needs to be updated. Members agreed to provide information to Terry, and to discuss it as needed throughout the NHMP update process.

It was noted that communications such as the cell towers and emergency services towers should be added to the list. Local, state, and federal entities rely on these communications services. They talked about having two lists of critical infrastructure, one that is available to the public and published in the NHMP and one that is separate and kept internal. Chris noted that information can be protected under the Freedom of Information Act. They can do GPS points for all the critical infrastructure that it is identified for this list. Chris and Terry will work together on getting the critical infrastructure and GPS information together. Tricia noted that with GPS data points they can create maps of the critical infrastructure.

The Steering Committee stated that fire season was coming up and they are concerned that it will be a severe season.

Tricia said she will provide the 3/29/18 meeting notes and the Hazard Vulnerability Assessment (HVA) Summary to the SC. If the SC decides it wants a Wheeler County NHMP flyer for this NHMP update process, Tricia will provide one for them to review. Tricia needs photos of hazards events to be sent to her so that she can include them in the flyer. Terry will update the Critical Infrastructure

List with the input of the SC members. Chris will provide updated wildfire data to Terry and Tricia. This additional wildfire information can be included in the Significant Historic Hazard Events Tables and be used to craft mitigation actions. The critical infrastructure information could also be used to create mitigation actions.

The meeting agenda and sign-in sheet are included below.

Wheeler County NHMP Update Steering Committee Meeting

Thursday, March 29, 2018
10:00 – 12:30 PM

Wheeler County Emergency Management
401 Fourth Street, Family Services Building
Fossil, OR 97830

AGENDA

I.	Welcome & Introductions (5 min)	Terry Ignowski
II.	NHMP Update Project (30 min) <ul style="list-style-type: none"> • What is the Natural Hazards Mitigation Plan (NHMP)? (NHMP Info Sheet) • NHMP Grant, including Cost Share (Cost Share Form) • NHMP Process and Schedule (Project Schedule) (FEMA Approval Letter 2014) • Public Outreach for the NHMP • Risk MAP (Handout) 	Tricia Sears Dave Lentzner
III.	OCCRI Research (15 min) at 10:30 am (#541-763-0929) (Handout)	Meghan Dalton
IV.	Steering Committee (15 min) <ul style="list-style-type: none"> • Composition of the Committee (SC Roster) • Roles and Participation • Elect/Decide a Chairperson • Ground Rules (e.g. Vote or Consensus) • Mission and Goals (On back of Agenda) 	Tricia
V.	Hazard Vulnerability Analysis (HVA) (60 min) <ul style="list-style-type: none"> • Work Session (Significant Historic Hazard Events, HVA Worksheet) • County vs City HVAs 	Tricia
VI.	Critical Infrastructure, Critical Facilities, and Lifelines (20 min) <ul style="list-style-type: none"> • Review Draft List 	Terry and Tricia
VII.	Next Steps (5 min) <ul style="list-style-type: none"> • Next Meeting • Meeting Notes and Follow up 	Tricia

Materials
 From Wheeler County: Printed copies of 2013 NHMP
 From DLCD: Meeting Agenda; NHMP Info Sheet; Cost Share Form; Project Schedule; FEMA Approval Letter 2014; Risk MAP Handout; OCCRI Handout; SC Roster; Significant Historic Hazard Events Tables; HVA Worksheet; and Critical Infrastructure List

From the Wheeler County NHMP December 2013

Mission

Not listed.

Examples:

Harney County 2013 NHMP and retained for 2017-18: *To create a disaster-resilient Harney County.*

Wasco County 2012 NHMP and retained for 2017-18: *Protect life, property and the environment through coordination and cooperation among public and private partners, which will reduce risk and loss, and enhance the quality of life for the people of Wasco County.*

Goals

The plan goals describe the overall direction that the participating jurisdiction's agencies, organizations, and citizens can take toward mitigating risk from natural hazards.

- 1) Safety of life and property
- 2) Increased cooperation and collaboration between groups and agencies.
- 3) Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education.

Critical Infrastructure, Critical Facilities, and Lifelines: Collected Definitions

One definition of critical infrastructure is "Systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters" (U.S. Department of Homeland Security [U.S. DHS], n.d.).

A definition of critical facilities: "Structures and institutions necessary, in the community's opinion, for response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery" (*2015 Hazard Mitigation Assistance (HMA) Guidance*, FEMA).

A definition of lifelines: "Lifelines include utility systems (potable water, wastewater, oil, natural gas, electric power facilities and communication systems) and transportation systems (airways, bridges, roads, tunnels and waterways). Communication facilities are also important lifelines." (*Portland Local Energy Assurance Plan*, 2012).

that they are responsible for completing and submitting the cost share forms to him on a monthly basis. Jason also asked the County Emergency Manager to please post the project flyer on the County website and Facebook page – and anywhere else she thought people would see it. He noted that the Community Profile and Risk Assessment Chapters of the plan would need to be posted on the website and that all County residents can and should take a few moments to review them and offer any comments that might have.

The Committee then reviewed the Hazard Vulnerability Analysis (HVA) that was completed at the last Steering Committee. All members in attendance indicated that they still agree with the outcome. They also reviewed the critical infrastructure list which is also an important source of information for the Risk Assessment.

Then the Committee spent the remainder of the meeting reviewing the current Mitigation Actions and developing new actions for the plan update. It was a lengthy and thorough discussion. The Committee agreed that wildfire, as the #1 natural hazard in the county, should receive the greatest emphasis in the plan update. To that end, it was agreed that the recommendations in the current Wheeler County Wildfire Protection Plan should be integrated into the mitigation actions in the plan update. The new mitigation actions for this plan update reflect this.

Jason wrapped up the meeting by reminding Committee members that they need to start talking to their elected bodies at the County and cities and remind them that the plan will need to be adopted after FEMA has reviewed and approved the plan.

Wheeler County NHMP Update Steering Committee Meeting

December 10, 2018
9:00 AM – 11:30 AM

Wheeler County Emergency Management
401 Fourth Street, Family Services Building Fossil, OR 97830

AGENDA

- | | | |
|------|--|--------------------------|
| I. | Welcome (5 min) | Jason |
| II. | Steering Committee Update (20 min) | Jason/Steering Committee |
| | <ul style="list-style-type: none">▪ Review Project Schedule▪ Steering Committee member updates (if any)▪ Cost share form and supporting documentation▪ Review status on posting NHMP information on the County and the Cities websites▪ Review Wheeler County NHMP Flyer (Handout)▪ Review project goals and finalize mission statement | |
| III. | Review Hazard Analysis Summary (5 min) | Jason |
| IV. | Review Critical Infrastructure (10 min) | Jason |
| V. | Review Mitigation Strategies and Actions (60 min) | Jason |
| | <ul style="list-style-type: none">▪ Review 2013 list of actions, update, and modify, delete, add actions for 2019 NHMP▪ Review Proposed New Mitigation Strategies and Actions | |
| VI. | Next Steps (5 min) | Jason |

Meeting Materials

Wheeler County to provide:

- Meeting Agenda
- Sign-in Sheet
- Cost Share Form & Cost Share Instructions
- Project Flyer
- Project Schedule

DLCD to provide:

- Hazard Analysis Summary

- Critical Infrastructure List
- Mitigation Strategies/Actions Tables (Current and New).
- OCCRI Report

Potential Plan Mission Statements

Harney County 2013 NHMP and retained for 2017-18:

- 1) *To create a disaster-resilient Harney County.*

Wasco County 2012 NHMP and retained for 2017-18:

- 2) *Protect life, property and the environment through coordination and cooperation among public and private partners, which will reduce risk and loss, and enhance the quality of life for the people of Wasco County.*

Other Examples:

- 3) *The mission of the Wheeler County Hazard Mitigation Plan is to establish sound public policy to protect life, property, and the quality of the natural environment; to reduce risk and prevent loss from future hazard events.*
- 4) *To make Wheeler County more resilient by reducing risk and enhancing the capability of the County and its citizens to respond effectively to and recover quickly from natural hazards.*
- 5) *To reduce risk, prevent loss and protect life, property and the environment from natural hazard events through coordination and cooperation among public and private partners. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities that will guide the county towards building a safer community.*

Plan Goals

- 1) Safety of life and property
- 2) Increased cooperation and collaboration between groups and agencies.
- 3) Motivate the public, private sector, and government agencies to mitigate against the effects of natural hazards through information and education.

Appendix D: Economic Analysis of Natural Hazard Mitigation Projects

This appendix was developed by the Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center. It has been reviewed and accepted by the Federal Emergency Management Agency as a means of documenting how the prioritization of actions shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

The appendix outlines three approaches for conducting economic analyses of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, State Hazard Mitigation Plan, (Oregon State Police – Office of Emergency Management, 2000), and Federal Emergency Management Agency Publication 331, *Report on Costs and Benefits of Natural Hazard Mitigation*. This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred. Evaluating possible natural hazard mitigation activities provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools. Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce “ripple-effects” throughout the community, greatly increasing the disaster's social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

What are some Economic Analysis Approaches for Evaluating Mitigation Strategies?

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into three general categories: benefit/cost analysis, cost-effectiveness analysis and the STAPLE/E approach. The distinction between the three methods is outlined below:

BENEFIT/COST ANALYSIS

Benefit/cost analysis is a key mechanism used by the state Office of Emergency Management (OEM), the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

Benefit/cost analysis is used in natural hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoiding future damages, and risk. In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented. A project must have a benefit/cost ratio greater than 1 (i.e., the net benefits will exceed the net costs) to be eligible for FEMA funding. Jurisdictions must use the FEMA BCA toolkit, latest version available, unless an alternate approach has been approved by FEMA. Jurisdictions must consult with the SHMO (State Hazard Mitigation Officer) if they intend on using an alternate approach. See <https://www.fema.gov/benefit-cost-analysis> for more information.

COST-EFFECTIVENESS ANALYSIS

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in Public Sector Mitigation Activities

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions which involve a diverse set of beneficiaries and non-market benefits.

Investing in Private Sector Mitigation Activities

Private sector mitigation projects may occur on the basis of one or two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies;
2. Dispose of the building or land either by sale or demolition;
3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
4. Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchases. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

STAPLE/E APPROACH

Considering detailed benefit/cost or cost-effectiveness analysis for every possible mitigation activity could be very time consuming and may not be practical. There are some alternate approaches for conducting a quick evaluation of the proposed mitigation activities which could be used to identify those mitigation activities that merit more detailed assessment. One of those methods is the STAPLE/E approach.

Using STAPLE/E criteria, mitigation activities can be evaluated quickly by steering committees in a synthetic fashion. This set of criteria requires the committee to assess the mitigation activities based on the Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLE/E) constraints and opportunities of implementing the particular mitigation item in your community. The second chapter in FEMA’s How-To Guide “Developing the Mitigation Plan – Identifying Mitigation Actions and Implementation Strategies” as well as the “State of Oregon’s Local Natural Hazard Mitigation Plan: An Evaluation Process” outline some specific considerations in analyzing each aspect. The following are suggestions for how to examine each aspect of the STAPLE/E approach from the “State of Oregon’s Local Natural Hazard Mitigation Plan: An Evaluation Process.”

Social: Community development staff, local non-profit organizations, or a local planning board can help answer these questions.

- Is the proposed action socially acceptable to the community?
- Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Will the action cause social disruption?

Technical: The city or county public works staff, and building department staff can help answer these questions.

- Will the proposed action work?
- Will it create more problems than it solves?
- Does it solve a problem or only a symptom?
- Is it the most useful action in light of other community goals?

Administrative: Elected officials or the city or county administrator, can help answer these questions.

- Can the community implement the action?
- Is there someone to coordinate and lead the effort?
- Is there sufficient funding, staff, and technical support available?
- Are there ongoing administrative requirements that need to be met?

Political: Consult the mayor, city council or county planning commission, city or county administrator, and local planning commissions to help answer these questions.

- Is the action politically acceptable?
- Is there public support both to implement and to maintain the project?

Legal: Include legal counsel, land use planners, risk managers, and city council or county planning commission members, among others, in this discussion.

- Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity?
- Are there legal side effects? Could the activity be construed as a taking?
- Is the proposed action allowed by the comprehensive plan, or must the comprehensive plan be amended to allow the proposed action?
- Will the community be liable for action or lack of action?
- Will the activity be challenged?

Economic: Community economic development staff, civil engineers, building department staff, and the assessor's office can help answer these questions.

- What are the costs and benefits of this action?
- Do the benefits exceed the costs?
- Are initial, maintenance, and administrative costs taken into account?
- Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private?)
- How will this action affect the fiscal capability of the community?
- What burden will this action place on the tax base or local economy?
- What are the budget and revenue effects of this activity?
- Does the action contribute to other community goals, such as capital improvements or economic development?
- What benefits will the action provide? (This can include dollar amount of damages prevented, number of homes protected, credit under the CRS, potential for funding under the HMGP or the FMA program, etc.)

Environmental: Watershed councils, environmental groups, land use planners and natural resource managers can help answer these questions.

- How will the action impact the environment?

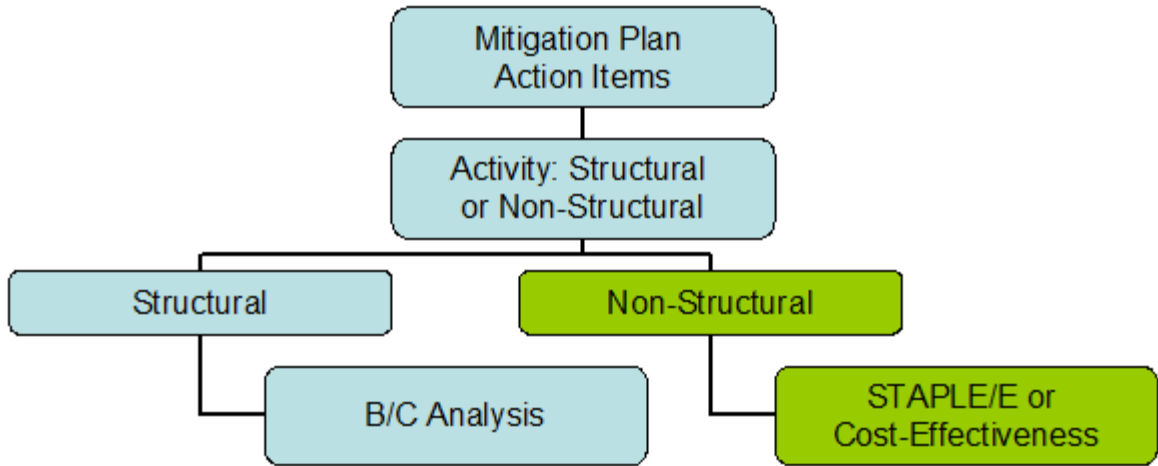
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

The STAPLE/E approach is helpful for doing a quick analysis of mitigation projects. Most projects that seek federal funding and others often require more detailed benefit/cost analyses.

When to use the Various Approaches

It is important to realize that various funding sources require different types of economic analyses. The following figure is to serve as a guideline for when to use the various approaches.

Figure D.1: Economic Analysis Flowchart



Source: Oregon Partnership for Disaster Resilience at the University of Oregon’s Community Service Center, 2005

Implementing the Approaches

Benefit/cost analysis, cost-effectiveness analysis, and the STAPLE/E are important tools in evaluating whether or not to implement a mitigation activity.

1. IDENTIFY THE ACTIVITIES

Activities for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation projects can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. CALCULATE THE COSTS AND BENEFITS

Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate activities. Potential economic criteria to evaluate alternatives include:

- **Determine the project cost.** This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- **Estimate the benefits.** Projecting the benefits or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

- **Consider costs and benefits to society and the environment.** These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.
- **Determine the correct discount rate.** Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. ANALYZE AND RANK THE ACTIVITIES

Once costs and benefits have been quantified, economic analysis tools can rank the possible mitigation activities. Two methods for determining the best activities given varying costs and benefits include net present value and internal rate of return.

- **Net present value.** Net present value is the value of the expected future returns of an investment minus the value of the expected future cost expressed in today's dollars. If the net present value is greater than the projected costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.
- **Internal rate of return.** Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project. Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk, project effectiveness, and economic, environmental, and social returns in choosing the appropriate project for implementation.

Economic Returns of Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or land owners as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the

owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

ADDITIONAL COSTS FROM NATURAL HAZARDS

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed “indirect” effects, but they can have a very direct effect on the economic value of the owner’s building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others.

Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

Resources

CUREe Kajima Project, *Methodologies for Evaluating the Socio-Economic Consequences of Large Earthquakes*, Task 7.2 Economic Impact Analysis, Prepared by University of California, Berkeley Team, Robert A. Olson, VSP Associates, Team Leader; John M. Eiding, G&E Engineering Systems; Kenneth A. Goettel, Goettel and Associates, Inc.; and Gerald L. Horner, Hazard Mitigation Economics Inc., 1997

Federal Emergency Management Agency, *Benefit/Cost Analysis of Hazard Mitigation Projects*, Riverine Flood, Version 1.05, Hazard Mitigation Economics, Inc., 1996

Federal Emergency Management Agency, *Report on the Costs and Benefits of Natural Hazard Mitigation*. Publication 331, 1996.

Goettel & Horner Inc., *Earthquake Risk Analysis Volume III: The Economic Feasibility of Seismic Rehabilitation of Buildings in the City of Portland*, Submitted to the Bureau of Buildings, City of Portland, August 30, 1995.

Goettel & Horner Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects Volume V*, Earthquakes, Prepared for FEMA's Hazard Mitigation Branch, October 25, 1995.

Horner, Gerald, *Benefit/Cost Methodologies for Use in Evaluating the Cost Effectiveness of Proposed Hazard Mitigation Measures*, Robert Olsen Associates, Prepared for Oregon State Police, Office of Emergency Management, July 1999.

Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon State Police – Office of Emergency Management, 2000.)

Risk Management Solutions, Inc., *Development of a Standardized Earthquake Loss Estimation Methodology*, National Institute of Building Sciences, Volume I and II, 1994.

VSP Associates, Inc., *A Benefit/Cost Model for the Seismic Rehabilitation of Buildings*, Volumes 1 & 2, Federal Emergency management Agency, FEMA Publication Numbers 227 and 228, 1991.

VSP Associates, Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects: Section 404 Hazard Mitigation Program and Section 406 Public Assistance Program*, Volume 3: Seismic Hazard Mitigation Projects, 1993.

VSP Associates, Inc., *Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model*, Volume 1, Federal Emergency Management Agency, FEMA Publication Number 255, 1994.

Appendix E:

Grant Programs

Hazard Mitigation Programs

Post-Disaster Federal Programs

- Hazard Mitigation Grant Program
 - The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.
<http://www.fema.gov/government/grant/hmgrp/>
- Physical Disaster Loan Program
 - When physical disaster loans are made to homeowners and businesses following disaster declarations by the U.S. Small Business Administration (SBA), up to 20% of the loan amount can go towards specific measures taken to protect against recurring damage in similar future disasters.
<http://www.sba.gov/services/disasterassistance/index.html>

Pre-Disaster Federal Programs

- Pre-Disaster Mitigation Grant Program
 - The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.
<http://www.fema.gov/government/grant/pdm/index.shtm>
- Flood Mitigation Assistance Program
 - The overall goal of the Flood Mitigation Assistance (FMA) Program is to fund cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other National Flood Insurance Program (NFIP) insurable structures. This specifically includes:
 - Reducing the number of repetitively or substantially damaged structures and the associated flood insurance claims;
 - Encouraging long-term, comprehensive hazard mitigation planning;
 - Responding to the needs of communities participating in the NFIP to expand their mitigation activities beyond floodplain development activities; and

- Complementing other federal and state mitigation programs with similar, long-term mitigation goals.
- <http://www.fema.gov/government/grant/fma/index.shtm>

Detailed program and application information for federal post-disaster and pre-disaster programs can be found in the FY10 Hazard Mitigation Assistance Unified Guidance, available at <http://www.fema.gov/library/viewRecord.do?id=3649>

For Oregon Emergency Management grant guidance on Federal Hazard Mitigation Assistance, visit: http://www.oregon.gov/OMD/OEM/plans_train/grant_info/hma.pdf

OEM contact: Clint Fella

State Programs

- Community Development Block Grant Program
 - Promotes viable communities by providing: 1) decent housing; 2) quality living environments; and 3) economic opportunities, especially for low and moderate income persons. Eligible Activities Most Relevant to Hazard Mitigation include: acquisition of property for public purposes; construction/reconstruction of public infrastructure; community planning activities. Under special circumstances, CDBG funds also can be used to meet urgent community development needs arising in the last 18 months which pose immediate threats to health and welfare. <http://www.hud.gov/offices/cpd/communitydevelopment/programs/>
- Oregon Watershed Enhancement Board
 - While OWEB’s primary responsibilities are implementing projects addressing coastal salmon restoration and improving water quality statewide, these projects can sometimes also benefit efforts to reduce flood and landslide hazards. In addition, OWEB conducts watershed workshops for landowners, watershed councils, educators, and others, and conducts a biennial conference highlighting watershed efforts statewide. Funding for OWEB programs comes from the general fund, state lottery, timber tax revenues, license plate revenues, angling license fees, and other sources. OWEB awards approximately \$20 million in funding annually. <http://www.oweb.state.or.us/>
- State Preparedness and Incident Response Equipment (SPIRE) Grant Program
 - Oregon House Bill 2687, which became effective in August 2017, established a grant program to distribute emergency preparedness equipment, which may include vehicles or other property, to local governments and other recipients to be used to decrease risk of life and property resulting from an emergency. Items purchased must qualify as capital assets, meaning individual items must cost at least \$5,000. A total of \$5,000,000 is available to procure emergency preparedness equipment to help Oregon communities prepare, respond, and recover from emergencies. Questions: Contact the SPIRE Grant Coordinator, Jim Jungling at jim.jungling@state.or.us, 503.378.3552

Federal Mitigation Programs, Activities & Initiatives

Basic & Applied Research/Development

- National Earthquake Hazard Reduction Program (NEHRP), National Science Foundation. Through broad based participation, the NEHRP attempts to mitigate the effects of earthquakes. Member agencies in NEHRP are the US Geological Survey (USGS), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the National Institute for Standards and Technology (NIST). The agencies focus on research and development in areas such as the science of earthquakes, earthquake performance of buildings and other structures, societal impacts, and emergency response and recovery. <http://www.nehrp.gov/>
- Decision, Risk, and Management Science Program, National Science Foundation. Supports scientific research directed at increasing the understanding and effectiveness of decision making by individuals, groups, organizations, and society. Disciplinary and interdisciplinary research, doctoral dissertation research, and workshops are funded in the areas of judgment and decision making; decision analysis and decision aids; risk analysis, perception, and communication; societal and public policy decision making; management science and organizational design. The program also supports small grants for exploratory research of a time-critical or high-risk, potentially transformative nature. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423&org=SES

Hazard ID and Mapping

- National Flood Insurance Program: Flood Mapping; FEMA. Flood insurance rate maps and flood plain management maps for all NFIP communities. <http://www.fema.gov/plan/prevent/fhm/index.shtml>
- National Digital Orthophoto Program, DOI – USGS. Develops topographic quadrangles for use in mapping of flood and other hazards. <http://www.ndop.gov/>
- Mapping Standards Support, DOI-USGS. Expertise in mapping and digital data standards to support the National Flood Insurance Program. <http://ncgmp.usgs.gov/ncgmpstandards/>
- Soil Survey, USDA-NRCS. Maintains soil surveys of counties or other areas to assist with farming, conservation, mitigation or related purposes. <http://soils.usda.gov/survey/>

Project Support

- Coastal Zone Management Program, NOAA. Provides grants for planning and implementation of non-structural coastal flood and hurricane hazard mitigation projects and coastal wetlands restoration. <http://coastalmanagement.noaa.gov/>
- Community Development Block Grant Entitlement Communities Program, HUD. Provides grants to entitled cities and urban counties to develop viable communities (e.g., decent housing, a suitable living environment, expanded economic opportunities), principally for low- and moderate- income persons. <http://www.hud.gov/offices/cpd/communitydevelopment/programs/entitlement/>
- National Fire Plan (DOI – USDA) Provides technical, financial, and resource guidance and support for wildland fire management across the United States. Addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability. <http://www.forestsandrangelands.gov/NFP/index.shtml>
- Assistance to Firefighters Grant Program, FEMA. Grants are awarded to fire departments to enhance their ability to protect the public and fire service personnel from fire and related hazards. Three types of grants are available: Assistance to Firefighters Grant (AFG), Fire

Prevention and Safety (FP&S), and Staffing for Adequate Fire and Emergency Response (SAFER).
<http://www.firegrantsupport.com/>

- Emergency Watershed Protection Program, USDA-NRCS. Provides technical and financial assistance for relief from imminent hazards in small watersheds, and to reduce vulnerability of life and property in small watershed areas damaged by severe natural hazard events.
<http://www.nrcs.usda.gov/programs/EWP/>
- Rural Development Assistance – Utilities, USDA. Direct and guaranteed rural economic loans and business enterprise grants to address utility issues and development needs.
<http://www.usda.gov/rus/>
- Rural Development Assistance – Housing, USDA. Grants, loans, and technical assistance in addressing rehabilitation, health and safety needs in primarily low-income rural areas. Declaration of major disaster necessary. <http://www.rurdev.usda.gov/rhs/>
- Public Assistance Grant Program, FEMA. The objective of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President. <http://www.fema.gov/government/grant/pa/index.shtm>
- National Flood Insurance Program, FEMA. Makes available flood insurance to residents of communities that adopt and enforce minimum floodplain management requirements.
<http://www.fema.gov/business/nfip/>
- HOME Investments Partnerships Program, HUD. Grants to states, local government and consortia for permanent and transitional housing (including support for property acquisition and rehabilitation) for low-income persons.
<http://www.hud.gov/offices/cpd/affordablehousing/programs/home/>
- Disaster Recovery Initiative, HUD. Grants to fund gaps in available recovery assistance after disasters (including mitigation).
<http://www.hud.gov/offices/cpd/communitydevelopment/programs/dri/driquickfacts.cfm>
- Emergency Management Performance Grants, FEMA. Helps state and local governments to sustain and enhance their all-hazards emergency management programs.
<http://www.fema.gov/government/grant/empg/index.shtm#0>
- Partners for Fish and Wildlife, DOI – FWS. Financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats.
<http://www.fws.gov/partners/>
- North American Wetland Conservation Fund, DOI-FWS. Cost-share grants to stimulate public/private partnerships for the protection, restoration, and management of wetland habitats. <http://www.doi.gov/partnerships/wetlands.html>
- Federal Land Transfer / Federal Land to Parks Program, DOI-NPS. Identifies, assesses, and transfers available Federal real property for acquisition for State and local parks and recreation, such as open space. http://www.nps.gov/ncrc/programs/flp/flp_questions.html
- Wetlands Reserve program, USDA-NRCS. Financial and technical assistance to protect and restore wetlands through easements and restoration agreements.
<http://www.nrcs.usda.gov/Programs/WRP/>

- Secure Rural Schools and Community Self-Determination Act of 2000, US Forest Service. Reauthorized for FY2008-2011, it was originally enacted in 2000 to provide five years of transitional assistance to rural counties affected by the decline in revenue from timber harvests on federal lands. Funds have been used for improvements to public schools, roads, and stewardship projects. Money is also available for maintaining infrastructure, improving the health of watersheds and ecosystems, protecting communities, and strengthening local economies. <http://www.fs.fed.us/srs/>

Appendix F: Wheeler County Natural Hazard Mitigation Public Opinion Survey

Survey Purpose and Use

As has been mentioned in this plan update, Wheeler County is Oregon's least populated county. It's rural, remote and dispersed population requires the use of public engagement tools that are tailored to the community. Therefore, in order to reach out directly to the greatest number County residents, an online public opinion survey was developed and administered.

The purpose of this survey was to reach as many county residents as possible in the most effective way. It gauged residents overall perception of natural disasters, what assets are most valued, how best to prioritize mitigation actions, and what are the most effective ways of communicating with residents.

The survey was done online from February 20, 2019 through March 21, 2019. A flyer promoting the survey and a link to it were placed on the Wheeler County website, the Wheeler County Facebook page, the Facebook pages for the cities of Fossil and Mitchell, and in the online version of the Wheeler County News. Twenty (20) unique surveys were completed and received. The results of the survey are detailed below.

Survey Results Displayed Graphically

The online survey had seven questions. The results from the questions are shown in the following graphs and tables.

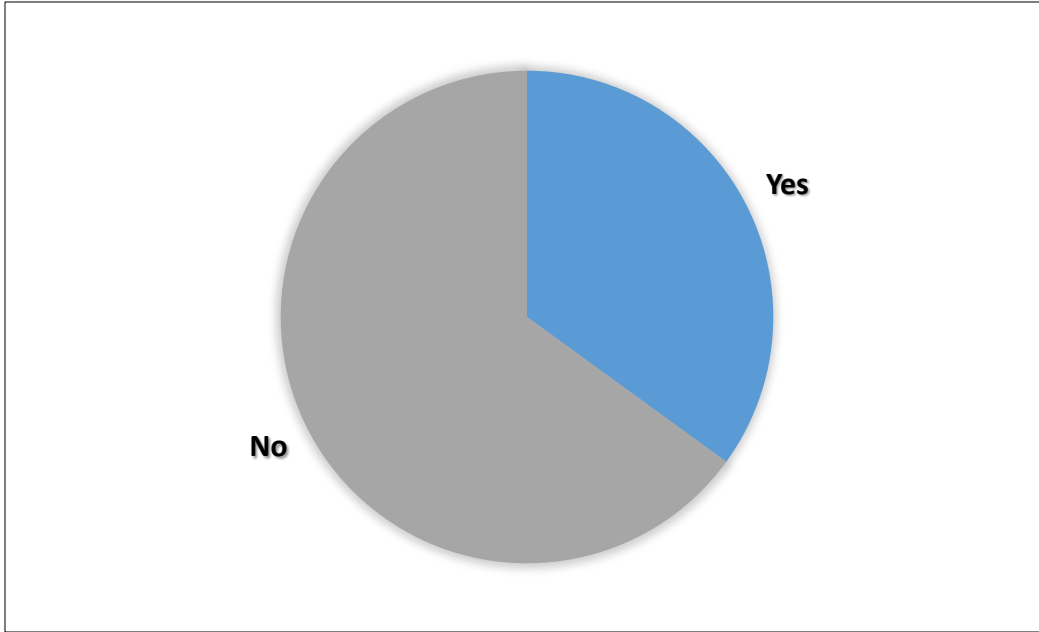


Figure F.1: Have you heard of the Natural Hazard Mitigation Plan before this?

Figure 1 indicates that people in Wheeler County are generally not even aware of the existence of the counties natural hazard mitigation plan. This is not uncommon. It indicates that the local governments need to make implementation of the plan a higher priority. This can be done by reviewing and following the plan implementation and maintenance process outlined in Chapter 5.

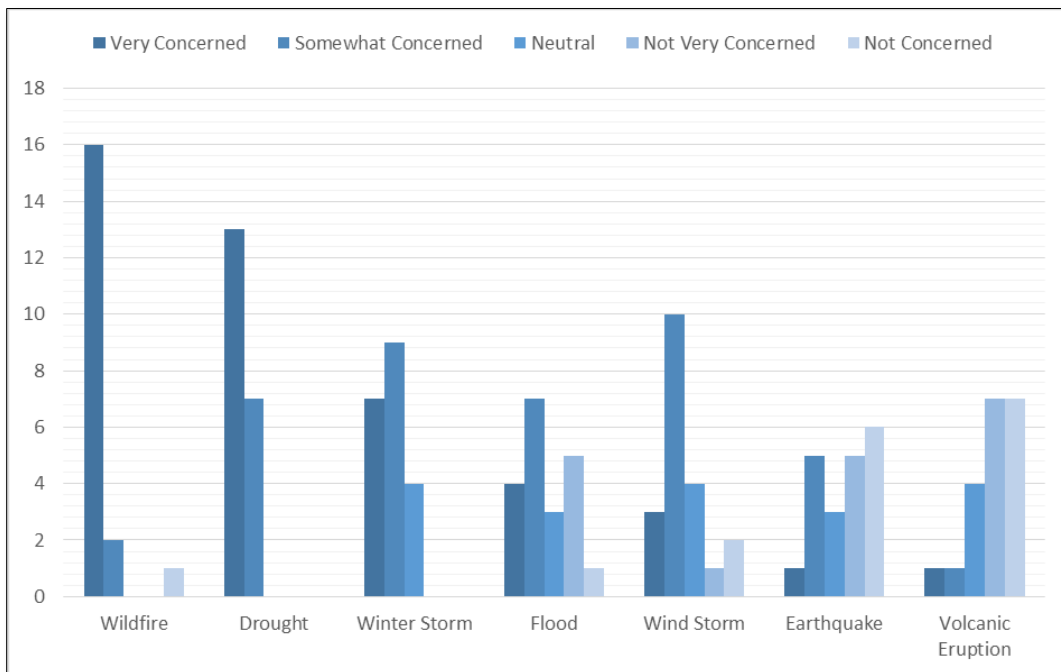


Figure F.2: How concerned are you about the following natural disasters affecting Wheeler County?

The results depicted in Figure 2 are consistent with the analysis done for Chapter 2: Risk Assessment. Wildfires and drought are clearly the hazards of greatest concern to the residents of Wheeler County. As such, the mitigation actions identified in this plan focus more heavily on these two hazards, particularly wildfires.

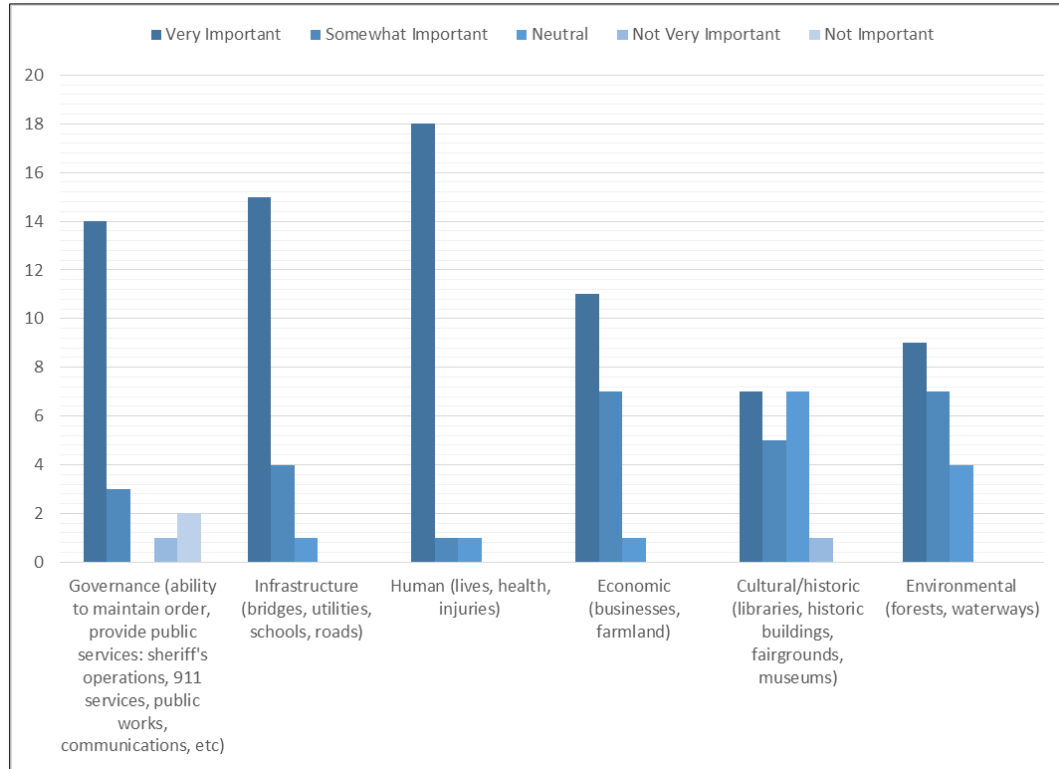


Figure F.3: Of the following Wheeler County assets, which do you think are the most important to protect from the impacts caused by a natural disaster?

The results in Figure 3 indicate that the people of Wheeler County see human life and critical infrastructure as the most important assets to protect, followed closely by key government services such as police, fire and emergency communications.

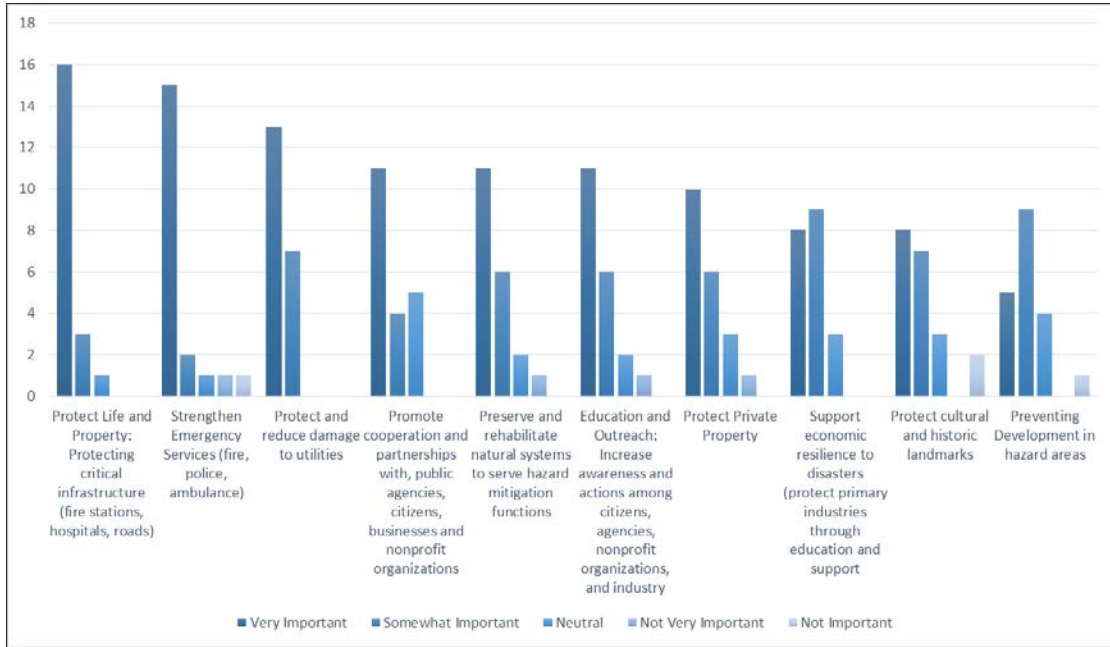


Figure F.4: Planning for natural hazards can help communities survive with fewer negative impacts. Prioritizing mitigation actions can help keep a community functioning as close to normally as possible during and after a disaster.

Based on the results in Figure 4, the county should focus their limited resources on implementing those mitigation actions that protect life, property and critical infrastructure while strengthening emergency services.

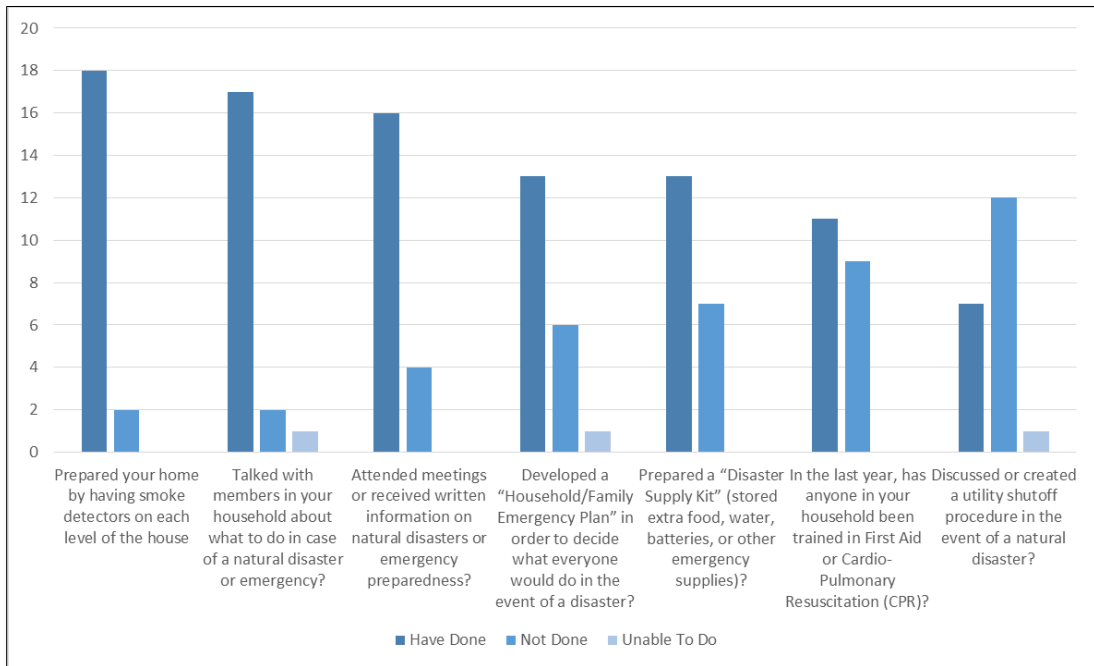


Figure F.5: For each activity listed below, please select the choice that applies to ANY mem For

example, for the first answer, if ANY member of your household "has attended meetings or received written information on natural disasters or emergency preparedness," please select "Have done."

The results in the figure above show that people in Wheeler County have done some things to prepare for a natural disaster, but that more could be accomplished. For example, the preparation of a Disaster Supply Kit is a relatively easy way to ensure that residents have access to emergency supplies such as food and water for the first two weeks after a disaster. Through outreach and education, the County could make residents more aware of the need for such things as a disaster kit, family emergency plan or the benefits of being trained in CPR.

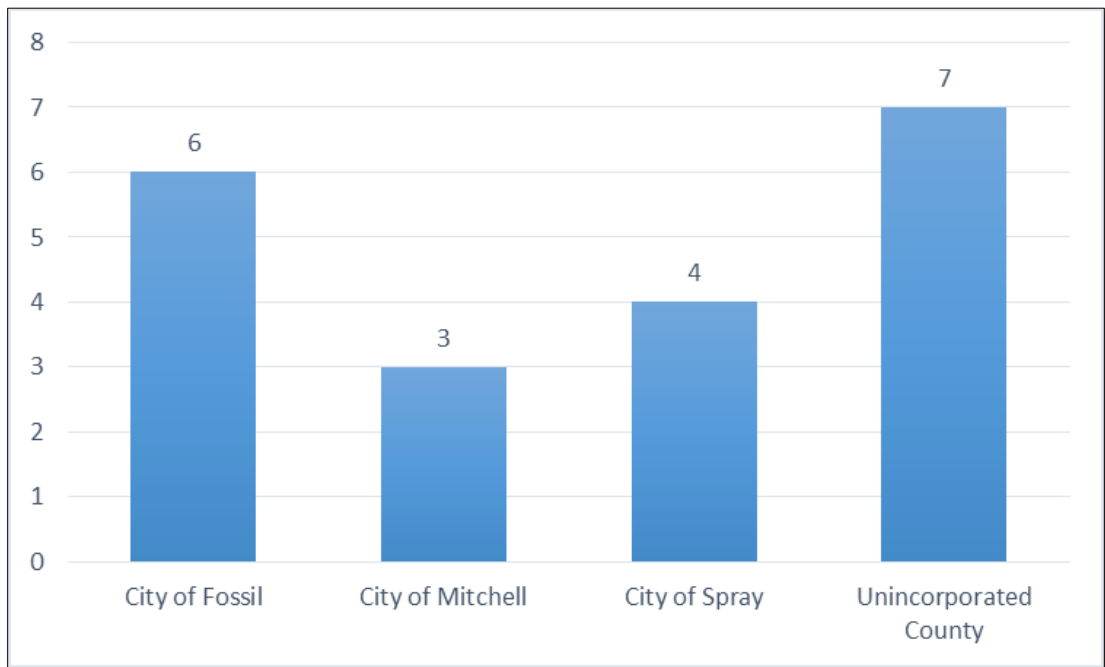


Figure F.6: What area of Wheeler County do you live in?

About half of the population in Wheeler County lives outside of the three incorporated cities based on the 2018 US Census estimates.

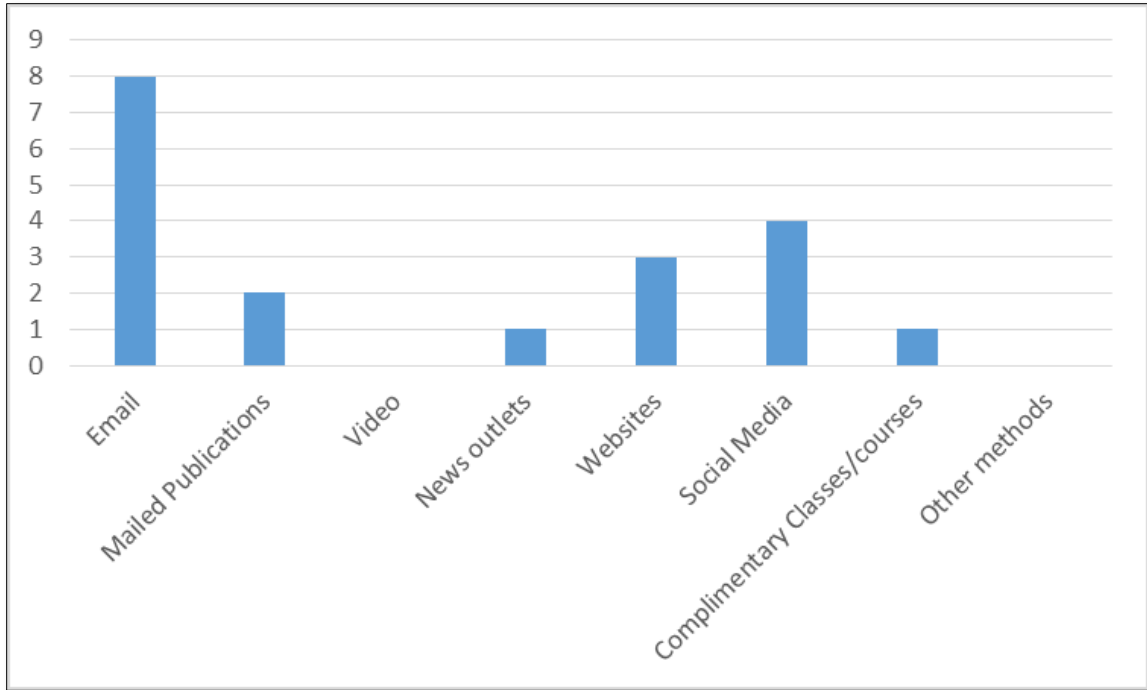


Figure F.7: What is the most effective way for you to receive information about how to make your household and home safer from natural disasters?

It is important to note that many residents do not have access to email and/or the internet. These people still rely on more traditional communication vehicles such as print media and civic gatherings, such as at senior centers.

Detailed Survey Results Displayed in Tabular Form.

Number of Survey Respondents: 20

1. Have you heard of the Natural Hazard Mitigation Plan before this?

Yes	No
7	13

2. How concerned are you about the following natural disasters affecting Gilliam County? Please assign a number to your concern, with "1" meaning "Not at all concerned," and "5" meaning "Very concerned."

Natural Disaster	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
Drought	13	7	0	0	0
Earthquake	1	5	3	5	6
Flood	4	7	3	5	1
Wildfire	16	2	0	0	1
Volcanic Eruption	1	1	4	7	7

Wind Storm	3	10	4	1	2
Winter Storm	7	9	4	0	0

3. Of the following Gilliam County assets, which do you think are the most important to protect from the impacts caused by a natural disaster? Please assign a number, with "1" meaning "not at all important" and "5" meaning "very important."

County Asset	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important
Governance (ability to maintain order, provide public services: sheriff's operations, 911 services, public works, communications, etc.)	14	3	0	1	2
Infrastructure (bridges, utilities, schools, roads)	15	4	1	0	0
Human (lives, health, injuries)	18	1	1	0	0
Economic (businesses, farmland)	11	7	1	0	0
Cultural/historic (libraries, historic buildings, fairgrounds, museums)	7	5	7	1	0
Environmental (forests, waterways)	9	7	4	0	0

4. Planning for natural hazards can help communities survive with fewer negative impacts. Prioritizing mitigation actions can help keep a community functioning as close to normally as possible during and after a disaster.

Of the following listed goals for reducing the risk from hazards, please assign a number to its level of importance, with "1" meaning "Not at all important," and "5" meaning "Very important."

Statements	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important
Protect Life and Property: Protecting critical infrastructure (fire stations, hospitals, roads)	16	3	1	0	0
Protect Private Property	10	6	3	1	0
Preventing Development in hazard areas	5	9	4	0	1
Support economic resilience to disasters (protect primary industries through education and support	8	9	3	0	0

Education and Outreach: Increase awareness and actions among citizens, agencies, nonprofit organizations, and industry	11	6	2	1	0
Promote cooperation and partnerships with, public agencies, citizens, businesses and nonprofit organizations	11	4	5	0	0
Protect cultural and historic landmarks	8	7	3	0	2
Preserve and rehabilitate natural systems to serve hazard mitigation functions	11	6	2	1	0
Strengthen Emergency Services (fire, police, ambulance)	15	2	1	1	1
Protect and reduce damage to utilities	13	7	0	0	0

5. For each activity listed below, please select the choice that applies to ANY member of your household.

For example, for the first answer, if ANY member of your household "has attended meetings or received written information on natural disasters or emergency preparedness," please select "Have done."

In your household, have you or someone in your household:	Have Done	Not Done	Unable To Do
Attended meetings or received written information on natural disasters or emergency preparedness?	16	4	0
Talked with members in your household about what to do in case of a natural disaster or emergency?	17	2	1
Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a disaster?	13	6	1
Prepared a "Disaster Supply Kit" (stored extra food, water, batteries, or other emergency supplies)?	13	7	0
In the last year, has anyone in your household been trained in First Aid or Cardio-Pulmonary Resuscitation (CPR)?	11	9	0
Prepared your home by having smoke detectors on each level of the house	18	2	0
Discussed or created a utility shutoff procedure in the event of a natural disaster?	7	12	1

6. What area of Gilliam County do you live in?

City of Fossil	City of Mitchell	City of Spray	Unincorporated County
6	3	4	7

7. What is the most effective way for you to receive information about how to make your household and home safer from natural disasters?

Email	Mailed Publications	Video	News outlets	Websites	Social Media	Complimentary Classes/courses	Other methods
8	2	0	1	3	4	1	0

Figure F.8: Wheeler County Natural Hazard Mitigation Public Opinion Survey Flyer



**SHARE
YOUR
VOICE**

**WE WANT
TO HEAR
FROM YOU**

**Take the Wheeler County Natural Hazards
Survey**

Survey link:
<https://www.surveymonkey.com/r/GMZ3WVT>

**Wildfires, Floods, Winter Storms, Landslides...
What Concerns You?**

Your answers are confidential and will be used to inform the 2019
Wheeler County Natural Hazards Mitigation Plan Update



For more information contact:

Terry Ignowski
Emergency Management Coordinator | Wheeler County
Phone: (541) 763-2380
Email: tignowski@co.wheeler.or.us

Appendix G: Mid-Columbia Regional Natural Hazard Mitigation Public Opinion Survey

Survey Purpose and Use

A public opinion survey was outside of the scope of work for the 2019 Wheeler County Update. The survey results below are from the 2014 NHMP Update which was sent to a large sampling of residents across eight Oregon counties, including Wheeler County. The demographics of Wheeler County have not changed significantly since this survey was completed. It has been included to provide additional information for decision makers in the implementation and maintenance of this plan update.

The purpose of this survey was to gauge the overall perception of natural disasters, determine a baseline level of loss reduction activity for residents in the community, and assess citizen's support for different types of individual and community risk reduction activities.

Data from this survey directly informs the natural hazard planning process. Counties in the Mid-Columbia region can use this survey data to enhance action item rationale and ideas for implementation. Other community organizations can also use survey results to inform their own outreach efforts. Data from the survey provides the counties with a better understanding of desired outreach strategies (sources and formats), a baseline understanding of what people have done to prepare for natural hazards, and desired individual and community strategies for risk reduction.

Background

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201 require that jurisdictions maintain an approved NHMP in order to receive federal funds for mitigation projects. Development of the Natural Hazards Mitigation Plan update process for eight counties in the Mid-Columbia Gorge and surrounding regions was pursued in compliance with subsections from 44 CFR 201.6 guidelines.

Citizen involvement is a key component in the natural hazard mitigation planning process. Citizens should have the opportunity to voice their ideas, interests and concerns about the impact of natural disasters on their communities. To that end, the DMA2K requires citizen involvement in the natural hazard mitigation planning process. It states: "An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

1. An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval
2. An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process.”

According to Bierle¹, the benefits of citizen involvement include the following: (1) educate and inform public; (2) incorporate public values into decision making; (3) substantially improve the quality of decisions; (4) increase trust in institutions; (5) reduce conflict; and (6) ensure cost effectiveness.

Methodology

In the fall of 2011, the Oregon Partnership for Disaster Resilience (OPDR) distributed a mailed survey to 7,500 random households throughout an eight county region in Northern Oregon. The counties surveyed included: Clackamas, Hood River, Gilliam, Morrow, Sherman, Umatilla, Wasco, and Wheeler. OPDR developed and distributed the survey in partnership with three members of the University of Oregon’s Resource Assistance for Rural Environments (RARE) program.

Given the geographic extent of the survey area and significant county population differences in the region, OPDR stratified the survey sample across three distinct sub-regions (see Table G-1 below). To ensure a minimum number of returns in each of the counties in sub-region three, OPDR leveled the sample at 400 surveys per county (excepting Umatilla). Once OPDR determined the sample size for each county, they contracted with the Oregon Secretary of State Elections Division (OED) to randomly select names and addresses from state voter rolls. Table G-1 shows the survey sample size by sub-region.

¹ Bierle, T. 1999. “Using social goals to evaluate public participation in environmental decisions.” *Policy Studies Review*. 16(3/4), 75-103.

Table G-1: Survey Sample Size

County	Population '09	Pop as percent of subregion	Survey sample size by county
Subregion 1 - West			
Clackamas	379,845	100%	2,500
Subregion 2 - Gorge			
Hood River	21,725	47%	1,200
Wasco	24,230	53%	1,300
Subtotal	45,955	100%	2,500
Subregion 3 - East			
Sherman*	1,830	2%	400
Gilliam*	1,885	2%	400
Wheeler*	1,585	2%	400
Morrow	12,540	14%	400
Umatilla	72,430	80%	900
Subtotal	90,270	100%	2,500
Combined Total	516,070		7,500

Source: 2011 NHMP Public Opinion Survey

*Indicates that OPDR modified the sample size in these counties in an attempt to ensure a minimum number of survey returns.

Each mailed survey packet contained: (1) a cover letter that explained the purpose of the survey and described the survey incentives; (2) a copy of the survey; (3) a survey participation card; and (4) a postage-paid envelope in which to return the completed survey and participation card.

The survey consisted of 24 questions divided into four sections: natural hazard information; community vulnerabilities and hazard mitigation strategies; mitigation and preparedness activities in your household; and general household information. OPDR and RARE designed the survey to determine public perceptions and opinions regarding natural hazards. Questions also focused on the methods and techniques survey respondents prefer to use in reducing the risks and losses associated with natural hazards.

The survey participation card asked survey recipients to enter the amount of time it took them to complete the survey. It also functioned as a voluntary entry form into a drawing for an assortment of household preparedness items. The drawing provided participants an incentive for completing the survey and expressed that it was not required, but rather encouraged, that they complete it. One winner from each of the eight participating counties was chosen at random by the OPDR office.

Ten days before the survey deadline, OPDR sent a reminder postcard to each household urging them to complete the survey and return it as soon as possible. Of the 7,500 surveys sent, 733 were returned undeliverable for a final sample size of 6,767. OPDR received 951 completed surveys for a 14-percent overall survey response rate.

A key concern of organizations that conduct surveys is statistical validity. If one were to assume that the sample was perfectly random *and* that there was no response bias, then the survey would have a margin of error of ± 5 -percent at the 95-percent confidence level. In simple terms, this means that if a survey were conducted 100 times, the results would end up within ± 5 -percent of those presented in this report.

One limitation of the study's methodology is potential non-response bias from the mailed survey. The survey results represent only those households where residents are registered to vote. There could also be a bias of answers based on which residents are renters compared to owners. Despite these areas of potential response bias, the intent of this survey was not to be statistically valid but instead to gain the perspective and opinions of resident's regarding natural hazards in the region. Our assessment is that the results reflect a range attitudes and opinions of residents throughout the eight surveyed counties.

Survey Results

This section presents the compiled data and analysis for the 2011 Mid-Columbia Region Natural Hazard Mitigation Public Opinion Survey. We provide a copy of the survey instrument as Attachment A of this report; raw data is provided in Attachment B.

Natural Hazard Information

This section reports the experiences of survey respondents involving natural hazards, and their exposure to preparedness information.

The survey results indicate that about 28-percent of the respondents or someone in their household has personally experienced natural disasters in the past five years, or since they have lived in the community in which they currently reside (see Table G-2 below).

Table G-2: Direct Experience with Natural Disasters in Respondent County

Answer	Percent	Number
Yes	28%	249
No	72%	656
Q-1 total	100%	905

Source: 2011 NHMP Public Opinion Survey

Of those respondents who have experienced a natural disaster in the last five years, 51-percent experienced windstorms, 49-percent experienced wildfire, 38-percent experienced severe winter storms, and 19-percent experienced flood. Table G-3 illustrates the disasters experienced in the past five years in the Mid-Columbia region.

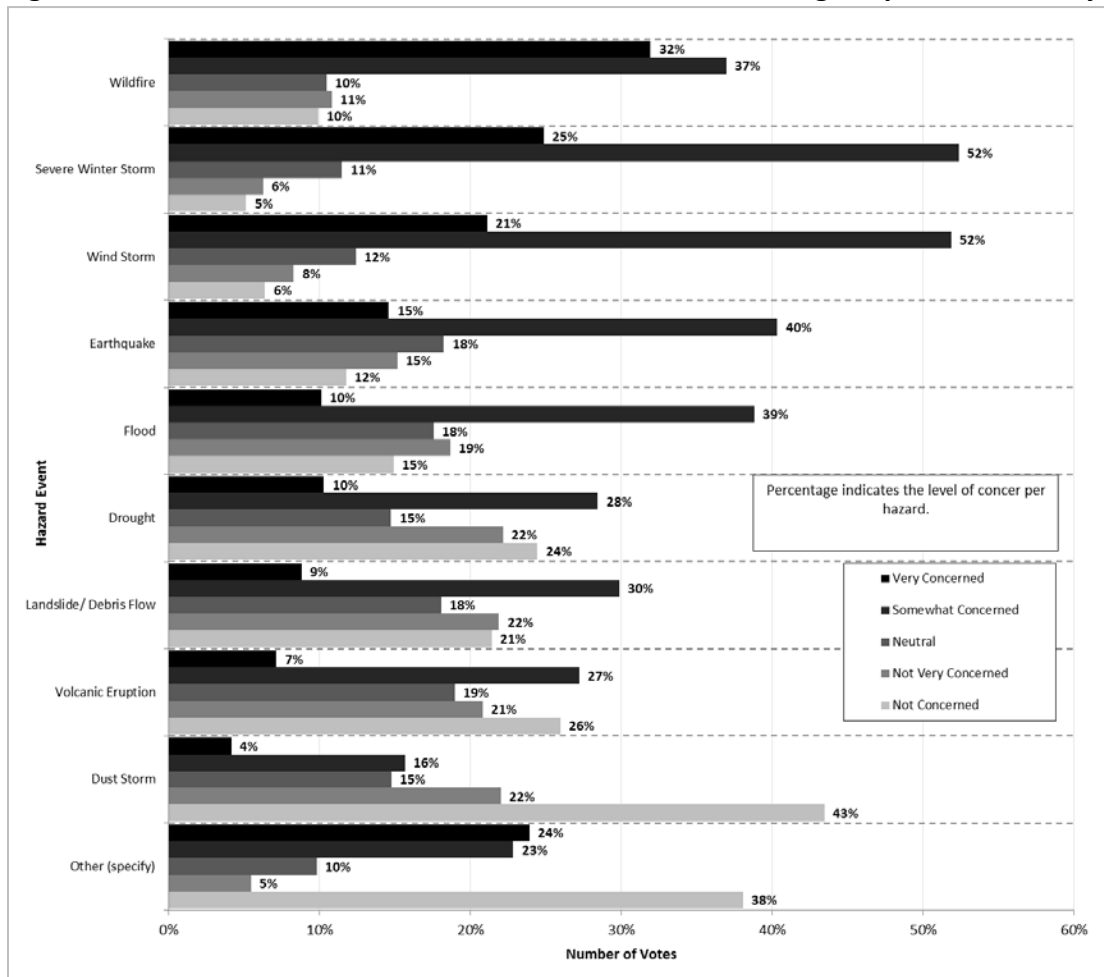
Table G-3: Type of Natural Disaster Experienced in Past Five Years

Hazard	Percent	Number
Windstorm	51%	126
Wildfire	49%	121
Severe Winter Storm	38%	94
Flood	19%	48
Drought	11%	27
Dust Storm	7%	17
Landslide/Debris Flow	7%	17
Earthquake	5%	13
Other	4%	10
Volcanic Eruption	1%	3
Q-1 "yes" answers	100%	249

Source: 2011 NHMP Public Opinion Survey

The survey also asked respondents to rank their personal level of concern for specific natural disasters affecting their community. Figure G-4 shows that more than 70-percent of respondents indicated that they are concerned or very concerned about windstorms and winter storms with nearly 60-percent indicating a high level of concern related to wildfires. A majority of respondents also demonstrated concern over earthquake and flood hazards with 55-percent and 49-percent of respondents marking “concerned” or “very concerned” for those two hazards respectively. Of lesser concern were the landslide, drought and volcano hazards with 47-, 46- and 43-percent of respondents marking “not very concerned” or “not concerned” for those hazards respectively. Dust storm is the hazard respondents are least concerned about with roughly 65-percent of respondents marking the “not very concerned” or “not concerned” choices. Figure G-1 summarizes respondent answers by hazard.

Figure G-1: Level of Concern About Natural Disasters Affecting Respondent County



Source: 2011 NHMP Public Opinion Survey

Next, the survey asked if survey recipients had received information about how to increase the safety of their households and homes from natural hazards. Table G-4 shows that over half (53-percent) of respondents indicated that they have received information regarding home and family safety from natural disasters at some time in the past.

Table G-4: Respondents Who Have Received Information Concerning Natural Disaster Home Safety

Answer	Percent	Number
Yes	53%	489
No	47%	438
Q-3 total	100%	927

Source: 2011 NHMP Public Opinion Survey

Of respondents who had received information, 27-percent received the information within the last six months and 20-percent received information six months to one year ago (see Table G-5). This suggests that, while outreach is occurring, it is reaching fewer than half of

the households in the Mid-Columbia region and surrounding areas, and that many of the households have not received any information in over a year.

Table G-5: Most Recent Date of Contact for Information Concerning Natural Disaster Home Safety

Answer	Percent	Number
Within last 6 months	27%	131
Between 6-12 months	20%	99
Between 1-2 years	22%	107
Between 2-5 years	15%	75
5 years or more	11%	55
Q-3 "yes" answers	100%	489

Source: 2011 NHMP Public Opinion Survey

Of the respondents who received information on natural hazard preparedness, the news media (36-percent) and government agencies (18-percent) were cited most often as being the source of the information. Table G-6 shows the sources most respondents last received information from. Note that while the question directed respondents to check only one answer, a number of respondents selected more than one choice. Therefore, readers should use some caution when interpreting these results.

Table G-6: Most Recent Provider of Natural Disaster Home Safety Information

Answer	Percent	Number
News Media	36%	174
Government Agency	18%	86
Other	15%	74
Not Sure	14%	68
Utility Company	8%	38
American Red Cross	6%	29
Neighbor/friend/family	5%	25
Insurance Agent/Company	5%	24
Other non-profit org.	4%	17
Social media (e.g. Facebook)	1%	4
Univ./research facility	0%	2
Elected official	0%	0
Q-4 total	111%	489

Source: 2011 NHMP Public Opinion Survey

Note: Total percentage exceeds 100% because some respondents chose more than one category.

Survey respondents provided an interesting contrast between the sources that they had recently received information from, and those that they perceived to be the most trustworthy. While only six-percent of respondents said they last received information from the American Red Cross, more respondents chose the American Red Cross as the most

trusted source of information than any other option. The second and third most trusted sources cited by respondents were “utility company” and “government agency”. “Elected Official” and “Social Media” received the lowest number of responses. Table G-7 shows the sources respondents trust the most for providing this information.

Table G-7: Most Trusted Providers of Information for Natural Disaster Home Safety

Answer	Number
American Red Cross	359
Utility Company	313
Government Agency	312
Univ./research facility	242
News Media	221
Insurance Agent/Company	186
Neighbor/friend/family	166
Not Sure	97
Other non-profit org.	93
Other	78
Elected official	14
Social media (e.g. Facebook)	9
Q-5 total	2,090

Source: 2011 NHMP Public Opinion Survey

Note: Respondents could check up to three information providers

When asked what the most effective way was to receive information, respondents indicated that television news (440 responses), newspaper stories (331 responses), and mail (315 responses) were the most effective. Interestingly, various types of advertisement (televisions, radio, billboards, and newspaper) all received relatively low responses. Table G-8 shows the effectiveness rating of information dissemination methods expressed by survey respondents.

Table G-8: Most Effective Method for Respondents to Receive Information Concerning Natural Disaster-Related Home Safety

Answer	Number
Television news	440
Newspaper stories	331
Mail	315
Fire Department/Rescue	245
Radio news	227
Fact sheet/brochure	224
Email newsletters	220
Online news outlets	126
Public workshops/meetings	121
University or research institution	87
Schools	72
Television ads	56
Books	50
Social media (e.g. Facebook)	38
Magazine	34
Radio ads	33
Other	33
Outdoor ads (e.g. billboards, etc.)	32
Newspaper ads	26
Chamber of Commerce	21
Q-6 total	2,731

Source: 2011 NHMP Public Opinion Survey

An overwhelming majority of survey respondents (87-percent of those who answered Question 7) indicated that they were not aware of their county’s natural hazards mitigation plan prior to receiving the survey. This suggests the need for increases in or changes to local NHMP education and outreach programs.

Table G-7: Respondent Knowledge/Awareness of County Natural Hazards Mitigation Plan

Answer	Percent	Number
Yes	13%	124
No	87%	814
Q-7 total	100%	938

Source: 2011 NHMP Public Opinion Survey

Consistent with the responses displayed in Table G-7, only 12-percent of respondents claimed to be aware, prior to the survey, that FEMA requires their county to update the NHMP every five years in order to be eligible for federal pre- and post-disaster hazard mitigation funds.

Table G-8: Respondent Awareness of FEMA Requirements for Five Year NHMP Update to Receive Hazard Mitigation Funding

Answer	Percent	Number
Yes	12%	110
No	88%	827
Q-8 total	100%	938

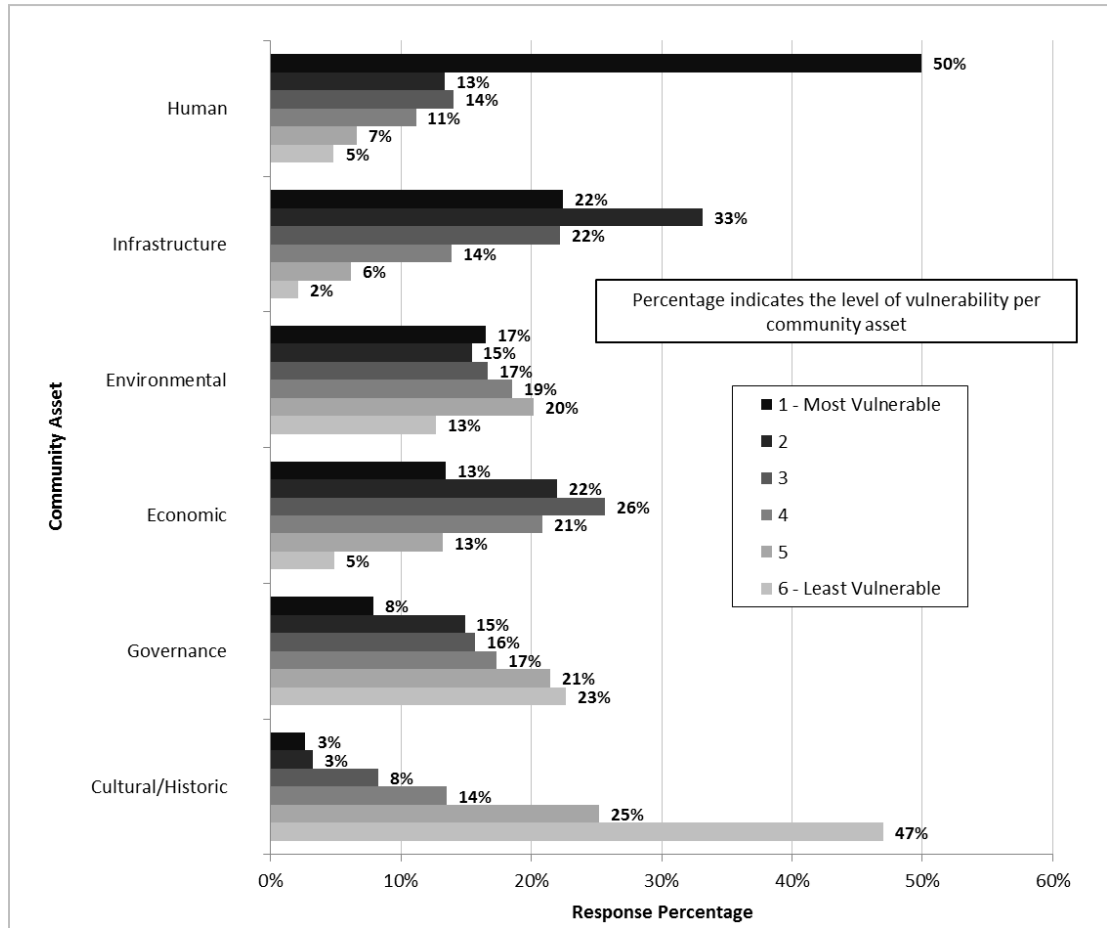
Source: 2011 NHMP Public Opinion Survey

Community Vulnerabilities and Hazard Mitigation Strategies

This section outlines the assets that survey respondents felt would be vulnerable to natural hazards in the region. The section also describes citizens’ priorities for planning for natural hazards and the community-wide strategies respondents support.

The survey asked respondents to rank categories of community assets in terms of their vulnerability. These questions were intended to help the Mid-Columbia region and surrounding communities determine citizen priorities when planning for natural hazards, by comparing the level of importance that they attach to specific community assets and risk reduction activities. Figure G-2 illustrates that respondents found human related assets to be by far the most vulnerable (50-percent), followed distantly by infrastructure (22-percent). Survey respondents found environmental assets to be the third most vulnerable (17-percent), followed closely by economic assets (13-percent), however economic assets made up a noticeably higher proportion than environmental assets in rankings 2-4. Cultural/historic assets (three-percent) received the lowest consistent ranking in terms of vulnerability, preceded somewhat closely by governance (eight-percent).

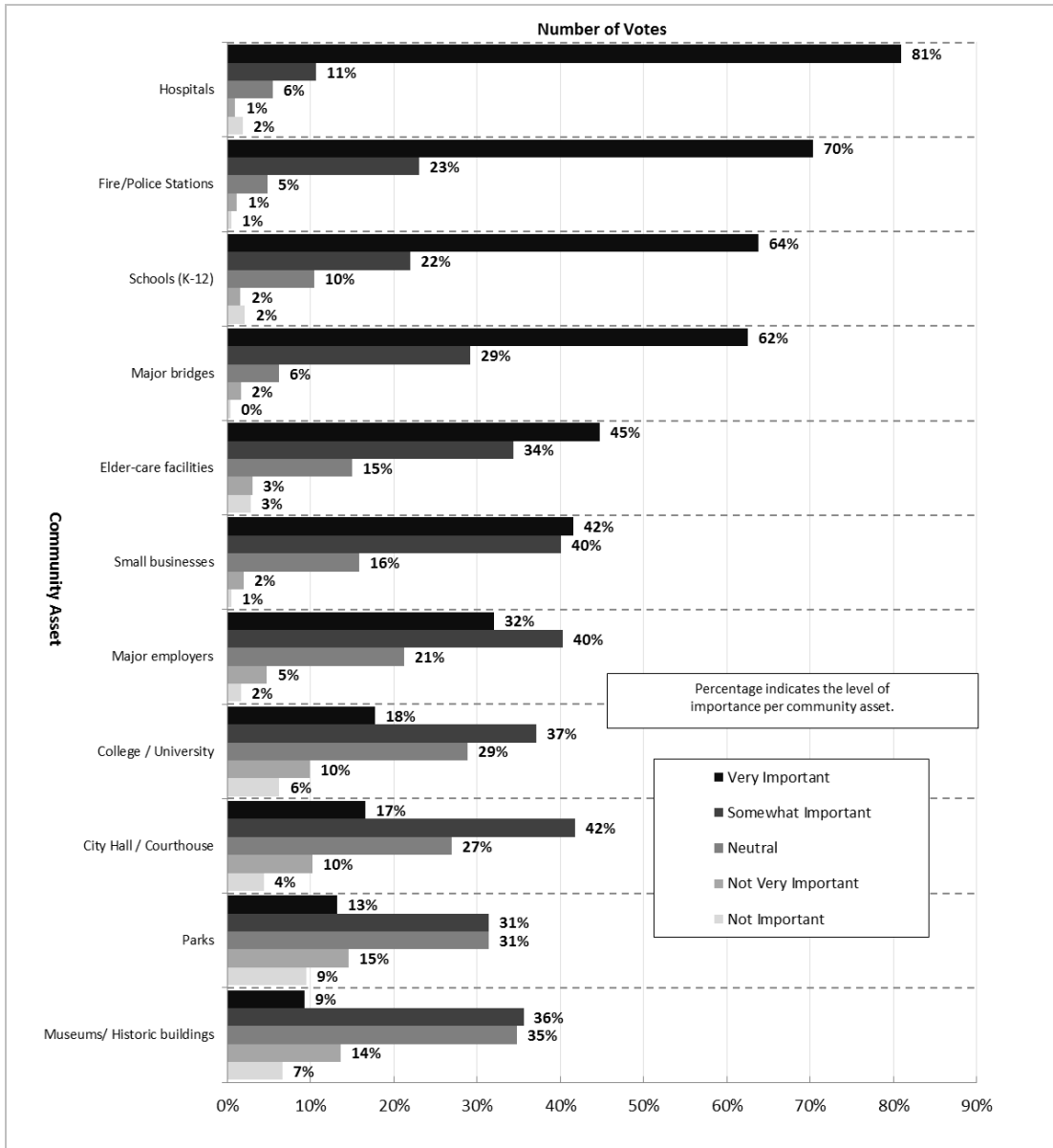
Figure G-2: Respondent Perceptions of Community Vulnerability



Source: 2011 NHMP Public Opinion Survey

Next, the survey asked respondents to indicate the importance that they attach to particular types of public and private community assets. As shown in Figure G-3, over 90-percent of respondents indicated that hospitals, major bridges and fire/police stations are very important or somewhat important to them. In addition, over 80-percent indicated that schools (K-12) and small businesses are very important or somewhat important to them. Parks were the least important to survey respondents, followed closely by museums/historical buildings, college/university, and city hall/courthouse.

Figure G-3: Respondent Community Asset Valuation



Source: 2011 NHMP Public Opinion Survey

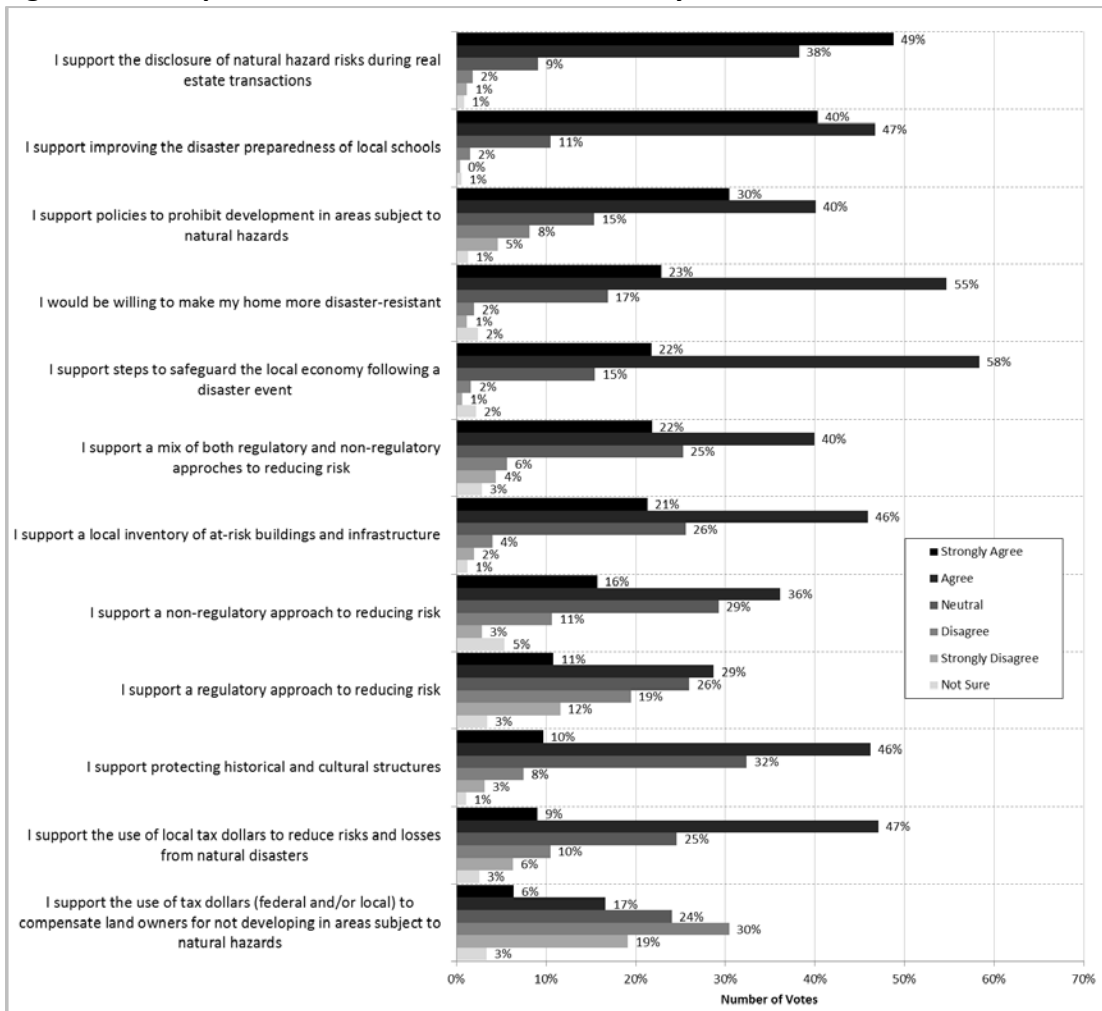
A number of activities can reduce your community’s risk from natural hazards. These activities can be both regulatory and non-regulatory. Please check the box that best represents your opinion of the following strategies to reduce the risk and loss associated with natural disasters.

To gauge attitudes toward different types of mitigation strategies, the survey asked respondents to indicate their level of support for various risk reduction activities. Figure G-4 shows that while there is general support among survey respondents about protecting assets such as schools, homes, businesses and historic or cultural assets, respondents were somewhat mixed in their agreement about how to accomplish those protections.

With respect to specific asset types, 87-percent of the respondents strongly agree or agree that they support improving the disaster preparedness of local schools, over 80-percent of respondents strongly agree or agree that they support steps to safeguard the local economy, and over 77-percent strongly agree or agree that they would be willing to make their homes more disaster-resistant. In addition, 87-percent strongly agree or agree that they support disclosure of natural hazard risks during real estate transactions.

With respect to risk reduction strategies, respondents generally appear to support a mix of regulatory, non-regulatory and tax-dollar based approaches. For example, over 50-percent of respondents support the use of tax dollars to reduce risk and losses from natural hazards and over 60-percent indicate support for a mix of regulatory and non-regulatory approaches to reducing risk. That said, respondents overwhelmingly support the use policy strategies over the use of tax supported compensation strategies when specifically used to limit development in hazard areas. As Figure G-4 shows, fewer than 25-percent of respondents indicated support when specifically asked about the use of tax dollars to compensate property owners for not developing in hazard areas (with close to 50-percent disagreeing or strongly disagreeing with a compensations approach) while 70-percent of respondents indicated general or strong support for policies that prohibit development in areas subject to natural hazards (with only 13-percent in disagreement).

Figure G-4: Respondent Preferences for Community Risk Reduction Activities

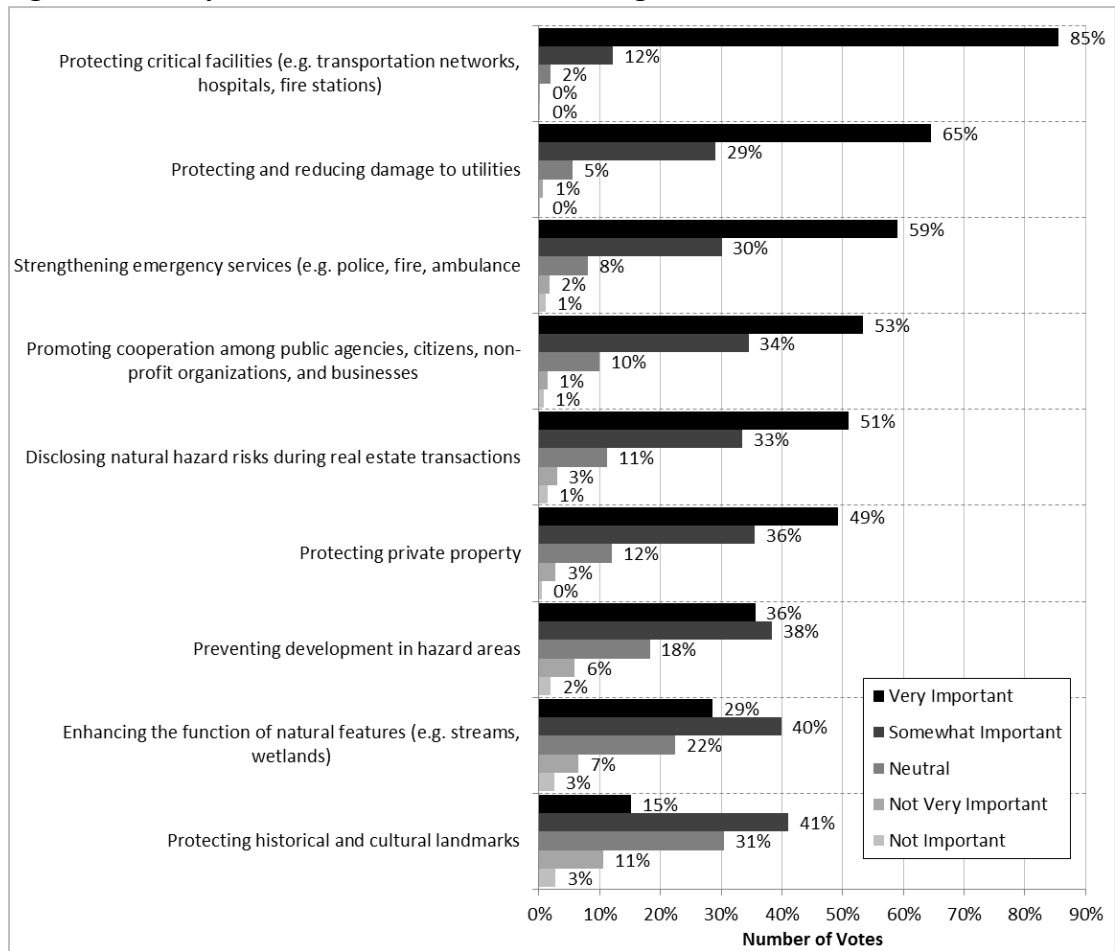


Source: 2011 NHMP Public Opinion Survey

The survey then asked respondents to indicate the level of importance they would place on a number of policies and priorities within their communities. The protection of critical facilities (e.g. transportation networks, hospitals, fire stations) received the strongest level of support with close to 100-percent of respondents finding it to be important or very important. Similarly, over 90-percent of survey respondents found protecting and reducing damage to utilities to be important or very important, with just under 90-percent who found strengthening emergency services (e.g. police, fire, ambulance) to be worthy of the same designation.

Roughly 50-percent of survey respondents felt that protecting private property and disclosing natural hazard risks during real estate transactions was important, as was promoting cooperation among public agencies, citizens, non-profit organizations, and businesses. Protecting historical and cultural landmarks was the lowest priority for survey respondents, followed by enhancing the function of natural features (e.g. streams, wetlands), and preventing development in hazard areas. Figure G-5 summarizes the results for priorities regarding planning for natural hazards in the region.

Figure G-5: Respondent Natural Hazard Planning Priorities



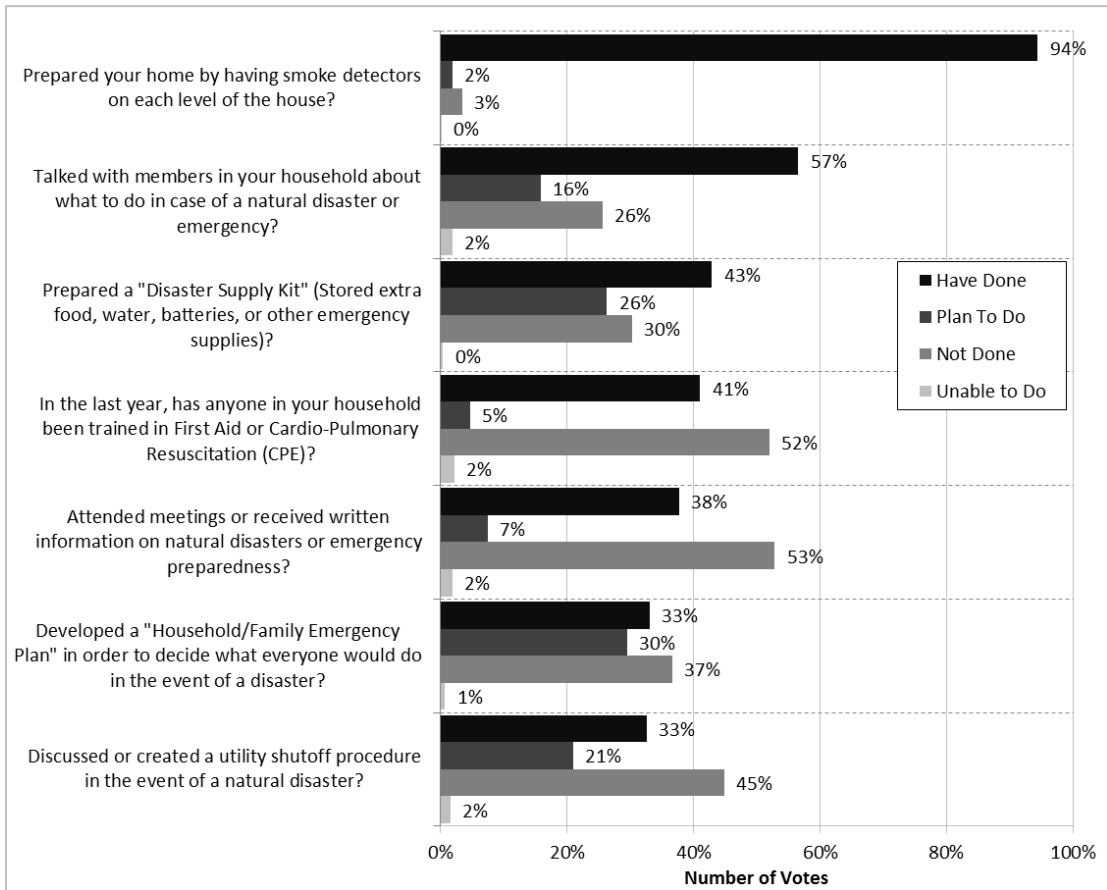
Source: 2011 NHMP Public Opinion Survey

Mitigation and Preparedness Activities in your Household

This section provides an overview of household level natural hazard mitigation and preparedness activities in the Mid-Columbia region.

Over 56-percent percent of respondents claimed to have talked with members of their households about what to do in the case of a natural disaster or emergency. In addition, 43-percent had prepared a “Disaster Supply Kit” which entails storing extra food, water, and other emergency supplies, while 41-percent were trained in first aid or CPR during the past year. Nearly 95-percent of respondents had placed smoke detectors on every level of the home while more than a third of respondents claimed to have attended meetings or received information on natural disasters or emergency preparedness, developed a “Household/Family Emergency Plan,” and/or discussed/created a utility shutoff procedure in the event of a natural disaster. Figure G-5 summarizes all of the activities that respondents indicated they have done, plan to do, have not done, or were unable to do to prepare for natural disasters.

Figure G-5: Activities that Respondents Have Done, Plan to Do, Have Not Done, or are Unable to Do



Source: 2011 NHMP Public Opinion Survey

General Household Information

Demographic questions provide a statistical overview of the characteristics of the respondents. This section asked respondents about their age and gender, level of education, median income, race, ethnicity, and length of residence in the state of Oregon.

AGE AND GENDER

Table G-9 shows the age range of survey respondents. The median age of survey respondents was 55-64 years old.

Table G-9: Age of Survey Respondents

Age	Percent	Number
<19	1%	5
20-24	2%	18
25-29	2%	19
30-34	3%	23
35-39	5%	43
40-44	6%	56
45-49	7%	65
50-54	12%	111
55-59	14%	127
60-64	15%	141
65-69	13%	121
70-74	8%	69
75-79	5%	47
80+	8%	73
Q-14 total	100%	918

Source: 2011 NHMP Public Opinion Survey

Table G-10 displays the gender of survey respondents, where women accounted for 54-percent of the sample.

Table G-10: Gender of Survey Respondents

Gender	Percent	Number
Female	46%	428
Male	54%	502
Q-15 total	100%	930

Source: 2011 NHMP Public Opinion Survey

LEVEL OF EDUCATION

In general, survey respondents were evenly distributed in terms of levels of education. About 16-percent of survey respondents specified they held a GED or were high school graduates, compared to over 31-percent who specified having attended some college or trade school. Just fewer than 35-percent of respondents had completed a college degree, while just over 16-percent of respondents had acquired a postgraduate degree.

Table G-11: Level of Education

Answer	Number	Percent
High School Grad/GED	147	16%
Some College/Trade School	291	31%
College degree	323	35%
Postgraduate degree	149	16%
Other	16	2%
Q-16 total	926	100%

Source: 2011 NHMP Public Opinion Survey

HOUSEHOLD INCOME

Just under 22-percent of respondents had household incomes of \$30,000 or less, over 32-percent had incomes from \$30,000-\$60,000, roughly 25-percent had incomes between \$60,000-\$99,999, while just over 21-percent had incomes of \$100,000 or more.

Table G-12: Household Income

Household Income	Percent	Number
Less than \$10,000	4%	33
\$10,000-\$19,999	9%	70
\$20,000-\$29,999	9%	74
\$30,000-\$39,999	10%	86
\$40,000-\$49,999	10%	86
\$50,000-\$59,999	11%	89
\$60,000-\$69,999	9%	71
\$70,000-\$79,999	7%	59
\$80,000-\$89,999	6%	46
\$90,000-\$99,999	4%	33
\$100,000-\$149,999	14%	119
More than \$150,000	7%	56
Q-17 total	100%	822

Source: 2011 NHMP Public Opinion Survey

REGIONAL RESIDENCY

Table G-13 lists the zip codes reported by survey respondents.

Table G-13: Respondent Zip Code

Answer	Percent	Number	Answer	Percent	Number
96086	0%	1	97063	3%	12
97001	0%	2	97065	3%	12
97002	0%	2	97067	1%	4
97004	0%	2	97068	6%	26
97009	2%	9	97070	2%	8
97013	3%	12	97071	0%	2
97014	2%	8	97081	0%	1
97015	2%	7	97086	1%	4
97017	0%	1	97089	2%	7
97021	3%	12	97140	0%	1
97022	1%	3	97206	1%	3
97023	2%	8	97219	0%	2
97027	1%	5	97222	4%	20
97028	0%	1	97267	6%	28
97029	0%	1	97750	4%	16
97031	22%	99	97756	0%	1
97033	1%	3	97801	7%	32
97034	2%	11	97812	4%	18
97035	3%	13	97813	0%	1
97037	2%	7	97818	1%	5
97038	3%	13	97823	1%	4
97039	4%	18	97830	6%	29
97040	2%	8	97835	0%	1
97041	4%	18	97836	1%	6
97042	0%	1	97838	8%	35
97044	0%	2	97843	0%	1
97045	8%	36	97844	1%	5
97049	1%	3	97862	4%	18
97050	1%	6	97868	0%	2
97051	0%	1	97874	2%	8
97055	2%	11	97875	1%	3
97056	0%	1	97880	0%	1
97058	28%	129	97882	1%	4
97062	0%	2	97886	1%	4
			Q-18 total	100%	456

Source: 2011 NHMP Public Opinion Survey

Of the seven counties the survey was mailed to, the most returned surveys came from residents of Clackamas County (31.8-percent). In Wasco County 201 surveys were returned, followed by 153 in Hood River County, and 122 in Umatilla County. Due to the survey distribution methodology, fewer surveys were distributed to Umatilla County than were to

Clackamas, Wasco or Hood River Counties, otherwise the return rate from the county may have more closely matched that of Clackamas County, which has a more comparable number of residents compared to the other counties in the region.

Table G-14: Percent of Surveys Received Per County

County	Percent	Number
Clackamas County	32%	297
Hood River County	16%	153
Gilliam County	3%	26
Morrow County	3%	25
Sherman County	5%	47
Umatilla County	13%	122
Wasco County	21%	201
Wheeler County	7%	64
Q-19 total	100%	935

Source: 2011 NHMP Public Opinion Survey

Over 80-percent of survey respondents have lived in Oregon for 20 years or more, roughly 10-percent have lived in Oregon for 10-19 years, and nearly 5-percent have for 5-9 years.

Table G-15: Length of Oregon Residency

Answer	Percent	Number
Less than 1 year	1%	5
1-5 years	4%	34
5-9 years	5%	44
10-19 years	10%	97
20 years or more	81%	754
Q-22 total	100%	934

Source: 2011 NHMP Public Opinion Survey

HOUSING CHARACTERISTICS

Homeownership is an important variable in education and outreach programs, and knowledge of the percentage of homeowners in a community can help target the programs. Additionally, homeowners might be more willing to invest time and money in making their homes more disaster resistant. Over 87-percent of survey respondents are homeowners.

Table G-16: Home Ownership

Answer	Percent	Number
Rent	13%	119
Own	87%	808
Q-23 total	100%	927

Source: 2011 NHMP Public Opinion Survey

Nearly 79-percent of survey respondents live in single family homes, 12-percent live in manufactured homes, and five-percent in apartments; the other four-percent live in duplexes, condo/townhouses, or some other form of housing.

Table G-17: Housing Type

Answer	Percent	Number
Single-family home	79%	710
Duplex	1%	5
Apartment (3-4 units)	1%	8
Apartment (5 or more units)	4%	35
Condo/townhouse	2%	16
Manufactured home	12%	112
Other	2%	18
Q-24 total	100%	904

Source: 2011 NHMP Public Opinion Survey

RACE AND ETHNICITY

Just under 97-percent of survey respondents specified white as their race; of those that replied, only 28 (roughly three-percent) specified a race other than white. Table G-18 presents the results.

Table G-18: Respondent Race

Race	Percent	Number
American Indian or Alaska Native	2%	16
Asian	1%	12
Black or African American	0%	3
Native Hawaiian or Other Pac Islander	0%	1
White	96%	879
Q-20 total	100%	911

Source: 2011 NHMP Public Opinion Survey

With respect to ethnicity, just under two-percent of survey respondents self-identified as Hispanic or Latino, whereas US Census figures suggest that the number should be much higher for the region. For example, nearly 15-percent of the population in Wasco County is reported as Hispanic or Latino in origin, compared to nearly 24-percent in Umatilla County.

Table G-19: Respondent Ethnicity

Ethnicity	Percent	Number
Hispanic or Latino	2%	16
Not Hispanic or Latino	98%	826
Q-21 Total	100%	842

Source: 2011 NHMP Public Opinion Survey

Written Responses to Open-Ended Questions

This section includes the transcripts of respondent answers when checking the “other” option provided in some questions. In addition, we’ve included comments provided by respondents at the end of the survey.

Question 1: During the past five years in the county you currently reside in, have you or someone in your household directly experienced a natural disaster such as an earthquake, severe windstorm, flood, wildfire, or other type of natural disaster? Other:

- Electrical outage
- Excess air pollution related to coal-fired plant and/or coal transported through Wasco County
- Hurricane
- Large fallen trees
- Rainstorm – very heavy
- Solar flares (emergency pulse)
- Unseasonable freeze, crops killed
- Water spout
- Wild animal damage

Question 2: How concerned are you about the following natural disasters affecting your county? Other:

- Airborne pathogens
- Anarchy
- Animal/plant virus infection
- Asteroid annihilation
- Chemical spill
- Combinations of . . .
- Corona mass ejections
- Dam failure (3)
- Dangerous wild animals
- December 21, 2012
- Depression & hunger
- Electrical outage
- Fog
- Government exploding more
- Hail
- Human cause (fallout)
- Ice storm
- Incompetent government @ all levels
- Large fallen trees (2)
- Mt. Ranier erupting
- Nuclear meltdown/war
- One of dams break
- Radiation from Hanford
- Reservoir above us getting damaged & flooding downhill on top of us
- Severe rain storm
- The Dalles dam breaking
- Tornado (2)
- Tsunami
- Tsunami evacuation zone

Question 4: From whom did you last receive information about how to make members of your household and your home safer from natural disasters? Other:

- Books (2)
- Boy Scouts & school projects
- CERT Training through Fire Dept.
- Church (4)
- Coast to Coast - George Nory
- CSEP
- Discover Channel, OPB, History Channel
- Emergency department of some type
- Employer (15)
- Employer CERT team
- Family
- FEMA
- Fire Department (12)
- Fire department distributed "Fire Preparedness" brochure
- Forest service
- Internet (4)
- Internet blogs
- Local health fair, community events
- Magazine
- Myself, I'm a former combat sailor (Panama 89, Desert Shield, Desert Storm)
- Myself, I was in a flood in Ashland that ruined the water & sewage plant
- Never
- None
- Providence Health Fair (hospital)
- Reading
- Safety commission
- School (2)
- Self
- Self-Google search
- Senior center
- Talk radio conservative
- Training
- TV commercials
- TV Outdoor Channel
- Web
- Work on disaster control committee OHSU library

Question 5: Whom would you most trust to provide you with information about how to make your household and home safer from natural disasters? Other:

- Books (3)
- Churches (10)
- Coast to Coast – George Nory
- Common sense
- Community events
- Consumer Reports
- County sheriff
- Department of Forestry
- Depends on what kind of disaster
- Drinking water supply
- Fellow church members
- Fire department (4)
- Fire department/police (2)
- God
- Hospital
- Internet blogs
- Internet research
- Mortgage lender
- Multiple sources preferred
- Law offices
- Local government agencies
- Local police department
- None
- Not the government!
- Personal research/internet
- Police
- Self (3)
- Senior center
- Several sources – best

- Someone who has gone through disaster
- Talk radio conservative
- Utility services

Question 6: What is the most effective way for you to receive information about how to make your household and home safer from natural disasters? Other:

- Churches (9)
- Door-to-door “hangers”
- Fire department/police
- Government
- Internet blogs
- News podcasts
- Newspapers
- Online, institution info
- Online publications/websites
- Read book
- Sheriff’s office
- Website

10. Next we would like to know what specific types of community assets are most important to you. *Other*

Rating	Community Asset
1	Active senior center
1	Active volunteer opportunities
1	Agriculture
1	Airports (2)
1	Ambulance
1	Animal shelters
1	Bridges
1	Broadband
1	Children!
2	Chamber of Commerce
1	Child abuse services/facility
1	Churches (12)
1	City maintenance
1	City works
1	Clean air
1	Columbia River (2)
1	Communications (3)
1	Community hall
1	Cultural arts
1	Dams (8)
1	Disaster plan
1	Dog & cat rescue
1	Ecological resources (2)
1	Education
1	Electrical substations
1	Electricity (6)
1	EMS
1	Evacuation routes
1	Family
1	Family farms
1	Farms (4)
1	Fire/ambulance
1	Food supplies/banks (19)
1	Forests
1	Foster care homes
1	Fuel availability (2)
1	Gas (3)
1	Geological study

Rating	Community Asset
1	Grain storage & shipping facilities
1	Hardware/lumber stores
1	Health Dept.
1	Highway/street maint. (2)
1	Highways/streets (17)
2	Highways/streets
1	Homes (2)
1	Humans
1	Individual property
1	Internet access (2)
1	Jobs
1	Lake
1	Laundromat
1	Livestock facilities
2	Library (9)
1	Local Catholic church
1	Local general practice MDs
1	Local medical clinic
2	Local rural veterinarian
2	Meals on Wheels
1	Local shopping
1	Medical clinic (7)
1	Mentally ill facilities
1	Mountains/trees/streams (2)
1	Movie theater
1	My apt.
1	National forest
1	NORCOR
1	Orchards
1	OSU Extension/4-H
1	People
1	Pharmacies (2)
1	Police/sheriff
2	Pool
1	Post Office (3)
1	Power infrastructure
1	Prisons
1	Public transportation (5)

Rating	Community Asset
1	Radio/CB
1	Range land
1	Recreation (3)
1	Red Cross (2)
1	River health
1	Scenic view
1	Security/safety (2)
1	Sewer
2	Sewer
1	Sheriff's Dept. (2)
1	Shopping areas
1	Sidewalks

Rating	Community Asset
1	Social services
1	Telephone (4)
1	Utilities (11)
1	Walking trails
1	Water sources (12)
1	Water for farming
2	Water supply
1	Water treatment
1	Wilderness areas (2)
2	Wildlife/fish
2	Wildlife
2	Wineries

Question 16: Please indicate your level of education. Other:

- 11th grade (2)
- Associates degree
- Automotive engineering, fire science degree, fire science instructor (retired)
- D.M.D., M.D., Ph.D.
- Dropped out of high school
- Extensive post-grad studies
- Half way through master's program online
- I got to the 9th grade, but did not finish
- JD, UO law school
- Masters in music
- Navy schools
- Nuclear medicine technology
- Post-master certification
- Quit high school to join the army
- Still in high school

Question 24: Do you own or rent your home? Other:

- 3 livable quarters, all separate
- 3,000 ft w/2 story garage
- Apartment (2)
- Apartment in single family home
- Retirement community
- Cracker box
- Farm (3)
- Farm w/outbuildings (2)
- Live with family
- Ranch (3)
- Ranch w/bunkhouses
- House
- Commercial property
- RV
- Travel trailer

Additional Comments

We received the following comments in response to the “Please feel free to provide any additional comments in the space provided” box at the end of the survey.

- You should be aware that I live in an apartment at Willamette View Retirement Community and preparedness is ever present in the general and overall planning in programs and printed word.
- Floods if all Columbia dams burst.
- Thanks for your interest in our community. U of O is positioned to use evidence-based science to evaluate/recommend/prioritize strategies to mitigate the disruptions of likely national disasters. Before acting, most citizens must be energized to prepare based upon credible & direct advice.
- Churches and schools are important for 1) comfort, 2) familiarity, 3) size for housing large groups, 4) willingness to be open for the public. I saw nothing suggesting the importance of churches.
- I thank God for your efforts to make us safe.
- 1) It would be very useful to discover locations of local community buildings that would provide emergency provisions. 2) Taking a quick seminar regarding emergency things-to-know.
- Income info should have NO effect on any questionnaire – there are stupid wealthy people and other very intelligent poor people, i.e. example – people running for elected offices – there sure are some “real sinners” out there!
- I feel there needs to be help for land owners to clear brush to prepare for wildfire in areas, also as land owners.
- The big earthquake is coming. Oregon must be ready.
- Building codes are too easy-going knowing that the sub-Cascadia fault line is waiting to happen. In other words, the prescriptive path for building is too lenient.
- My answers are based on the fact that I live in a disaster-free area, mostly.
- Due to my health and age I live in an assisted living facility.
- I neither trust nor rely on government for anything. I have ZERO confidence in the propaganda machine that is our current print and broadcast media. I trust only myself and my family. We will survive.
- I would not support any proposals for tax increases!
- Biggest threat is a major earthquake affecting the entire Pacific Northwest region. Public seems unaware of this threat from Cascadia Subduction Zone.
- I feel wildfire is by far the most problem in the Eastern Oregon area. Now that Ordnance is almost closed I would like to see “Oregon Emergency Management” set up to build fire guards now. It would put lots of people to work and we sure do need that and next summer is too late to start building them. We had lots of cleared areas many years ago. Now railroad and wheat farmers buy insurance and don’t have fire guards.
- As I and my family only moved to Oregon in January 2008 from the U.K. I am still not familiar with many of the situations referred to in this survey. I am sorry I cannot be more helpful.
- As a geologist in OR & WA, earthquakes are the biggest concern facing our area in the near future. Our infrastructure and non-reinforced structures will not withstand even a moderate subduction zone quake. Geologic history has shown repeated 9+

magnitude earthquakes, most recently in the 1600s. Government will cease to function without our bridges and roads. Serious effort needs to be dedicated to identifying vulnerable features and buildings.

- I applaud your efforts to improve and comply with disaster preparedness and its requirements.
- I own an adult foster home. I have emergency preparedness plan, maps, supplies, food, water, info on every single person in my home, and phone numbers of contacts in case of emergency. I and my staff are as prepared as anyone can be. A lot of survival depends on how quick you are at making decisions and right decisions under pressure. So have plans, practice procedures, and if it happens hopefully everyone reacts correctly based on practice.
- I lost faith in FEMA after Hurricane Katrina and in info given by top government officials (“duct tape”). But I think the government (Fed and local) should show leadership in these areas. Partnership with university may help with credibility. I also don’t trust the media to report it accurately enough. These days they often seem to oversimplify or over-sentimentalize.
- Don’t want to see implementation of disaster plans as reason to hire more government employees.
- Should ask type of social economic data for people 1) Do they work? 2) Do they work for a) emergency service, 2) critical infrastructure, 3) government, 4) disaster mitigation group, 5) school. 3) Do they have children? 4) Is there anyone in the household with disabilities? This will allow for more detailed trenching & more focus on community efforts.
- Due to cutbacks I’m not too confident Umatilla County can provide any realistic disaster plan or relief. Ensuring electrical utility service/restoration is most critical for disaster recovery in my area.
- Hope the time, effort, and expense of this survey results in information that will be used to plan for dealing with natural disasters. If not, this survey is a waste of time and expense.
- We have no school, hospital, or elder care facilities. Our daycare facilities are important. We have pre-school but no permanent site. Also, we did (5 to 6 years ago) have a county-wide power outage and I called everywhere to find fuel for stranded motorists – the only gas station in Sherman County that can still pump gas is the station (Texaco @ the time) at the east end of Rufus! Shaniko in Wasco County could not pump gas either. My husband is an EMT/firefighter and regional safety officer for ODOT. He will respond (either as ODOT or a volunteer) in the event of a natural disaster and I and extended family will do as he says if he’s able to communicate with me. More planning and preparedness would be good though so I know exactly what to do, how to do it, and when to do it! Thank you for your survey!
- It’s hard to relate to any natural disasters in our area as we’ve never had any real ones in my 80 years except strong winter storms. Our town is on a hill so is pretty immune to these.
- Thanks for doing this. My best to all in 2012.
- We would be interested in a disaster training – not via video or internet – from a line person.

- Several years ago I was involved in a severe dust storm traveling on I-84. In this dust storm a number of people were killed in highway accidents. It was really terrible. Since this time, not much, if anything, has been done to mitigate or regulate the high levels of agricultural tillage adjacent to the interstate highway. I would suspect that the agricultural operators along this highway receive significant federal subsidies. Why not regulate this?
- I never had understood why people develop in possible high risk areas such as on rivers or bluffs, and expect someone else to pay for loss. I am not for regulatory action or policies to prohibit owners from doing what they want, however, I do believe people should be responsible for their actions.
- FEMA is bungling and incompetent at best and looks like a criminal dirty tricks outfit. Not only did they fail @ New Orleans, they attacked people who did help. Recommend disbanding of FEMA, prosecute FEMA. They have much to answer for and have done no good. The kind of emergency they want is to attack people and put them in slave labor camps.
- I would like to recommend that at least once a year the counties should do a Practice run just in case there is a natural disaster. That way people won't freak out and cause more problems if a disaster happens.
- Concern for seniors who retire in rural places. How will their residence be identified for providing assistance in a major disaster? The question applies to handicapped as well.
- My family has had some unhappy experiences with FEMA. A bridge over a creek built by the owners for approximately \$1,200 was flooded and when they tried to borrow money to rebuild were told that they must have an engineer fly over inspection, etc. to the tune of approximately \$10,000 in order to get a loan. Even though this was not a grant but a payable loan. Needless to say, they did not use FEMA loan and found it a big joke that FEMA was there to help in emergencies!
- Education on preparedness is essential (widespread). Community preparedness is key – community involvement, truth about regional hazards would help people to prepare. Government cannot be relied on for truth. Media cannot be relied on for truth. Possibly very proactive community education workshops through fire, police, schools for the entire area. Some people's emergency preparedness = a gun → they just take what they need by force instead of stocking up.
- We experience wildfires or a threat of one nearly every year. Our volunteer fire departments are a great comfort. They respond immediately and perform with unbelievable expertise.
- 1) We need more local first aid classes. 2) Posting notices in our Post Offices is a good way to communicate. 3) All of our local utilities need to be more involved in educating for disasters.
- Fuel (*e.g. dead wood) for wildfires in the forests is one of the main hazards in our area.
- We live in a remote area, in a canyon, crossing creeks, accessible from one direction only. We are extremely concerned about wildfire & flood due to our lack of accessibility. We have been instructed by a fire department visit how to make our area more fire safe.
- An earthquake near Spray would isolate (100-percent) the town from outside help or leaving for any reason. Surrounded by a lot of rock rims. One way in would be air!

- Good info, needs to be done. Good survey!
- Encouraging employers to train employees would be another outlet for learning. My employer, Mid Col Center for Living, has taken an upfront, prepared, and involved approach to emergency and/or disaster awareness. I think all employers should do the same. I have taken my training home & shared w/my family & friends it is comforting to know we are prepared.
- The time taken for a federal agency to act/react places much undue strain on those most affected. The recent Nehalam flooding and the FEMA antics were an embarrassment to the citizens of Vernonia & surrounding area.
- About 7-8 years ago I attended a Red Cross Preparedness meeting to deal with the possibility of a chemical depot leak and its effects on the populace. Fortunately, we never had to find out how the plan worked!
- Fish & wildlife don't allow streams to be cleared to avoid flooding. Fish seem to be more important than people or property to them!! Not a good way to be.
- I live in a home for the elderly, about 100 people. I answered the questions about where I live.
- Some of the answers I gave are because I don't trust the people who would ultimately make the decisions – especially environmentalists. I think some are not in the majority of our population to realize the basic needs. In other words, they go overboard and only have their opinion. Thank you.
- Organize acts, curb disobedience. Could result in serious consequences & would refute an organized response.
- Wildfire, wind, & ice storms are our biggest concern here. Maintaining the farming lifestyle is more important than preserving buildings. Saving farms leads to continued support of the community as farms continue to generate income.
- Education is much stronger than regulation because you can achieve voluntary action; nobody has resources to enforce regulations after they are written.
- I am very concerned about the long-term detrimental effects of extensive pesticide use in this area on the many orchards here and the cross-contamination with the drinking water, both municipal and even individual wells that are privately owned. I see what appears to be a statistically larger developmentally challenged population here and wonder if there is a connection to the extensive pesticide use and water runoff.
- Resources need to be developed, determined, and maintained by local neighborhoods and communities because in the event of a large disaster outside resources will more than likely be strapped or not available.
- I have worked in hospitals in nuclear medicine, s-ray, and radiation therapy for 38 years. Have been involved in nuclear medicine disaster preparedness in Arkansas and Oregon and gone through training for dirty bomb response. Worked at Mid-Columbia Medical Center in The Dalles, Oregon, for 22½ years.
- Thanks to those of you who are devoted to smart safety strategies. We do what we can, also.
- I feel that the emphasis should be on individual preparedness. Too many people feel that the government should & will be at their doorstep in an emergency. I feel that the information should be aimed at citizens.

- 1) Need community information as to where to assemble in a disaster. 2) Need education as to how to prepare as a public employee to help others. 3) Is a staging area in place for children and animals?
- Homeowners/buyers should be aware of potential risk, but government should not ensure again (e.g. flood) it.
- Our county/city has never held a meeting to inform the public of any disaster plan. I don't even know where they have emergency shelter or supplies.
- Utilities, utilities, utilities.
- Thanks for the opportunity to participate in your survey.
- We do not have a hospital in our county. Roads and bridges are very important to reach a hospital if Air Link cannot fly. The John Day River floods often.
- We live in a secure community & have very few natural disasters and Mexicans help me out a lot!!
- With global climate change and natural disasters increasing in frequency and severity it is a good thing that you are undertaking this work! I became particularly frustrated while trying to honestly complete this survey, especially Questions 11 and 12 and almost threw it in the trash. Why? Lack of definitions, examples, explanations, implications of answers, etc. Some of the questions seemed to me could only be validly answered by someone fairly well versed in land use planning, disaster planning, and management. Please understand that I find almost all surveys of any type frustrating and I throw them away, however, I believe in what you are doing, so I am taking the time to offer my comments. The survey would probably have gotten a better feeling for citizen attitudes, ideas, and priorities and thus more accurate and meaningful results if there had been some type of **introductory "white paper"** document discussing the hazards and explaining the current principles of natural hazard mitigation and providing some of the information mentioned below. Q1: Minimizes the import by framing it only in the personal context – "...have you or someone in your household directly experienced..." The questions should have started with "Which natural disasters have your county experienced in the last 4 years?" Q6: The "Other methods" seemed to actually be sources of the information, not ways of receiving information. Q11: "... regulatory approach to reducing risk, "...non-regulatory approaches." Examples of regulations that might be used and examples of non-regulatory approaches would be helpful to know. "support policies to prohibit development in areas subject to natural hazards." Private property? Public lands? Examples of such policies. Use of local tax dollars to reduce risks and losses from natural disasters – examples. Steps to safeguard the local economy following a disaster – examples. Q12: Protecting private property? By whom? How? Who pays? I cannot accurately answer this question without knowing the context. In a "white paper," ODF's wildfire impact/protection self-certification program for Forestland-Urban Interface Lots would be a great example. What does "enhancing the function of natural features" mean? Q11 and 12: Disclosure of natural hazard risks during real estate transactions – Who is to be the official body to make these risk determinations including the probabilities of such occurrences? Will insurance companies be able to use this information to "cherry pick" clients offering to insure some clients/properties, both public and private, and not others?
- We believe successful disaster management depends on people working together in specific local neighborhood groups rather than depending on community-wide

response by EMS. Help with organizing these groups on a community-wide scale is necessary.

- Thank you for bringing this to our attention. It lets us know what we need to be thinking about doing to prepare for a disaster.
- I received far more disaster info (i.e. hurricane) the few years I lived in Florida than I have ever received while living in Oregon.
- We have spent about \$30,000 in the last two decades to flood-proof our residence. Our neighbors have paid/constructed similar amounts to control flood/debris flow problems!
- Because the questions were pretty general there was a need of more specific information (Q11). The survey was a good vehicle to have a discussion with our children and grandchildren. We did the survey at a family dinner.
- I do understand that government needs to be involved in mitigating/preventing natural disasters, but I also believe citizens and landowners have the same responsibility. I don't believe tax dollars should be used to pay landowners when they buy property and it has potential disaster areas, i.e. building a house on an ocean beach.
- We live near the Columbia River and experience windstorms frequently throughout the year. More information about "severe windstorms" would be beneficial.
- There are several homes and properties not occupied or bank-owned in the area. This is a hazard as well since they're not being maintained or kept up. These can be disasters waiting to happen. It's frustrating when the bank won't sell until prices are up.
- Wheeler County has a population of around 1200 – no radio, no newspaper! We have no way to communicate with residents in small communities that are 75 to 90 miles apart. Our officials are elderly and for the most part uneducated or unwilling to act on behalf of citizens. The best thing the U of O could do is provide us with a way to communicate. Cell towers, cable, radio stations, etc are all needed.
- I think people who live in cities are more likely to be unprepared. There is an assumption that the state, FEMA, or National Guard can take care of them. If the disaster is widespread this is not true. When a widespread disaster strikes, people have to rely upon themselves and assist others as possible. I've lived on a farm and in cities. Farm people know their neighbors. I believe community building and outreach are important aspects that are missing, especially in areas of population density. If a large disaster strikes Facebook & Twitter could go down – even if it doesn't it does not substitute for knowing one's immediate neighbors. We insulate ourselves – from neighbors and extreme possibilities.
- Both have had first aid training. One had CPR training, many hours of firefighting. We have landscaped our property protecting in case of flooding.
- In the future you should define the "use of a regulatory approach." I don't think many "civilians" are familiar with the jargon. Jargon should be avoided when at all possible in public surveys.
- I feel people should be able to build where they want. However, if they choose to build in a natural disaster prone area and the natural disaster occurs, tax @ shouldn't go to help them. They knew!

- Small towns such as Pendleton are home to many intelligent, flexible, and self-sufficient people who I am confident, once they learn to communicate better, will make the changes necessary to weather any storm.
- Would be very excited to attend informational meetings on this subject. We as a family are not prepared for a disaster. This makes you think about the issue.
- RE: #20 & 21. Hispanic is no more white than Indian. Why isn't there a race for Hispanic? Just saying!
- In the event of a national disaster information on preparing for pets would also be appreciated.
- I want to thank all who are working with this organization. This survey has brought awareness to me and everyone around me that I have talked to about this matter. Thank you.
- As a small business owner I already filled out three sets of reports each year to BATF, Oregon Fire Marshall, and Fed DOT. Also pay \$700-800 to file reports. Don't need any more paperwork to fill out or fees to pay.
- The Sheriff's Department employees do not understand or know local ordinances. Planning Commissions do not support environmental issues. All departments refuse to comply with ORS 192 preventing citizens from access to information.
- My husband and I took the time to fill out this questionnaire because we've been concerned about what would happen if we were to have a natural disaster occur in The Dalles-Hood River, Oregon area. To the best of our knowledge the two most devastating disasters that could occur in this area would be an earthquake and Mt. Hood could erupt. With the major fault line that we have in this area, along with the chance of Mt. Hood could erupt, we truly feel that the residents in this area have not been prepared properly for either of those disasters. If either of these were to occur, the entire area on both sides of the river would basically be shut off from the rest of the state on both sides of the Columbia River. We have been extremely fortunate for many years not to have incurred a disaster, but our day is coming. We truly feel that this area needs to be educated on what to do and where to go sometime in the near future, before it's too late.
- Mostly I'm concerned with wildfire. We have two homes, paid for. One is in the urban interface in Washington State. I keep my property clear of brush and downed trees, but it is only a matter of time until the west burns given all the bug kill.
- Earthquake is my biggest fear of property damage and possible loss of life.
- Thanks for asking! Good luck with your results.
- No mention of housing & feeding of victims. Don't wait for FEMA.
- See "Oregon At Risk" from OSSPAC.
- In future surveys, either allow "mixed" for race and ethnicity, or don't ask. It makes a mixed-ethnicity person like me have to choose one parentage over another. As for race, in addition to inter-'racial' marriage, there is no biological/scientific basis for the term. Also, this should be literacy-adjusted. Many of the words would stump many people. This is a very high-literacy level survey. Is this being made available in Spanish?
- Oregon residents who are not accustomed to earthquakes really need to be educated. News media needs to stop acting like they want a serious natural disaster to occur in Oregon. Education needed for everyone if there is a big earthquake on the Cascadia Subduction Zone.

- This is a wonderful idea. I look forward to receiving info on how to plan for disasters.
- 1) Every household needs to know the current route of evacuation! Need to teach this in the schools. 2) Need fire extinguishers or garden hoses ready to go in case of indoor/outdoor fires (burn barrel ban!). 3) Our hazard in Maupin is the railroad & tanks that haul chemicals. The general public has not been informed of any siren system & evacuation route.
- I live in a three-story apartment building built in the late 60s. If there is an earthquake it will all come down and I am on the bottom level. Also, I lived through Hurricane Andrew in Florida so I know exactly what preparedness can do.
- I'm worried about unsafe trees falling on our house.
- 1) I believe we have two major threats – windstorms, resulting in downed trees, damaged buildings, etc. This can happen any year. It should be a foundation from which to build disaster preparedness. 2) The other threat is earthquake. When it finally does hit, it might be ugly – if we are practiced at one we will be better prepared for two.
- Police, fire, medical very important for us all. Thanks. Our gorge is most beautiful and loved by all. Recycling, peace, and harmony for all hopefully. Thanks.
- Sheriff's offices were not listed. While similar, they perform a more demanding service in rural counties than police. In Wasco County they cover almost 3,000 miles as opposed to less than 10. They have responsibility for search and rescue, marine, forest, animal control functions, and jails in addition to law enforcement duties, all of which are critical in emergencies.
- I think people in rural areas are generally more prepared because they experience power outages (along with water loss) more often and have become more self-reliant. I don't want a nanny state! We don't need government doing more things for us. We need government doing less things to us.
- We do not trust FEMA for anything!
- For me, as a senior citizen, it would be helpful to get a brief written summary of what I should do in my area of town for listed emergencies. Evacuating is not an easily accomplished option for many of us as senior citizens. Would buses (school?) be a possibility? Pets?
- Have lived in earthquake-prone areas. Also high wind areas. Always have disaster kit at ready.
- I believe in less government regulation and I do not think there is tax money available to pay for some of the things implied here. Our county is almost broke and so is our state & federal government. People need to take more care of themselves and not depend on the government to do so.
- We are very concerned about wildfires in our area. We are surrounded by wooded acreage with a large electrical line and a natural gas line to the east of our property.
- This county couldn't help anyone. They argue over everything. The government is in the way to progress. Red tape, no jobs, only stoppage from government. We had a diabetic visit who forgot their needles – no one had any available. Clinics or ambulance said it was not their job. In a disaster? Laughing out loud. You better look out for yourself if you visit here. Sheriff is 1 hour away. Better be packing a gun. Robbers get away with no consequences.

- I'm in a small town in Wheeler County. The need I see is how to care for these people in a natural disaster. In the rest of the state supplies of food would stop & they would come to this area. I think there should be stockpiles in each community.
- 1) Give homeowners more freedom to cut down very large trees near or around home, property, roads, infrastructures, etc. that they believe will cause major damage to these areas if trees should fall down from storms and/or natural or war acts. Permits and/or city requirements are to regulatory and leave dangerous trees in place. So please stop permits and regulations. We need to get these trees under control and away from private and public structures. 2) Every two to three days police, fire, and ambulance come down Hwy 43 in West Linn, Lake Oswego, etc. blaring their sirens. Could we have them train on highways outside city limits with sirens, and train in Hwy 43 with sirens off or maybe just once a month with them on. We don't know if it is something serious that they are going to or just training. This is also causing major noise pollution and disturbance during sleep hours with animals barking and we won't know when it is for real or not when something major happens such as disasters. Thank you so much.
- Might be a good idea to address special needs of rural landowners. These people have animals, livestock, and other features that may present unique circumstances in an emergency. Utilities are the primary asset I rely on, especially electricity which is important for heat, refrigeration, & well water. Earthquake or volcanic eruption is two major disasters I am concerned about that will have a major effect on Clackamas County. Special info, training, information, and survival kits would be valuable. Thanks for this opportunity!
- It is up to the owners of property to take care of themselves and their property, not the government. Neighbors and friends will take care of each other.
- As a survivor of a G-5 tornado in 1974 and then a blizzard in 1978 I strongly believe in disaster preparedness and possibly emergency exercises involving as many agencies as possible such as what Gary Brown did for Sioux City, Iowa, in 1989. They had an awesome response from police, fire, National Guard, volunteers, etc. resulting in lives saved after the crash of United 232. It would be great to have that kind of team ready to respond to any natural disaster!
- I don't know where to find the information needed to do the things listed in the household preparedness section.
- Community meetings are always on Saturday and I work. Evenings would be better.
- Stop spending money on light rail and use it to fortify road and utility infrastructure.
- Newspapers could print stories/maps, etc. occasionally to help inform the public of regular procedures, possible problems, escape routes, and who would be first responders to different types of events. So at least the public would have a "rough" idea in place.
- One area of disaster mitigation could be the promotion of PVSolar to offer a backup plan for electrical power should our utility grid breakdown.
- There needs to be more workshops or disaster meetings.
- The Native American, disregarding spiritual beliefs & customs, has more common sense than any other race/ethnicity. The Native American has always respected, preserved, and taken care of the land. They (American/Native Indian) take only what they need and preserve/protect what they don't need. The Native American is the best EPA ever. PUT THEM IN CHARGE OF ECOLOGY. They (Native Americans)

don't rape the landscape. ASK THEM!!! Also, we need less, not more, federal government.

- We have very few instances of natural disasters. The worst have been freezing & destroying fruit trees and some destruction from high winds and dust.
- In Wasco County not enough information goes out to the public about preparedness programs. Can public access online a copy of programs?
- We had a large tree limb fall on cars and insurance wouldn't pay for anything because they say it was a natural disaster. And there was a flood once because the dam was full and the man who opened the gates of the dam was gone. Do you consider this a natural disaster or negligence?
- We have chemical facilities here with ammonia and weed & bug killers (all poisons) – most in large tanks. A disaster could trigger a second disaster. These tanks are located on the edge of town at a higher elevation than 98-percent of the town. The natural drainage would be into the town proper.
- I am a Red Cross volunteer and trainer.
- Brochure mailings explaining utility shutoff, emergency kit contents, quantity of food (days) to have on hand, good places for family members to meet if separated & why, other issues regularly associated but not thought about during/concerning natural disasters. Have community information meetings made up of community citizens. If any of these exist make them more accessible/known about to community citizens. Thank you!
- In Wamic we are only concerned about flood because we are not allowed to clear the stream bed of three mile creek above and below town. We flood because the creek is forced to spread out because of overgrowth in the creek. The creek is dry for part of the year, yet we are not allowed to clean the creek. We flood only because of politics and nothing natural.
- Good idea – thank you for asking!
- I believe people should be advised on real estate documents if the home they are about to buy is built on an ancient landslide. As consumers we'd have no idea! I am shocked how few people carry earthquake insurance. To me, this is like a ticking time bomb situation like those who didn't insure in Louisiana before Katrina hit. Wish we'd help people understand the real quake danger here!
- This is a great thing to do. As a small community, a natural disaster would devastate our town.
- Thank you!!! Would be interested in the results. Number 9 was a little confusing ... human life is most important to me but in our rural area it is not likely to impact people.
- My experience is that my local fire department & U.S. Forest Service office had little/limited info readily available about fire prevention in small acreage residential zones in upland forest ecosystem. This should change with staff and related kits/packets of info easily accessible/no fee.
- Like the concept of personal preparedness for natural disasters, etc. Personal responsibility and gathering of info, etc. Don't totally agree with government agencies mandating policies or spending money on things that should be individual responsibility, etc., i.e. government really does things half as good for twice the cost.

- I'm very concerned that our county's grotesquely incompetent "planning" department could be involved in any activities that could affect safety or emergency response.
- Would like to know if there is a community facility where people can go if their homes are damaged (i.e. school gym, etc.).
- We have a wood stove in case electricity goes out. We have also strapped water heaters to walls & reinforced beams to floor joists with gussets. We have thinned out many tree limbs near house but still have more. Attending a meeting and receiving written info on preparedness would be very helpful.

**Appendix H:
Future Climate Projections
Wheeler County**

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Future Climate Projections Wheeler County

August 2018

A Report to the Oregon Department of Landscape Conservation and Development Prepared

by

The Oregon Climate Change Research Institute



*Photo credit: Painted Hills-John Day Fossil Beds National Monument by Ivan McClellan,
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Future Climate Projections: Wheeler County

A report to the Oregon Department of Landscape Conservation and Development

Prepared by:

Meghan Dalton, David Rupp, Linnia Hawkins
Oregon Climate Change Research Institute
College of Earth, Ocean, and Atmospheric Sciences
104 CEOAS Admin Building
Oregon State University
Corvallis, OR 97331

Guidance and review provided by:

Tricia Sears, Oregon Department of Land Conservation and Development

August 2018

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Executive Summary

This report presents future climate projections for Wheeler County relevant to specific natural hazards for the 2020s (2010–2039 average) and 2050s (2040–2069 average) compared to the 1971–2000 average historical baseline. The projections were analyzed for a lower greenhouse gas emissions scenario as well as a higher greenhouse gas emissions scenario, using multiple global climate models. This summary lists only the projections for the 2050s under the higher emissions scenario. Projections for both time periods and both emissions scenarios can be found within relevant sections of the main report.



Heat Waves

Extreme heat events are expected to increase in frequency, duration, and intensity due to continued warming temperatures.

In Wheeler County, the frequency of hot days with temperatures at or above 90°F is projected to increase on average by 29 days (with a range of 11 to 39 days) by the 2050s under the higher emissions scenario compared to the historical baseline.

In Wheeler County, the temperature of the hottest day of the year is projected to increase by 8°F (with a range of 3 to 12°F) by the 2050s under the higher emissions scenario compared to the historical baseline.



Cold Waves

Cold extremes are still expected to occur from time to time, but with much less frequency and intensity as the climate warms.

In Wheeler County, the frequency of days at or below freezing is projected to decline on average by 10 days (with a range of 5 to 15 days) by the 2050s under the higher emissions scenario compared to the historical baseline.

In Wheeler County, the temperature of the coldest night of the year is projected to increase by 9°F (with a range of 0 to 15°F) by the 2050s under the higher emissions scenario compared to the historical baseline.



Heavy Rains

The intensity of extreme precipitation events is expected to increase slightly in the future as the atmosphere warms and is able to hold more water vapor.

In Wheeler County, the magnitude of precipitation on the wettest day and wettest consecutive five days per year is projected to increase on average by about 14% (with a range of -1% to 36%) and 11% (with a range of -6% to 31%), respectively, by the 2050s under the higher emissions scenario compared to the historical baseline.

In Wheeler County, the frequency of days with at least ¾" of precipitation and the frequency of days exceeding a threshold for landslide risk is not projected to change substantially.



River Flooding

Mid- to low-elevation areas in Wheeler County’s Blue Mountains that are near the freezing level in winter, receiving a mix of rain and snow, are projected to experience an increase in winter flood risk due to warmer winter temperatures causing precipitation to fall more as rain and less as snow.



Drought

Drought conditions, as represented by low spring snowpack, low summer soil moisture, and low summer runoff, are projected to become more frequent in Wheeler County by the 2050s compared to the historical baseline.



Wildfire

Wildfire risk, as expressed through the frequency of very high fire danger days, is projected to increase under future climate change. In Wheeler County, the frequency of very high fire danger days per year is projected to increase on average by about 39% (with a range of -12 to +102%) by the 2050s under the higher emissions scenario compared to the historical baseline.



Air Quality

Under future climate change, the risk of wildfire smoke exposure is projected to increase in Wheeler County. The number days with high concentrations of wildfire-specific particulate matter is projected to increase by 53% by 2046–2051 under a medium emissions scenario compared with 2004–2009.

Windstorms

Limited research suggests very little, if any, change in the frequency and intensity of windstorms in the Pacific Northwest as a result of climate change.

Dust Storms

Limited research suggests that the risk of dust storms in summer would decrease in eastern Oregon under climate change in areas that experience an increase in vegetation cover from the carbon dioxide fertilization effect.

Increased Invasive Species & Pests

Warming temperatures, altered precipitation patterns, and increasing atmospheric carbon dioxide levels increase the risk for invasive species, insect and plant pests for forest and rangeland vegetation, and cropping systems.

Loss of Wetland Ecosystems








Freshwater wetland ecosystems are sensitive to warming temperatures and altered hydrological patterns, such as changes in precipitation seasonality and reduction of snowpack.

Introduction

Industrialization has given rise to increasing amounts of greenhouse gas emissions worldwide, which is causing the Earth’s climate to warm (IPCC, 2013). The effects of which are already apparent here in Oregon (Dalton *et al.*, 2017). Climate change is expected to influence the likelihood of occurrence of existing natural hazard events such as heavy rains, river flooding, drought, heat waves, cold waves, wildfire, and air quality.

Oregon’s Department of Land Conservation and Development (DLCD) contracted with the Oregon Climate Change Research Institute (OCCRI) to perform and provide analysis of the influence of climate change on natural hazards. The scope of this report is limited to the geographic area encompassed by the eight Oregon counties (thus including the counties, the cities within them and the Burns Paiute Tribe) that are part of the two Pre-Disaster Mitigation (PDM) 16 grants DLCD received. Those counties include: Wasco, Hood River, Harney, Lake, Malheur, Wheeler, Sherman, and Gilliam Counties. Outcomes of this analysis include county-specific data, graphics, and text summarizing climate change projections for climate metrics related to each of the natural hazards lists in Table 1. This information will be integrated into the Natural Hazards Mitigation Plan (NHMP) updates for the eight counties, and can be used in other county plans, policies, and programs. In addition to this report, sharing of data, and other technical assistance will be provided to the counties.

Table 1 Natural hazards and related climate metrics evaluated in this project.

 <p>Heavy Rains Wettest Day ♦♦ Wettest Five Days Landslide Threshold Exceedance</p>	 <p>Heat Waves Hottest Day ♦♦ Warmest Night “Hot” Days ♦♦ “Warm” Nights</p>
 <p>River Flooding Annual maximum daily flows</p>	 <p>Cold Waves Coldest Day ♦♦ Coldest Night “Cold” Days ♦♦ “Cold” Nights</p>
 <p>Drought Summer Flow ♦♦ Spring Snow Summer Soil Moisture</p>	 <p>Air Quality Unhealthy Smoke Days</p>
 <p>Wildfire Fire Danger Days</p>	<p>Windstorms ♦♦ Dust Storms Increased Invasive Species & Pests Loss of Wetland Ecosystems</p>

Future Climate Projections Background

Introduction

The county-specific future climate projections prepared by OCCRI are derived from 10–20 global climate models (GCM) and two scenarios of future global greenhouse gas emissions. Future climate projections have been “downscaled”—that is, made locally relevant—and summaries of projected changes in the climate metrics in Table 1 are presented for an early 21st century period and a mid 21st century period compared to a historical baseline. (Read more about the data sources in the Appendix.)

Global Climate Models

Global climate models are sophisticated computer models of the Earth’s atmosphere, water, and land and how these components interact over time and space according to the fundamental laws of physics (Figure 1). GCMs are the most sophisticated tools for understanding the climate system, but while highly complex and built on solid physical principles, they are still simplifications of the actual climate system. There are several ways to implement such simplifications into a GCM, which results in each one giving a slightly different answer. As such, it is best practice to use at least ten GCMs and look at the average and range of projections across all of them. (Read more about GCMs & Uncertainty in the Appendix.)

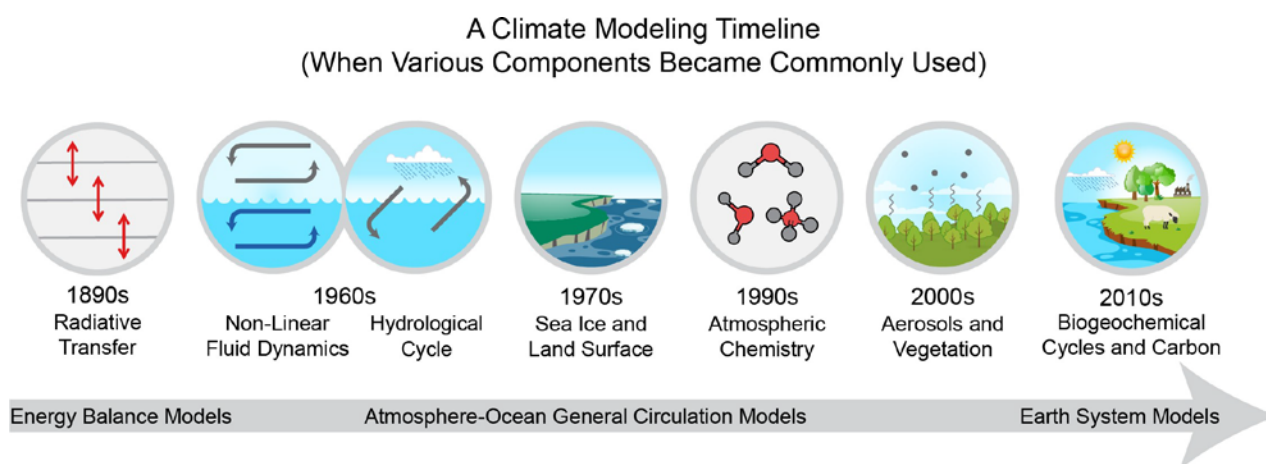


Figure 1 As scientific understanding of climate has evolved over the last 120 years, increasing amounts of physics, chemistry, and biology have been incorporated into calculations and, eventually, models. This figure shows when various processes and components of the climate system became regularly included in scientific understanding of global climate calculations and, over the second half of the century as computing resources became available, formalized in global climate models. (Source: science2017.globalchange.gov)

Greenhouse Gas Emissions

When used to project future climate, scientist give the GCMs information about the quantity of greenhouse gases that the world would emit, then the GCMs run simulations of what would happen to the air, water, and land over the next century. Since the precise amount of greenhouse gases the world will emit over the next century is unknown, scientists use several scenarios of different amounts of greenhouse gas emissions based on plausible

societal trajectories. The future climate projections prepared by OCCRI uses emissions pathways called Representative Concentration Pathways (RCPs). There are several RCPs and the higher global emissions are, the greater the increase in global temperature is expected (Figure 2). OCCRI considers a lower emissions scenario (RCP 4.5) and a higher emissions scenario (RCP 8.5) because they are the most commonly used scenarios in published literature and the downscaled data is available for these scenarios. (Read more about Emissions Scenarios in the Appendix.)

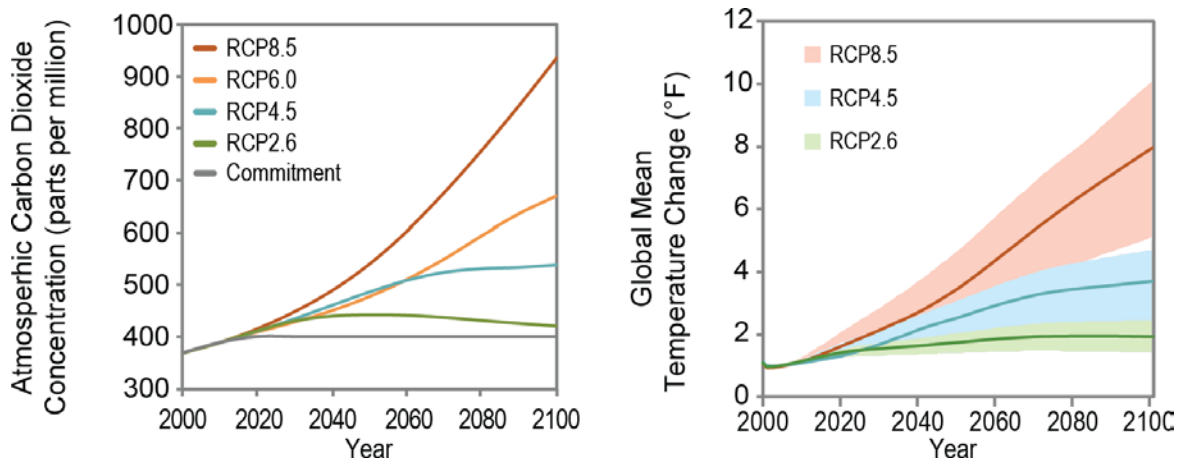


Figure 2 Future scenarios of atmospheric carbon dioxide concentrations (left) and global temperature change (right) resulting from several different emissions pathways, called Representative Concentration Pathways (RCPs), which are considered in the fourth and most recent National Climate Assessment. (Source: science2017.globalchange.gov)

Downscaling

Global climate models simulate the climate across adjacent grid boxes the size of about 60 by 60 miles. To make this coarse resolution information locally relevant, global climate model outputs have been combined with historical observations to translate large-scale patterns into high-resolution projections. This process is called statistical downscaling. The future climate projections produced by OCCRI were statistically downscaled to a resolution with grid boxes the size of about 2.5 by 2.5 miles (Abatzoglou and Brown, 2012). (Read more about Downscaling in the Appendix.)

Future Time Periods

When analyzing global climate model projections of future climate, it is best practice to compare the average across at least a 30-year period in the future to an average historical baseline across at least 30 years. For the future climate projections produced by OCCRI, two 30-year future periods are presented in comparison with a 30-year historical baseline (Table 2).

Table 2 Historical and future time periods for presentation of future climate projections

Historical Baseline	Early 21 st Century "2020s"	Mid 21 st Century "2050s"
1971–2000	2010–2039	2040–2069

How to Use the Information in this Report

Under a changing climate, past trends, while valuable, may no longer be, on their own, reliable predictors of future outcomes. Future projections from GCMs provide an opportunity to explore a range of plausible outcomes taking into consideration the climate system's complex response to increasing concentrations of greenhouse gases. It is important to be aware that GCM projections should not be thought of as predictions of what the weather will be like at some specified date in the future, but rather viewed as predictions of the long-term statistical aggregate of weather, in other words, "climate", if greenhouse gas concentrations follow some specified trajectory.¹

The projections of climate variables in this report, both in the direction and magnitude of change, are best used in reference to the historical climate conditions under which a particular asset or system is designed to operate. For this reason, considering the projected changes between the historical and future periods allows one to envision how current systems of interest would respond to climate conditions that are different from what they have been. In some cases, the projected change may be small enough to be accommodated within the existing system. In other cases, the projected change may be large enough to require adjustments, or adaptations, to the existing system.

¹ Read more: <https://nca2014.globalchange.gov/report/appendices/faqs#narrative-page-38784>

² Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

Average Temperature

Oregon’s average temperature warmed at a rate of 2.2°F per century during 1895–2015. Average temperature is expected to continue warming during the 21st century under scenarios of continued global greenhouse gas emissions; the rate of warming depends on the particular emissions scenario (Dalton *et al.*, 2017). By the “2050s” compared to the 1970–1999 historical baseline, Oregon’s average temperature is projected to increase by 3.6 °F with a range of 1.8°–5.4°F under a lower emissions scenario (RCP 4.5) and by 5.0°F with a range of 2.9°F–6.9°F under a higher emissions scenario (RCP 8.5) (Dalton *et al.*, 2017). Furthermore, summers are projected to warm more than other seasons (Dalton *et al.*, 2017).

Average temperature in Wheeler County is projected to warm during the 21st century at a similar rate to Oregon as a whole (Figure 3). Projected increases in average temperature in Wheeler County compared to the 1971–2000 historical baseline range from 1.0–3.7°F by the 2020s and 1.8–7.4°F by the 2050s, depending on emissions scenario and climate model (Table 3).

**Annual Average Temperature Projections
Wheeler County**

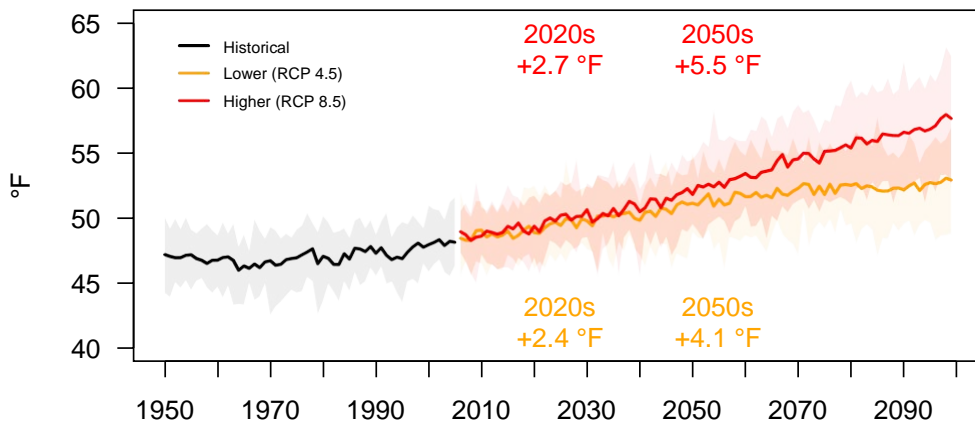


Figure 3 Annual average temperature projections for Wheeler County as simulated by 20 downscaled global climate models under a lower (RCP 4.5) and a higher (RCP 8.5) greenhouse gas emissions scenario. Solid line and shading depicts the 20-model mean and range, respectively. The multi-model mean differences for the 2020s (2010–2039 average) and the 2050s (2040–2069 average) compared to the historical baseline (1971–2000 average) are shown.

Table 3 Average and range of projected future changes in Wheeler County’s average temperature from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models.

	Change by Early 21 st Century “2020s”	Change by Mid 21 st Century “2050s”
Higher (RCP 8.5)	+2.7°F (1.5 to 3.7)	+5.5°F (3.0 to 7.4)
Lower (RCP 4.5)	+2.4°F (1.0 to 3.7)	+4.1°F (1.8 to 5.9)



Heat Waves

Extreme heat events are expected to increase in frequency, duration, and intensity in Oregon due to continued warming temperatures. In fact, the hottest days in summer are projected to warm more than the change in mean temperature over the Pacific Northwest (Dalton *et al.*, 2017). This report presents projected changes for three metrics of heat extremes for both daytime (maximum temperature) and nighttime (minimum temperature) (Table 4).

Table 4 Heat extreme metrics and definitions

Metric	Definition
Hot Days	Number of days per year maximum temperature is greater than or equal to 90°F
Warm Nights	Number of days per year minimum temperature is greater than or equal to 65°F
Hottest Day	Annual maximum of maximum temperature
Warmest Night	Annual maximum of minimum temperature
Daytime Heat Waves	Number of events per year with at least 3 consecutive days with maximum temperature greater than or equal to 90°F
Nighttime Heat Waves	Number of events per year with at least 3 consecutive days with minimum temperature greater than or equal to 65°F

In Wheeler County, all the extreme heat metrics in Table 4 are projected to increase by the 2020s and 2050s under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios (Table 5). For example, compared to the 1971–2000 historical baseline, by the 2050s under the higher emissions scenario, the number of hot days greater than or equal to 90°F is projected to increase by 29 days on average with a range of about 11 to 39 days. Likewise, the temperature of the hottest day of the year is projected to increase by 8.0°F on average with a range of 3.0°F to 11.5°F and the frequency of daytime heat waves is projected to increase by 2.7 events per year.

Projected changes in the frequency extreme heat days (i.e., Hot Days and Warm Nights) are shown in Figure 4. Projected changes in the magnitude of heat records (i.e., Hottest Day and Warmest Night) are shown in Figure 5. Projected changes in the frequency of extreme heat events (i.e., Daytime Heat Waves and Nighttime Heat Waves) are shown in Figure 6.

Table 5 Mean and range of projected future changes in extreme heat metrics for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models.

	Change by Early 21 st Century “2020s”		Change by Mid 21 st Century “2050s”	
	Lower	Higher	Lower	Higher
Hot Days	+10.1 days (3.3–16.0)	+12.0 days (4.5–16.6)	+20.0 days (7.4–29.2)	+28.5 days (10.7–39.3)
Warm Nights	+1.6 days (0.3–3.3)	+1.9 days (0.8–3.2)	+4.3 days (0.5–8.8)	+8.5 days (2.8–18.5)
Hottest Day	+3.3°F (1.0–4.9)	+4.0°F (1.3–5.5)	+5.9°F (2.5–10.4)	+8.0°F (3.0–11.5)
Warmest Night	+2.5°F (0.8–3.8)	+2.9°F (1.0–4.5)	+4.4°F (1.7–7.2)	+6.5°F (3.3–9.6)
Daytime Heat Waves	+1.2 events (0.7–2.1)	+1.4 events (0.8–1.9)	+2.2 events (1.2–3.6)	+2.7 events (1.5–4.2)
Nighttime Heat Waves	+0.2 events (0.0–0.5)	+0.2 events (0.1–0.5)	+0.6 events (0.0–1.2)	+1.2 events (0.1–2.1)

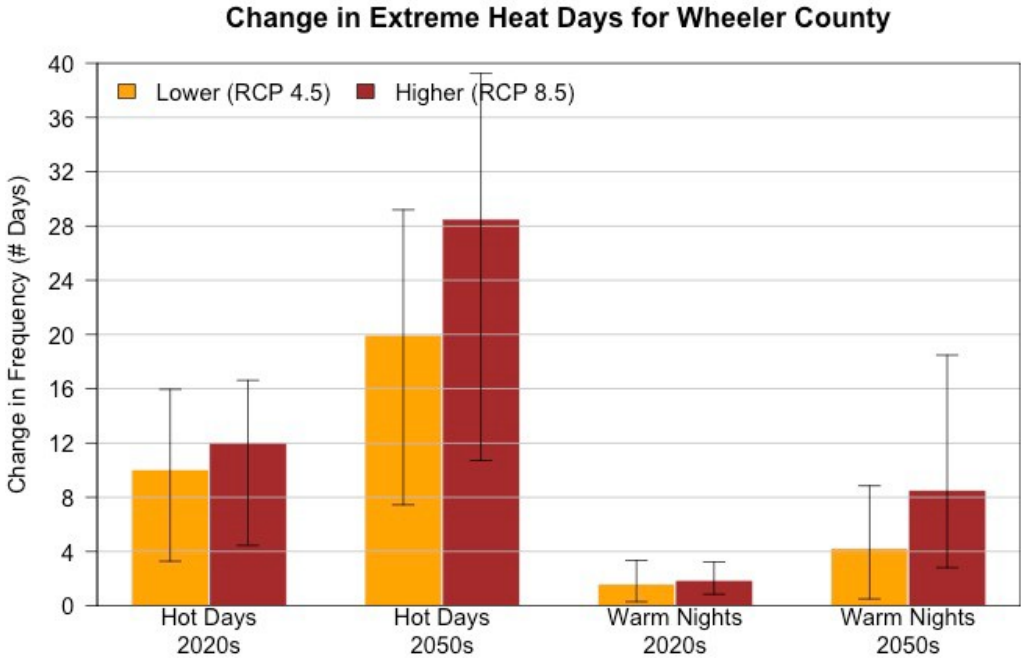


Figure 4 Projected future changes in the number of hot days (left two sets of bars) and number of warm nights (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models. The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs. Hot days are defined as days with maximum temperature of at least 90°F; warm nights are defined as days with minimum temperature of at least 65°F.

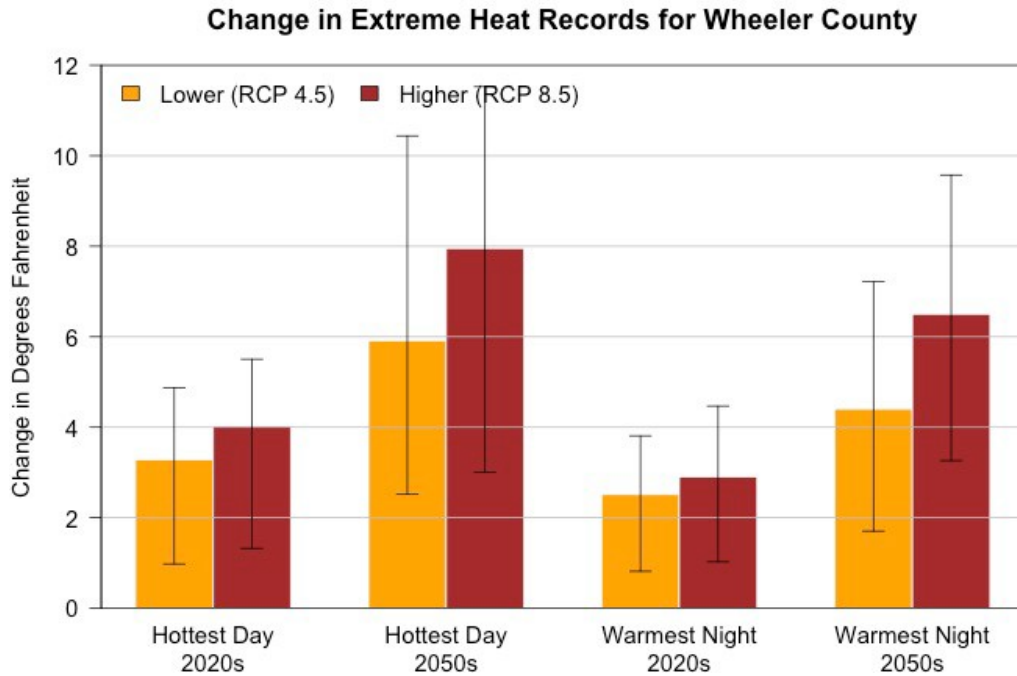


Figure 5 Projected future changes in the hottest day of the year (left two sets of bars) and warmest night of the year (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models. The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs.

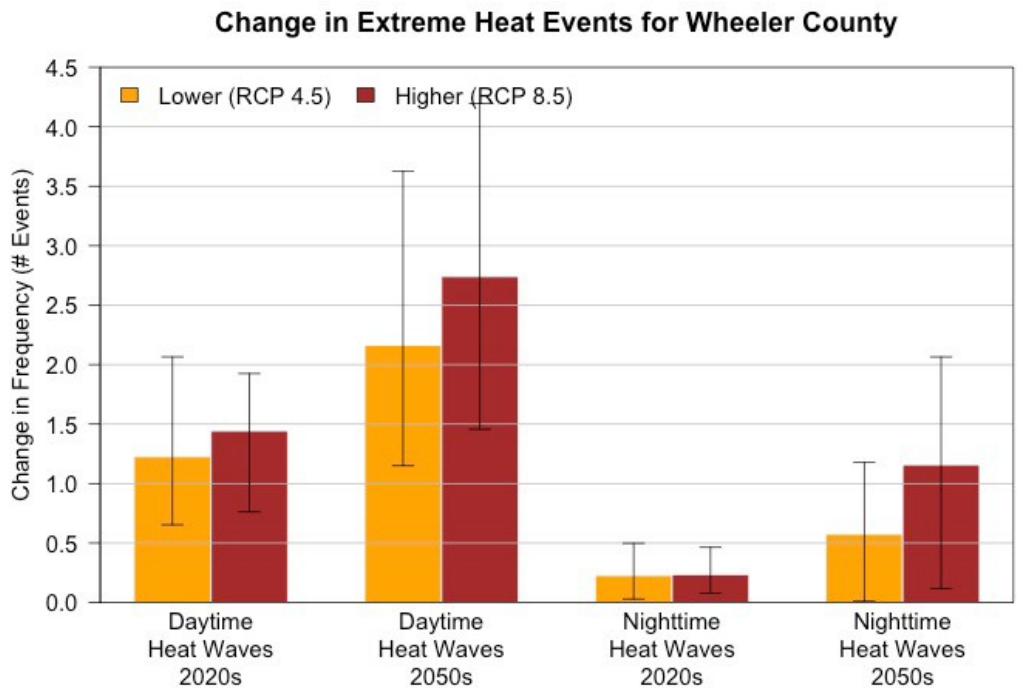


Figure 6 Projected future changes in the number of daytime heat waves (left two sets of bars) and number of nighttime heat waves (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models. The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs. Daytime heat waves are defined as events with three or more consecutive days with maximum temperature of at least 90°F; nighttime heat waves are defined as events with three or more consecutive days with minimum temperature of at least 65°F.

Key Messages:

- Extreme heat events are expected to increase in frequency, duration, and intensity due to continued warming temperatures.
- In Wheeler County, all the extreme heat metrics in Table 4 are projected to increase by the 2020s and 2050s under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios (Table 5).
- In Wheeler County, the frequency of hot days with temperatures at or above 90°F is projected to increase on average by 29 days (with a range of 11 to 39 days) by the 2050s under the higher emissions scenario compared to the historical baseline.
- In Wheeler County, the temperature of the hottest day of the year is projected to increase by 8°F (with a range of 3 to 12°F) by the 2050s under the higher emissions scenario compared to the historical baseline.



Cold Waves

Over the past century, cold extremes have become less frequent and severe in the Northwest; this trend is expected to continue under future global warming of the climate system (Vose *et al.*, 2017). This report presents projected changes for three metrics of cold extremes for both daytime (maximum temperature) and nighttime (minimum temperature) (Table 6).

Table 6 Cold extreme metrics and definitions

Metric	Definition
Cold Days	Number of days per year maximum temperature is less than or equal to 32°F
Cold Nights	Number of days per year minimum temperature is less than or equal to 0°F
Coldest Day	Annual minimum of maximum temperature
Coldest Night	Annual minimum of minimum temperature
Daytime Cold Waves	Number of events per year with at least 3 consecutive days with maximum temperature less than or equal to 32°F
Nighttime Cold Waves	Number of events per year with at least 3 consecutive days with minimum temperature less than or equal to 0°F

In Wheeler County, the extreme cold metrics in Table 6 are projected to become less frequent or less cold by the 2020s and 2050s under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios (Table 7). For example, by the 2050s under the higher emissions scenario, the number of cold days less than or equal to 32°F is projected to decrease by 10 days on average with a range of about 5 to 15 days. Likewise, the temperature of the coldest night of the year is projected to increase by 8.6°F on average with a range of 0.4°F to 15.3°F and the frequency of daytime cold waves is projected to decrease by 1.3 events per year.

Projected changes in the frequency extreme cold days (i.e., Cold Days and Cold Nights) are shown in Figure 7. Projected changes in the magnitude of cold records (i.e., Coldest Day and Coldest Night) are shown in Figure 8. Projected changes in the frequency of extreme cold events (i.e., Daytime Cold Waves and Nighttime Cold Waves) are shown in Figure 9.

Table 7 Mean and range of projected future changes in extreme cold metrics for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models.

	Change by Early 21 st Century “2020s”		Change by Mid 21 st Century “2050s”	
	Lower	Higher	Lower	Higher
Cold Days	-5.3 days (-9.5 to 0.6)	-6.7 days (-11.3 to -1.8)	-8.9 days (-12.4 to -3.0)	-10.2 days (-15.3 to -5.0)
Cold Nights	-0.4 days (-1.3 to 0.5)	-0.7 days (-1.4 to 0.2)	-0.9 days (-1.7 to 0.2)	-1.0 days (-1.6 to -0.1)
Coldest Day	+1.8°F (-1.4 to 4.9)	+3.3°F (-0.1 to 6.9)	+5.2°F (0.4 to 9.7)	+6.4°F (0.3 to 11.1)
Coldest Night	+2.7°F (-1.7 to 8.9)	+4.7°F (0.8 to 11.7)	+6.8°F (0.7 to 12.1)	+8.6°F (0.4 to 15.3)
Daytime Cold Waves	-0.7 events (-1.3 to 0.3)	-0.9 events (-1.6 to -0.1)	-1.2 events (-1.7 to -0.4)	-1.3 events (-2.1 to -0.6)
Nighttime Cold Waves	-0.0 events (-0.2 to 0.1)	-0.1 events (-0.2 to 0.1)	-0.1 events (-0.2 to 0.1)	-0.1 events (-0.3 to -0.0)

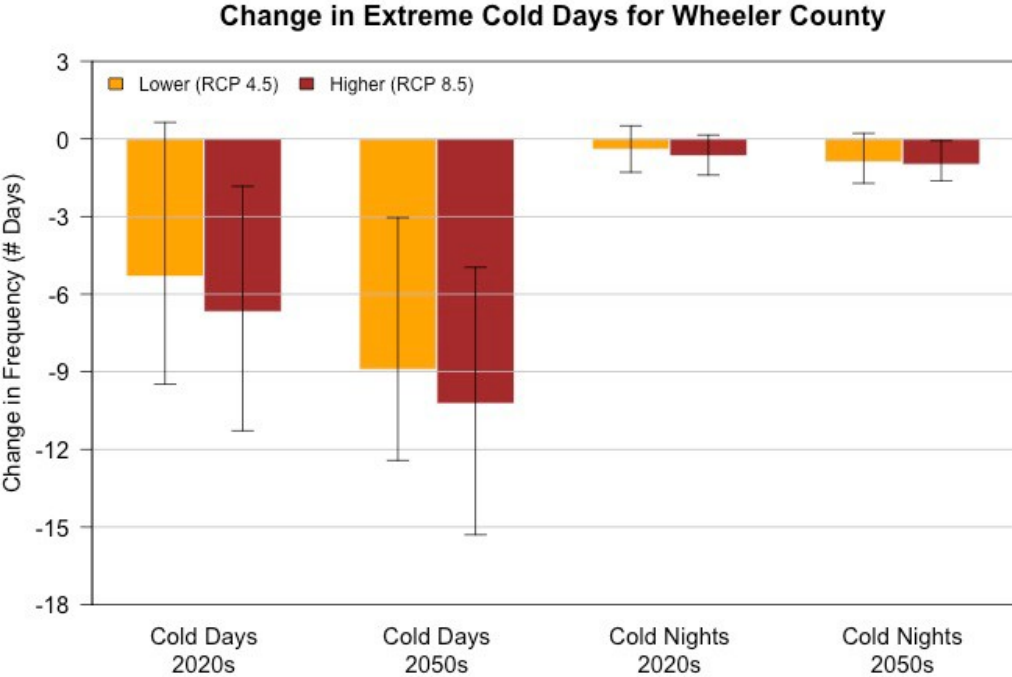


Figure 7 Projected future changes in the number of cold days (left two sets of bars) and number of cold nights (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models. The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs. Cold days are defined as days with maximum temperature at or below 32°F; cold nights are defined as days with minimum temperature at or below 0°F.

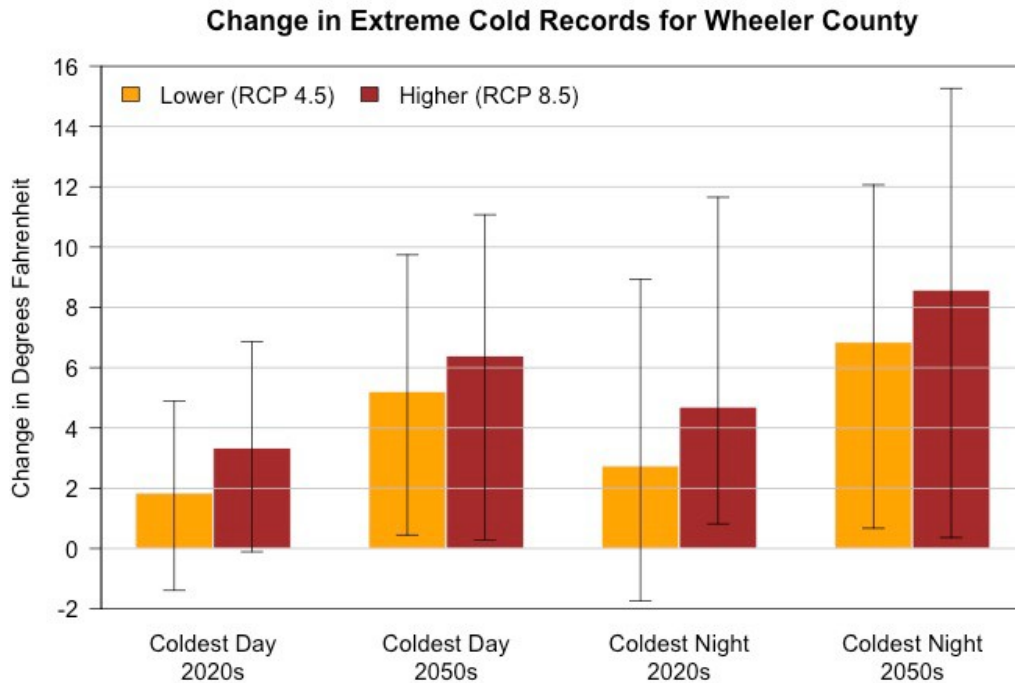


Figure 8 Projected future changes in the coldest day of the year (left two sets of bars) and coldest night of the year (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models. The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs.

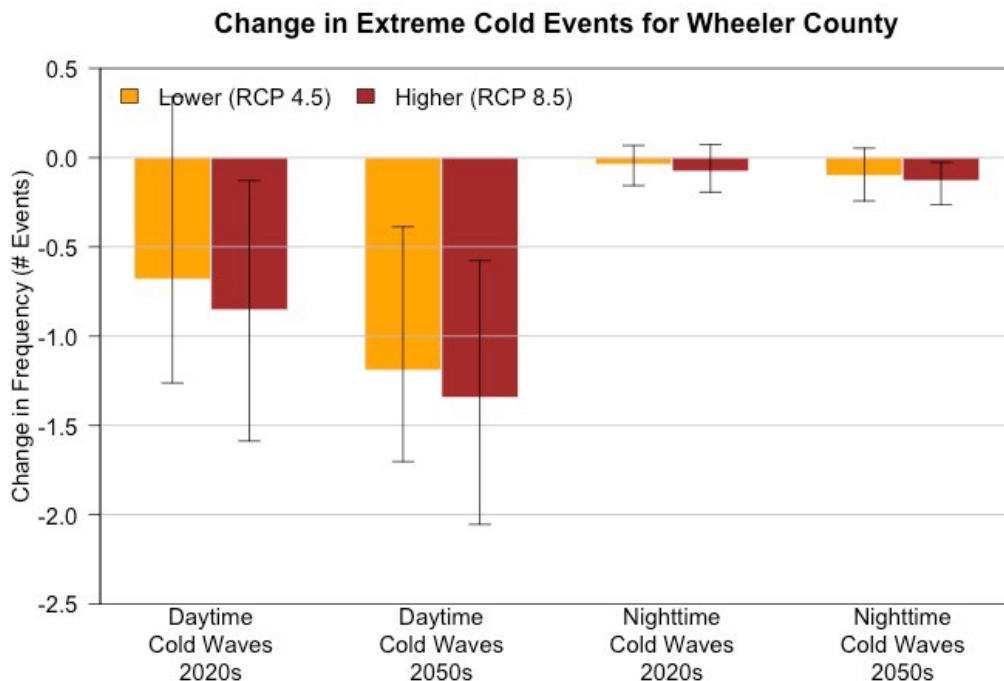


Figure 9 Projected future changes in the number of daytime cold waves (left two sets of bars) and number of nighttime cold waves (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models. The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs. Daytime cold waves are defined as events with three or more consecutive days with maximum temperature at or below 32°F; nighttime cold waves are defined as events with three or more consecutive days with minimum temperature at or below 0°F.

Key Messages:

- Cold extremes are still expected to occur from time to time, but with much less frequency and intensity as the climate warms.
- In Wheeler County, the extreme cold metrics in Table 6 are projected to become less frequent or less cold by the 2020s and 2050s under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios (Table 7).
- In Wheeler County, the frequency of days at or below freezing is projected to decline on average by 10 days (with a range of 5 to 15 days) by the 2050s under the higher emissions scenario compared to the historical baseline.
- In Wheeler County, the temperature of the coldest night of the year is projected to increase by 9°F (with a range of 0 to 15°F) by the 2050s under the higher emissions scenario compared to the historical baseline.



Heavy Rains

There is greater uncertainty in future projections of precipitation-related metrics than temperature-related metrics. This is because of the large natural variability in precipitation patterns and the fact that the atmospheric patterns that influence precipitation are manifested differently across GCMs. From a global perspective, mean precipitation is likely to decrease in many dry regions in the sub-tropics and mid-latitudes and increase in many mid-latitude wet regions (IPCC, 2013). That boundary between mid-latitude increases and decreases in precipitation is positioned a little differently for each GCM, which results in some models projecting increases and others decreases in Oregon (Mote *et al.*, 2013).

In Oregon, observed precipitation is characterized by high year-to-year variability and future precipitation trends are expected to continue to be dominated by this large natural variability. On average, summers in Oregon are projected to become drier and other seasons to become wetter resulting in a slight increase in annual precipitation by the 2050s. However, some models project increases and others decreases in each season (Dalton *et al.*, 2017).

Extreme precipitation events in the Pacific Northwest are governed both by atmospheric circulation and by how it interacts with complex topography. Atmospheric rivers—long, narrow swaths of warm, moist air that carry large amounts of water vapor from the tropics to mid-latitudes—generally result in coherent extreme precipitation events west of the Cascade Range, while closed low pressure systems often lead to isolated precipitation extremes east of the Cascade Range (Parker and Abatzoglou, 2016).²

Observed trends in the frequency of extreme precipitation events across Oregon have depended on the location, time frame, and metric considered, but overall the frequency has not changed substantially. As the atmosphere warms, it is able to hold more water vapor that is available for precipitation. As a result, the frequency and intensity of extreme precipitation events are expected to increase slightly in the future (Dalton *et al.*, 2017). This report presents projected changes for four metrics of precipitation extremes (Table 8).

Table 8 Precipitation extreme metrics and definitions

Metric	Definition
Wettest Day	Annual maximum 1-day precipitation per water year
Wettest Five-Days	Annual maximum 5-day precipitation total per water year
Wet Days	Number of days with precipitation greater than 0.75 inches per year
Landslide Risk Days	Number of days per water year exceeding the USGS landslide threshold ³ : https://pubs.er.usgs.gov/publication/ofr20061064 <ul style="list-style-type: none"> ○ $P3/(3.5-.67*P15)>1$ where ○ P3 = Previous 3-day precipitation accumulation ○ P15 = 15-day precipitation accumulation prior to P3

² Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

³ This threshold was developed for Seattle, Washington and may or may not have similar applicability to other locations.

In Wheeler County, the magnitude of precipitation on the wettest day and wettest consecutive five days is projected to increase on average by the by the 2020s and 2050s under both the lower and higher emissions scenarios (Table 9). However, some models project decreases in these metrics for certain time periods and scenarios. For example, by the 2050s under the higher emissions scenario, the magnitude, or amount, of precipitation on the wettest day of the year is projected to increase by 13.9% on average with a range of about -0.6 to 36.0%. Likewise, the magnitude of precipitation on the wettest consecutive five days of the year is projected to increase by 10.9% on average with a range of -5.8 to 31.1%. The average number of days per year with precipitation greater than 3/4" isn't projected to change substantially.

Landslides are often triggered by rainfall when the soil becomes saturated. A cumulative rainfall threshold serves as a surrogate for landslide risk. For Wheeler County, the average number of days per year exceeding the landslide risk threshold is projected to remain about the same. It is important to note that the landslide threshold used in this report was developed for Seattle, Washington and may or may not have similar applicability to other locations.

Projected changes in the magnitude of extreme precipitation events (i.e., Wettest Day and Wettest Five-Days) are shown in Figure 10. Projected changes in the frequency of extreme precipitation events (i.e., Wet Days and Landslide Risk Days) are shown in Figure 11.

Table 9 Mean and range of projected future changes in extreme precipitation metrics for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models.

	Change by Early 21 st Century "2020s"		Change by Mid 21 st Century "2050s"	
	Lower	Higher	Lower	Higher
Wettest Day	+9.6% (-1.5 to 21.4)	+5.8% (-5.4 to 23.9)	+12.9% (-1.7 to 27.2)	+13.9% (-0.6 to 36.0)
Wettest Five-Days	+6.6% (-7.5 to 15.9)	+3.4% (-9.0 to 15.9)	+8.0% (-4.1 to 20.5)	+10.9% (-5.8 to 31.1)
Wet Days	+0.3 days (-0.3 to 0.6)	+0.2 days (-0.1 to 0.6)	+0.4 days (-0.0 to 0.7)	+0.4 days (-0.1 to 0.9)
Landslide Risk Days	+0.2 days (-0.2 to 0.5)	+0.2 days (-0.3 to 0.6)	+0.3 days (-0.1 to 0.8)	+0.4 days (-0.1 to 1.0)

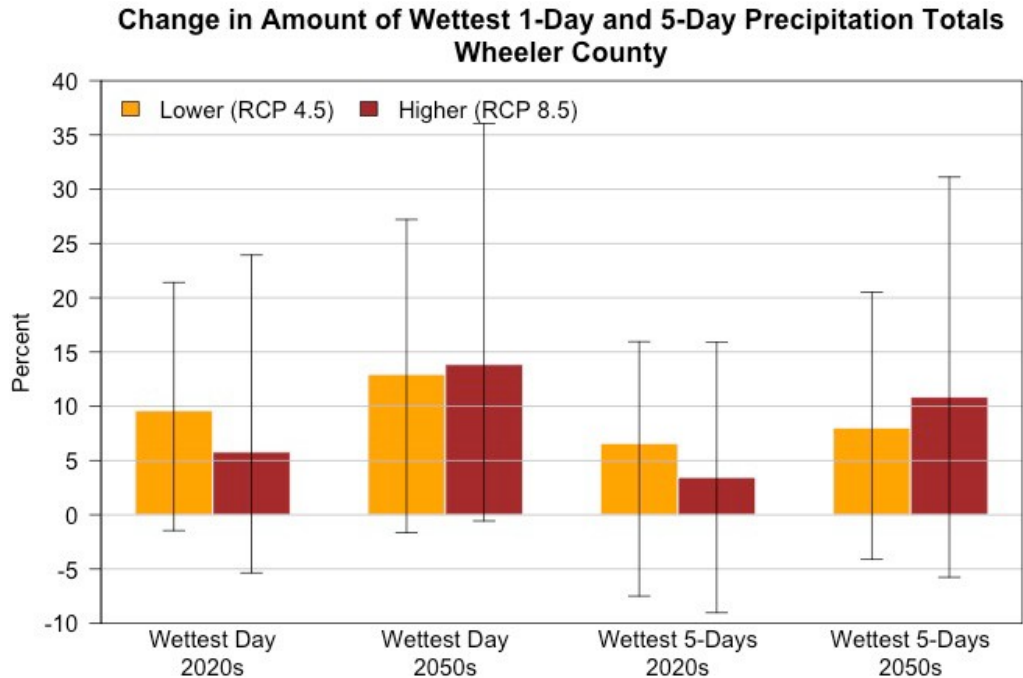


Figure 10 Projected future changes in the wettest day of the year (left two sets of bars) and wettest consecutive five days of the year (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models. The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs.

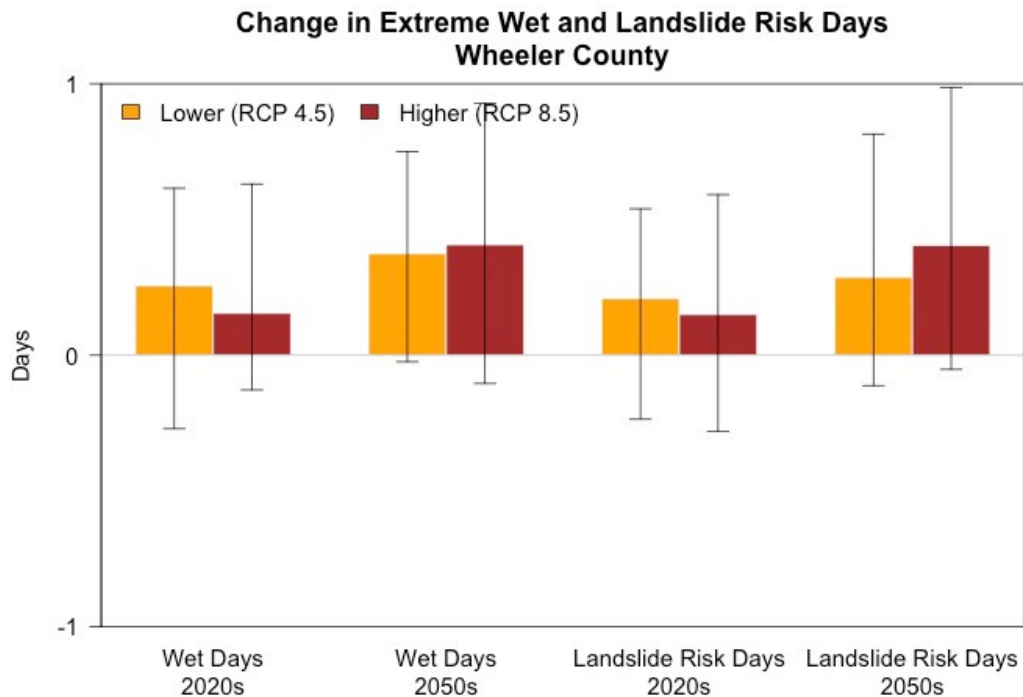


Figure 11 Projected future changes in the frequency of wet days (left two sets of bars) and landslide risk days (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models. The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs.

Key Messages:

- The intensity of extreme precipitation events is expected to increase slightly in the future as the atmosphere warms and is able to hold more water vapor.
- In Wheeler County, the magnitude of precipitation on the wettest day and wettest consecutive five days per year is projected to increase on average by about 14% (with a range of -1% to 36%) and 11% (with a range of -6% to 31%), respectively, by the 2050s under the higher emissions scenario compared to the historical baseline.
- In Wheeler County, the frequency of days with at least $\frac{3}{4}$ " of precipitation and the frequency of days exceeding a threshold for landslide risk is not projected to change substantially.



River Flooding

Future streamflow magnitude and timing in the Pacific Northwest is projected to shift toward higher winter runoff, lower summer and fall runoff, and an earlier peak runoff, particularly in snow-dominated regions (Naz *et al.*, 2016; Raymondi *et al.*, 2013).⁴ These changes are expected to result from warmer temperatures causing precipitation to fall more as rain and less as snow, in turn causing snow to melt earlier in the spring; and in combination with increasing winter precipitation and decreasing summer precipitation (Dalton *et al.*, 2017).

Warming temperatures and increased winter precipitation are expected to increase flood risk for many basins in the Pacific Northwest, particularly mid- to low-elevation mixed rain-snow basins with near freezing winter temperatures (Tohver *et al.*, 2014). The greatest changes in peak streamflow magnitudes are projected to occur at intermediate elevations in the Cascade Range and the Blue Mountains (Safeeq *et al.*, 2015). Recent advances in regional hydro-climate modeling support this expectation, projecting increases in extreme high flows for most of the Pacific Northwest, especially west of the Cascade Crest (Najafi and Moradkhani, 2015; Naz *et al.*, 2016; Salathé *et al.*, 2014). One study, using a single climate model, projects flood risk to increase in the fall due to earlier, more extreme storms, including atmospheric river events, and to a shift of precipitation from snow to rain (Salathé *et al.*, 2014).⁵

Some of the Pacific Northwest's largest floods occur when copious warm rainfall from atmospheric rivers combine with a strong snowpack, resulting in rain-on-snow flooding events (Safeeq *et al.*, 2015). During 1998–2014 in the California Sierra Nevada, atmospheric rivers were associated with half of all rain-on-snow events (Guan *et al.*, 2016). As a result of climate warming, rain-on-snow events are projected to decline at lower elevations, due to decreasing snow cover, and to increase at higher elevations as the number of rainy as opposed to snowy days increases (Safeeq *et al.*, 2015; Surfleet and Tullos, 2013).⁶ How such changes in rain-on-snow frequency would affect high streamflow events is varied. For example, projections for the Santiam River, OR, show an increase in annual peak daily flows with moderate return intervals (<10 years) but a decrease at higher (> 10-year) return intervals (Surfleet and Tullos, 2013).

In parts of the Blue Mountains (the Wallowa Mountains, Hells Canyon Wilderness Area, and northeast Wallowa-Whitman National Forest), flood magnitude is expected to increase by the end of the century under a medium emission scenario (SRES-A1B)⁷, particularly in mid-elevation areas, as precipitation falls more as rain and less as snow (Clifton *et al.*, 2018) (Figure 12). An increase in flood magnitude for a specified flood frequency implies an increase in flood frequency for a given flood magnitude. Figure 12 shows projections of flood magnitude change for the 2080s compared to a historical baseline, unfortunately, quantitative information about flood risk in Wheeler County for the 2020s and 2050s is not available.

⁴ Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

⁵ Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

⁶ Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

⁷ The medium emissions pathway (SRES-A1B) is from an earlier generation of emissions scenarios and it is most similar to RCP 6.0 from Figure 2.

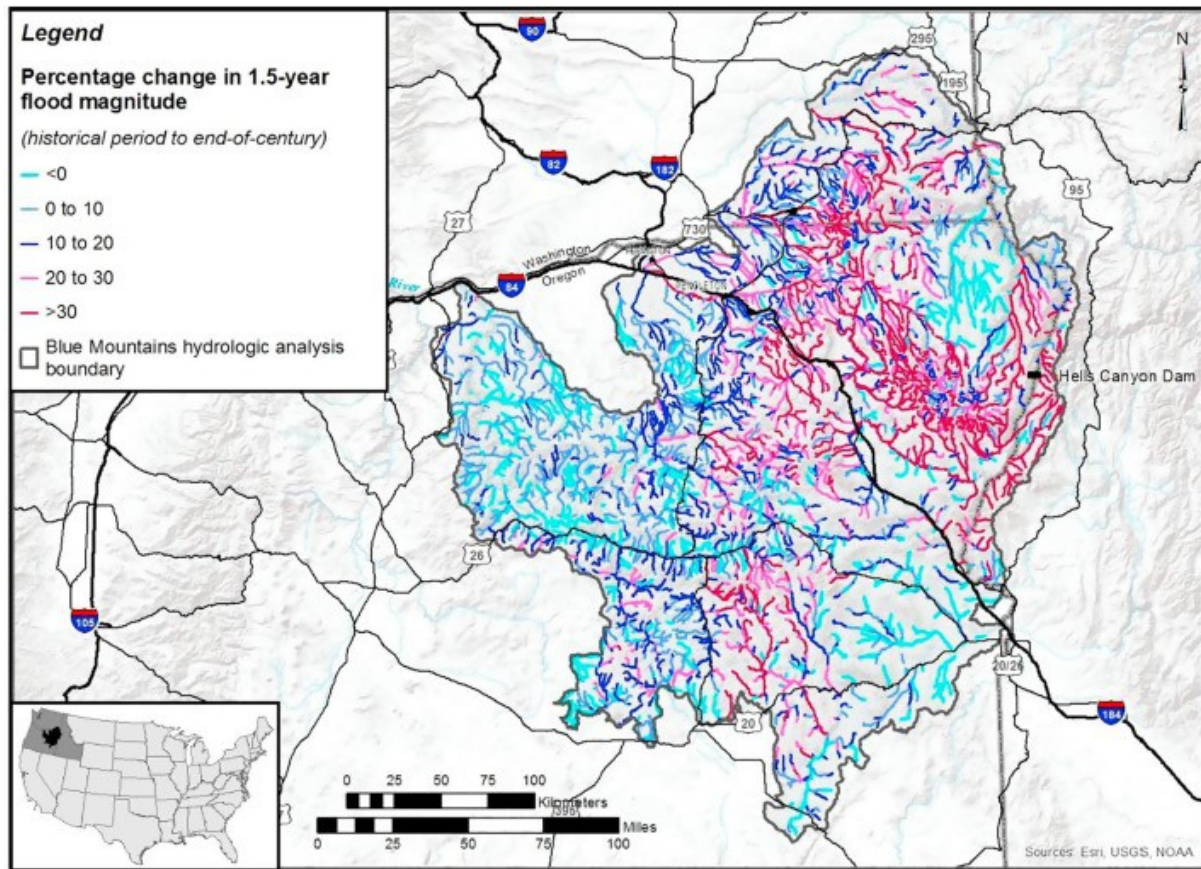


Figure 12 Projected change in the 1.5-year return interval daily flow magnitude between the historical period (1970–1999) and the 2080s (2070–2099) under a medium emissions scenario (SRES-A1B)⁸ for the Blue Mountains region. (Source: Clifton et al., 2018)

Key Messages:

- Mid- to low-elevation areas in Wheeler County’s Blue Mountains that are near the freezing level in winter, receiving a mix of rain and snow, are projected to experience an increase in winter flood risk due to warmer winter temperatures causing precipitation to fall more as rain and less as snow.

⁸ The medium emissions pathway (SRES-A1B) is from an earlier generation of emissions scenarios and it is most similar to RCP 6.0 from Figure 2.



This report presents future changes in three variables indicative of drought conditions—spring snowpack, summer soil moisture⁹, and summer runoff. Across the western US, mountain snowpack is projected to decline leading to reduced summer soil moisture in mountainous environments (Gergel *et al.*, 2017). Climate change is expected to result in lower summer streamflows in historically snow-dominated basins across the Pacific Northwest as snowpack melts off earlier due to warmer temperatures and summer precipitation decreases (Dalton *et al.*, 2017).

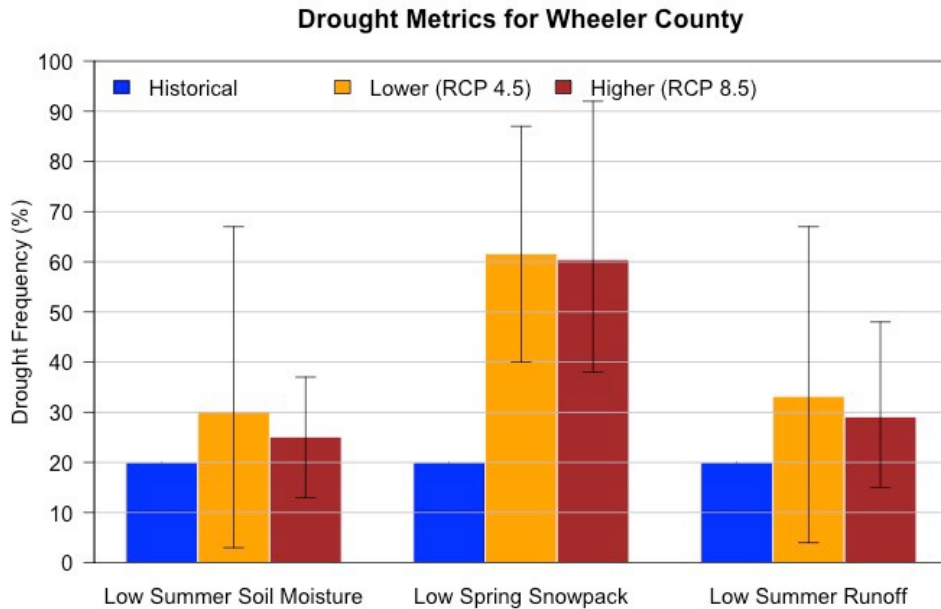


Figure 13 Frequency of the historical baseline (1971–2000) 1-in-5 year event (by definition 20% frequency) of low summer soil moisture (average of June–July–August), low spring snowpack (April 1 snow water equivalent), and low summer runoff (average of June–July–August) for the future period 2040–2069 for lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios. The bar and whiskers depict the mean and range across ten global climate models. (Data Source: Integrated Scenarios of the Future Northwest Environment, <https://climate.northwestknowledge.net/IntegratedScenarios/>)

Changes in drought conditions for low spring snowpack, low summer soil moisture, and low summer runoff are presented in terms of a change in the frequency of the historical baseline 1-in-5 year event (that is, an event having a 20% chance of occurrence in any given year). The future projections, displayed in the orange and brown bars of Figure 13, are the frequency in the future period of the magnitude of the event that has a 20% frequency in the historical period. In Wheeler County, spring snowpack (that is, the snow water equivalent on April 1), summer runoff, and summer soil moisture are projected to decline under both lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios by the 2050s. This leads to the magnitude of low spring snow pack, low summer soil moisture, and low summer runoff expected with a 20% chance in any given year of the historical period being projected to occur more frequently by the 2050s under both emissions scenarios (Figure 13). Of the three metrics, climate change shows the strongest impact on spring snowpack (i.e., the 1-in-5 year event becomes a roughly a 1-in-1.66 year event), while the impacts on soil

⁹ Soil moisture projections are for the total moisture in the soil column from the surface to 140 cm below the surface.

moisture and streamflow are much smaller, especially considering the range of projections from various climate model simulations. The 2020s were not evaluated in this drought analysis, but can be expected to be similar but of smaller magnitude to the changes for the 2050s.

While these projections are for county-wide averages, a recent climate vulnerability analysis (Clifton *et al.*, 2018) reveals larger impacts on summer low flows in certain parts of the Blue Mountains region. Mid-elevations in the North Fork John Day display relatively high sensitivity of snowpack to warming and the Upper John Day sub-basin is at high risk for summer water shortage associated with low streamflow (Clifton *et al.*, 2018) (Figure 14).

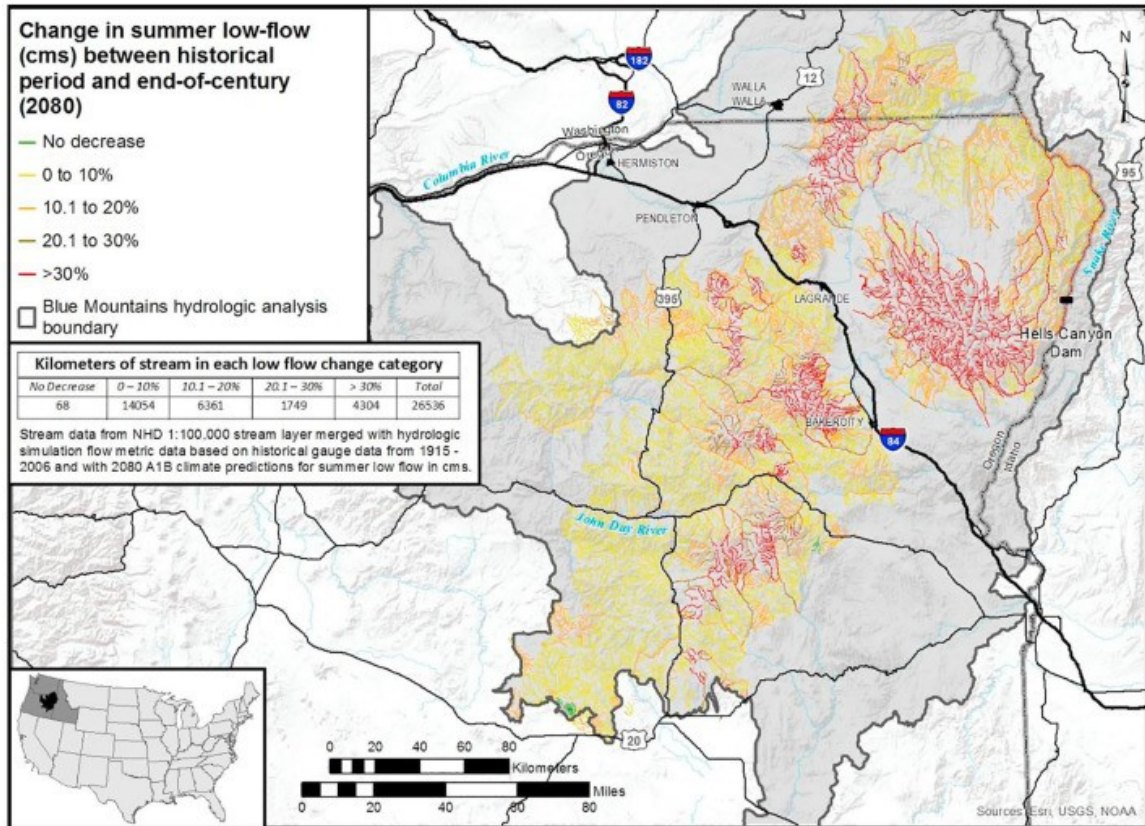


Figure 14 Projected change in mean summer streamflow from the historic time period (1970–1999) to the 2080s (2070–2099) under a medium emissions scenario¹⁰ for streams in the Blue Mountains region. Note, the 0 to 10%, 10.1 to 20%, etc. all indicate decreases in flow. (Source: Clifton *et al.*, 2018)

Key Messages:

- Drought conditions, as represented by low spring snowpack, low summer soil moisture, and low summer runoff, are projected to become more frequent in Wheeler County by the 2050s compared to the historical baseline.
- By the end of the 21st century, summer low flows are projected to decrease in the Blue Mountains region; the Upper John Day sub-basin is at high risk for summer water shortage associated with low streamflow.

¹⁰ The medium emissions pathway (SRES-A1B) is from an earlier generation of emissions scenarios and it is most similar to RCP 6.0 from Figure 2.



Wildfire

Over the last several decades, warmer and drier conditions during the summer months have contributed to an increase in fuel aridity and enabled more frequent large fires, an increase in the total area burned, and a longer fire season across the western United States, particularly in forested ecosystems (Dennison *et al.*, 2014; Jolly *et al.*, 2015; Westerling, 2016; Williams and Abatzoglou, 2016). The lengthening of the fire season is largely due to declining mountain snowpack and earlier spring snowmelt (Westerling, 2016). Recent wildfire activity in forested ecosystems is partially attributed to human-caused climate change: during the period 1984–2015, about half of the observed increase in fuel aridity and 4.2 million hectares (or more than 16,000 square miles) of burned area in the western United States were due to human-caused climate change (Abatzoglou and Williams, 2016). Under future climate change, wildfire frequency and area burned are expected to continue increasing in the Pacific Northwest (Barbero *et al.*, 2015; Sheehan *et al.*, 2015).¹¹

As a proxy for wildfire risk, this report considers a fire danger index called 100-hour fuel moisture (FM100), which is a measure of the amount of moisture in dead vegetation in the 1–3 inch diameter class available to a fire. It is expressed as a percent of the dry weight of that specific fuel. FM100 is a common index used by the Northwest Interagency Coordination Center to predict fire danger. A majority of climate models project that FM100 would decline across Oregon by the 2050s under the higher (RCP 8.5) emissions scenario (Gergel *et al.*, 2017). This drying of vegetation would lead to greater wildfire risk, especially when coupled with projected decreases in summer soil moisture. This report defines a “very high” fire danger day to be a day in which FM100 is lower (i.e., drier) than the historical baseline 10th percentile value. By definition, the historical baseline has 36.5 very high fire danger days annually. The future change in wildfire risk is expressed as the average annual number of additional “very high” fire danger days for two future periods under two emissions scenarios compared with the historical baseline (Figure 15).

¹¹ Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

Change in Annual Very High Fire Danger Days Wheeler County

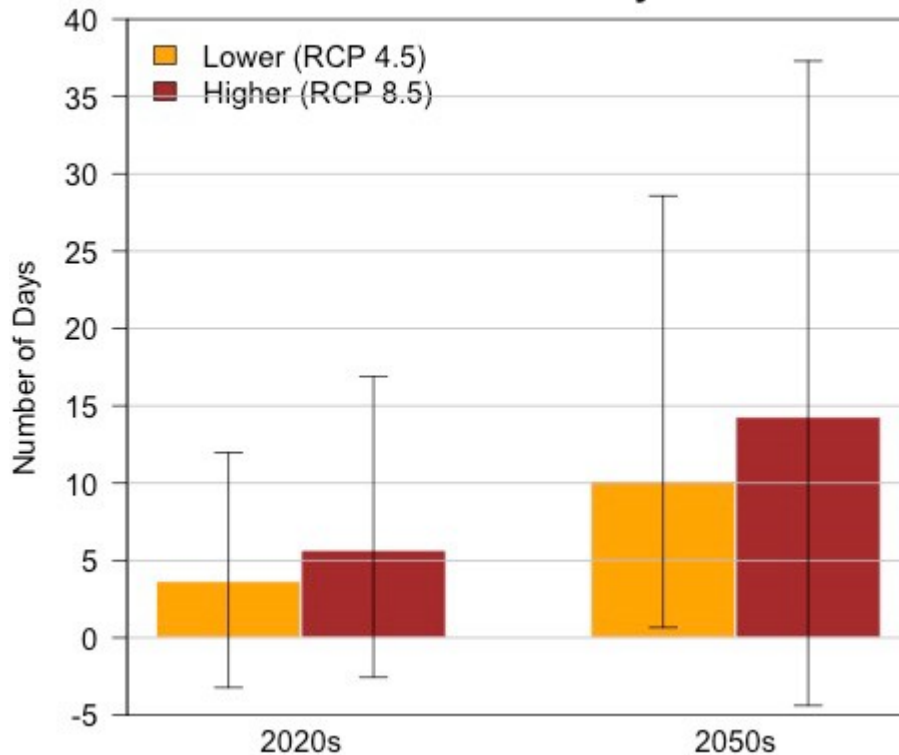


Figure 15 Projected future changes in the frequency of very high fire danger days for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 18 global climate models. The bars and whiskers display the mean and range, respectively, of changes across the 18 GCMs. (Data Source: Northwest Climate Toolbox, climatetoolbox.org/tool/Climate-Mapper)

Key Messages:

- Wildfire risk, as expressed through the frequency of very high fire danger days, is projected to increase under future climate change in Wheeler County.
- In Wheeler County, the frequency of very high fire danger days per year is projected to increase on average by 14 days (with a range of -4 to +37 days) by the 2050s under the higher emissions scenario compared to the historical baseline.
- In Wheeler County, the frequency of very high fire danger days per year is projected to increase on average by about 39% (with a range of -12 to +102%) by the 2050s under the higher emissions scenario compared to the historical baseline.



Air Quality

Climate change is expected to worsen outdoor air quality. Warmer temperatures may increase ground level ozone pollution, more wildfires may increase smoke and particulate matter, and longer, more potent pollen seasons may increase aeroallergens. Such poor air quality is expected to exacerbate allergy and asthma conditions and increase respiratory and cardiovascular illnesses and death (Fann *et al.*, 2016).¹² This report presents quantitative projections of future air quality measures related to fine particulate matter (PM_{2.5}) from wildfire smoke.

Climate change is expected to result in a longer wildfire season with more frequent wildfires and greater area burned (Sheehan *et al.*, 2015). Wildfires are primarily responsible for days when air quality standards for PM_{2.5} are exceeded in western Oregon and parts of eastern Oregon (Liu *et al.*, 2016), although woodstove smoke and diesel emissions are also main contributors (Oregon DEQ, 2016). Across the western United States, PM_{2.5} levels from wildfires are projected to increase 160% by mid-century under a medium emissions pathway¹¹ (SRES A1B) (Liu *et al.*, 2016). This translates to a greater risk

of wildfire smoke exposure through increasing frequency, length, and intensity of “smoke waves”—that is, two or more consecutive days with high levels of PM_{2.5} from wildfires (Liu *et al.*, 2016).¹³

The change in risk of poor air quality due to wildfire-specific PM_{2.5} is expressed as the number of “smoke wave” days within a six-year period in the present (2004–2009) and mid-century (2046–2051) under a medium emissions pathway¹⁴ (Figure 16). See Appendix for description of methodology and access to the Smoke Wave data.

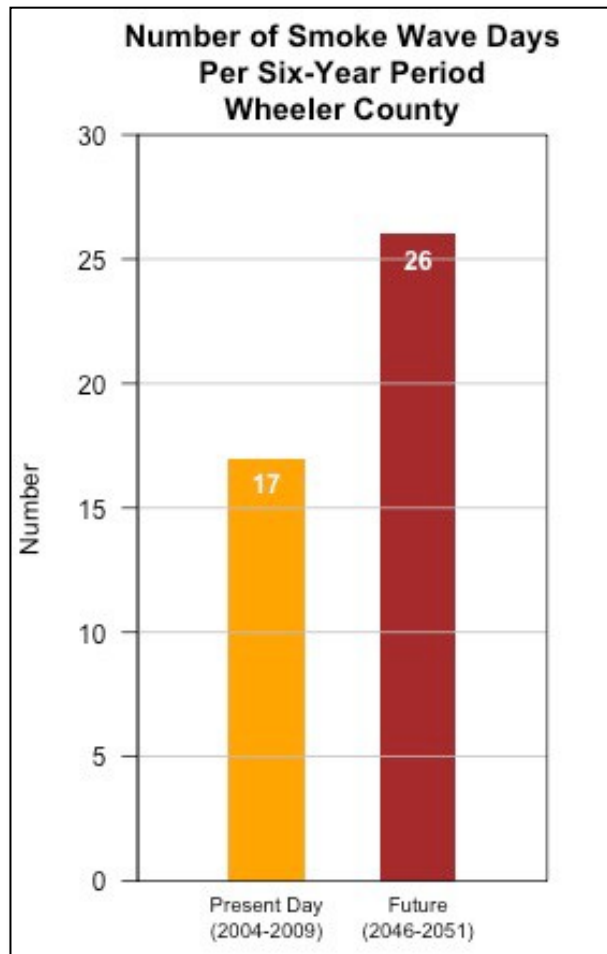


Figure 16 Simulated present day (2004–2009) and future (2046–2051) frequency of “smoke wave” days for Wheeler County under a medium emissions scenario¹¹. The bars display the mean across 15 GCMs. (Data source: Liu *et al.* 2016, <https://khanotations.github.io/smoke-map/>)

¹² Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

¹³ Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

¹⁴ The medium emissions pathway used is from an earlier generation of emissions scenarios. Liu *et al.* (2016) used SRES-A1B, which is most similar to RCP 6.0 from Figure 2.

Key Messages:

- Under future climate change, the risk of wildfire smoke exposure is projected to increase in Wheeler County.
- In Wheeler County, there is projected to be 9 more “smoke wave” days during 2046–2051 under a medium emissions scenario compared with 2004–2009.
- In Wheeler County, the number of “smoke wave” days is projected to increase by 53% by 2046–2051 under a medium emissions scenario compared with 2004–2009.

Windstorms

Climate change has the potential to alter surface winds through changes in the large-scale free atmospheric circulation and storm systems, and through changes in the connection between the free atmosphere and the surface. West of the Cascade Mountains in the Pacific Northwest, changes in surface wind speeds tend to follow changes in upper atmosphere winds associated with extratropical cyclones (Salathé *et al.*, 2015). However, there is a high degree of uncertainty in future projections of extratropical cyclone frequency (IPCC, 2013). East of the Cascades, cool air pooling is common which can impede the transport of wind energy from the free atmosphere to the surface. Changes in this factor are likely important for understanding future changes in windstorms (Salathé *et al.*, 2015). However, this is not yet well studied. Therefore, no descriptions of future changing conditions are included in this report.

Key Messages:

- Limited research suggests very little, if any, change in the frequency and intensity of windstorms in the Pacific Northwest as a result of climate change.

Dust Storms

Climate, through precipitation and winds, and vegetation coverage can influence the frequency and magnitude of dust events, or dust storms, which primarily concern parts of eastern Oregon. Periods of low precipitation can dry out the soils increasing the amount of soil particulate matter available to be entrained in high winds. In addition, the amount of vegetation cover can influence the amount of soil susceptible to high winds.

One study found that in eastern Oregon, precipitation is the dominant factor affecting dust event frequency in the spring whereas vegetation cover is the dominant factor in the summer (Pu and Ginoux, 2017). The same study projected that in the summertime in eastern Oregon, dust event frequency would decrease largely due to a decrease in bareness (or an increase in vegetation cover) (Pu and Ginoux, 2017). There were no clear projected changes in other seasons or locations in Oregon. These projections compare the 2051–2100 average under a higher emissions scenario (RCP 8.5) with the 1861–2005 average.

Another study found that wind erosion in Columbia Plateau agricultural areas is projected to decrease by mid-century under a lower emissions scenario (RCP 4.5) largely due to increases in biomass production, which retain the soil (Sharratt *et al.*, 2015). The increase in vegetation cover in both studies is likely due to the fertilization effect of increased amounts of carbon dioxide in the atmosphere and warmer temperatures. Tillage practices may also influence the amount of soil available to winds. Therefore, no descriptions of future changing conditions are included in this report.

Key Messages:

- Limited research suggests that the risk of dust storms in summer would decrease in eastern Oregon under climate change in areas that experience an increase in vegetation cover from the carbon dioxide fertilization effect.

Increased Invasive Species & Pests

Warming temperatures, altered precipitation patterns, and increasing atmospheric carbon dioxide levels increase the risk for invasive species, insect and plant pests for forest and rangeland vegetation, and cropping systems.

Warming and more frequent drought will likely lead to a greater susceptibility among trees to insects and pathogens, a greater risk of exotic species establishment, more frequent and severe forest insect outbreaks (Halofsky and Peterson, 2016), and increased damage by a number of forest pathogens (Vose *et al.*, 2016). In Oregon and Washington, mountain pine beetle (*Dendroctonus ponderosae*) and western spruce budworm (*Choristoneura freemani*) are the most common native forest insect pests, and both have caused substantial tree mortality and defoliation over the past several decades (Meigs *et al.*, 2015).¹⁵

Climatic warming has facilitated the expansion and survival of mountain pine beetles, particularly in areas that have historically been too cold for the insect (Littell *et al.*, 2013). Across the western United States, the time between generations among different populations of mountain pine beetles is similar; however, the amount of thermal units required to complete a generation cycle was significantly less for beetles at cooler sites (Bentz *et al.*, 2014). Winter survival and faster generation cycles could be favored under future projections of decreases in the number of freeze days (Rawlins *et al.*, 2016).¹⁶

Western spruce budworm is a destructive defoliator that sporadically breaks out in interior Oregon Douglas-fir (*Pseudotsuga menziesii*) forests (Flower *et al.*, 2014). An analysis of three hundred years of tree ring data reveals that outbreaks tended to occur near the end of a drought, when trees' physiological thresholds had likely been reached. This analysis suggests that such outbreaks would likely intensify under the more frequent drought conditions that are projected for the future (Flower *et al.*, 2014), unless increasing atmospheric carbon dioxide, which may enhance water use efficiency, mitigates drought stress.¹⁷

More frequent rangeland droughts could facilitate invasion of non-native weeds as native vegetation succumbs to drought or wildfire cycles, leaving bare ground (Vose *et al.*, 2016). Cheatgrass (*Bromus tectorum L.*), a lower nutritional quality forage grass, facilitates more frequent fires, which reduces the capacity of shrub steppe ecosystem to provide livestock forage and critical wildlife habitat (Boyte *et al.*, 2016). Cheatgrass is a highly invasive species in the rangelands in the West that is projected to expand northward (Creighton *et al.*, 2015) and remain stable or increase in cover in most parts of the Great Basin (Boyte *et al.*, 2016) under climate change.¹⁸

Crop pests and pathogens may continue to migrate poleward under global warming as has been observed globally for several types since the 1960s (Bebber *et al.*, 2013). Much

¹⁵ Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017), p.49

¹⁶ Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017), p.49

¹⁷ Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017), p. 49–50

¹⁸ Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017), p. 70

remains to be learned about which pests and pathogens are most likely to affect certain crops as the climate changes, and about which management strategies will be most effective.¹⁹

Key Messages:

- Warming temperatures, altered precipitation patterns, and increasing atmospheric carbon dioxide levels increase the risk for invasive species, insect and plant pests for forest and rangeland vegetation, and cropping systems.

Loss of Wetland Ecosystems

Wetlands play key roles in major ecological processes and provide a number of essential ecosystem services: flood reduction, groundwater recharge, pollution control, recreational opportunities, and fish and wildlife habitat, including for endangered species.²⁰ Climate change stands to affect freshwater wetlands Oregon through changes in the duration, frequency, and seasonality of precipitation and runoff; decreased groundwater recharge; and higher rates of evapotranspiration (Raymondi *et al.*, 2013).

Reduced snowpack and altered runoff timing may contribute to the drying of many ponds and wetland habitats across the Northwest.²¹ The absence of water or declining water levels in permanent or ephemeral wetlands would affect resident and migratory birds, amphibians, and other animals that rely on the wetlands (Dello and Mote, 2010). However, potential future increases in winter precipitation may lead to the expansion of some wetland systems, such as wetland prairies.²²

In Oregon’s western Great Basin, changes in climate would alter the water chemistry of fresh and saline wetlands affecting the migratory water birds that depend on them. Hotter summer temperatures would cause freshwater sites to become more saline making them less useful to raise young birds that haven’t yet developed the ability to process salt. At the same time, increased precipitation would cause saline sites to become fresher thereby decreasing the abundance of invertebrate food supply for adult water birds (Dello and Mote, 2010).

Key Messages:

- Freshwater wetland ecosystems are sensitive to warming temperatures and altered hydrological patterns, such as changes in precipitation seasonality and reduction of snowpack.

¹⁹ Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017), p. 67

²⁰ Verbatim from the Oregon Climate Change Adaptation Framework, p. 62

²¹ Verbatim from the Climate Change in the Northwest (Dalton *et al.*, 2013), p. 53

²² Verbatim from the Climate Change in the Northwest (Dalton *et al.*, 2013), p. 53

Appendix

Future Climate Projections Background

Read more about emissions scenarios, global climate models, and uncertainty in the Climate Science Special Report, Volume 1 of the Fourth National Climate Assessment (<https://science2017.globalchange.gov>).

Emissions Scenarios: <https://science2017.globalchange.gov/chapter/4#section-2>

Global Climate Models &

Downscaling: <https://science2017.globalchange.gov/chapter/4#section-3>

Uncertainty: <https://science2017.globalchange.gov/chapter/4#section-4>

Climate & Hydrological Data

Statistically downscaled GCM output from the Fifth phase of the Coupled Model Intercomparison Project (CMIP5) served as the basis for future projections of temperature, precipitation, and hydrology variables. The coarse resolution of GCMs output (100–300 km) was downscaled to a resolution of about 6km using the Multivariate Adaptive Constructed Analogs (MACA) method, which has demonstrated skill in complex topographic terrain (Abatzoglou and Brown, 2012). The MACA approach utilizes a gridded training observation dataset to accomplish the downscaling by applying bias-corrections and spatial pattern matching of observed large-scale to small-scale statistical relationships. (For a detailed description of the MACA method see: <http://maca.northwestknowledge.net/MACAMethod.php>.)

This downscaled gridded meteorological data (i.e., MACA data) is used as the climate inputs to an integrated climate-hydrology-vegetation modeling project called Integrated Scenarios of the Future Northwest Environment (<https://climate.northwestknowledge.net/IntegratedScenarios/>). Snow dynamics were simulated using the Variable-Infiltration Capacity hydrological model (VIC version 4.1.2.1; (Liang *et al.*, 1994) and updates) run on a 1/16th x 1/16th (6 km) grid.

Simulations of historical and future climate for the variables maximum temperature (*tasmax*), minimum temperature (*tasmin*), and precipitation (*pr*) are available at the daily time step from 1950 to 2099 for 20 GCMs and 2 RCPs (i.e., RCP4.5 and RCP8.5). Hydrological simulations of snow water equivalent (*SWE*) are only available for the 10 GCMs used as input to VIC. Table X lists all 20 CMIP5 GCMs and indicates the subset of 10 used for hydrological simulations. Data for all the models available was obtained for each variable from the Integrated Scenarios data archives in order to get the best uncertainty estimates.

All simulated climate data and the streamflow data have been bias-corrected using quantile mapping techniques. Only SWE is presented without bias correction. Quantile mapping adjusts simulated values by creating a one-to-one mapping between the cumulative probability distribution of simulated values and the cumulative probability distribution of observed values. In practice, both the simulated and observed values of a variable (e.g.,

daily streamflow) over the some historical time period are separately sorted and ranked and the values are assigned their respective probabilities of exceedence. The bias corrected value of a given simulated value is assigned the observed value that has the same probability of exceedence as the simulated value. The historical bias in the simulations is assumed to stay constant into the future; therefore the same mapping relationship developed from the historical period was applied to the future scenarios. For MACA, a separate quantile mapping relationship was made for each non-overlapping 15-day window in the calendar year. For streamflow, a separate quantile mapping relationship was made for each calendar month.

Hydrology was simulated using the Variable-Infiltration Capacity hydrological model (VIC; Liang et al. 1994) run on a $1/16^{\text{th}} \times 1/16^{\text{th}}$ (6 km) grid. To generate daily streamflow estimates, runoff from VIC grid cells was then routed to selected locations along the stream network using a daily-time-step routing model. Where records of naturalized flow were available, the daily streamflow estimates were then bias-corrected so that their statistical distributions matched those of the naturalized streamflows.

The wildfire danger day metric was computed using the same MACA climate variables to compute the 100-hour fuel moisture content according to the equations in the National Fire Danger Rating System.

Smoke Wave Data

Abstract from Liu et al. (2016):

Wildfire can impose a direct impact on human health under climate change. While the potential impacts of climate change on wildfires and resulting air pollution have been studied, it is not known who will be most affected by the growing threat of wildfires. Identifying communities that will be most affected will inform development of fire management strategies and disaster preparedness programs. We estimate levels of fine particulate matter ($\text{PM}_{2.5}$) directly attributable to wildfires in 561 western US counties during fire seasons for the present-day (2004–2009) and future (2046–2051), using a fire prediction model and GEOS-Chem, a 3-D global chemical transport model. Future estimates are obtained under a scenario of moderately increasing greenhouse gases by mid-century. We create a new term “Smoke Wave,” defined as ≥ 2 consecutive days with high wildfire-specific $\text{PM}_{2.5}$, to describe episodes of high air pollution from wildfires. We develop an interactive map to demonstrate the counties likely to suffer from future high wildfire pollution events. For 2004–2009, on days exceeding regulatory $\text{PM}_{2.5}$ standards, wildfires contributed an average of 71.3 % of total $\text{PM}_{2.5}$. Under future climate change, we estimate that more than 82 million individuals will experience a 57 % and 31 % increase in the frequency and intensity, respectively, of Smoke Waves. Northern California, Western Oregon and the Great Plains are likely to suffer the highest exposure to wildfire smoke in the future. Results point to the potential health impacts of increasing wildfire activity on large numbers of people in a warming climate and the need to establish or modify US wildfire management and evacuation programs in high-risk regions. The study also adds to the growing literature arguing that extreme events in a changing climate could have significant consequences for human health.

Data can be accessed here: <https://khanotations.github.io/smoke-map/>

For the DLCD project, we looked at the variable “Total # of SW days in 6 yrs”. This variable tallies all the days within each time period in which the fine particulate matter exceeded the threshold defined as the 98th quantile of the distribution of daily wildfire-specific PM_{2.5} values in the modeled present-day years, on average across the study area. Liu et al. (2016) used 15 GCMs from the Third Phase of the Coupled Model Intercomparison Project (CMIP3) under a medium emissions scenario (SRES-A1B). The data site only offers the multi-model mean value (not the range), which should be understood as the aggregate direction of projected change rather than the actual number expected.

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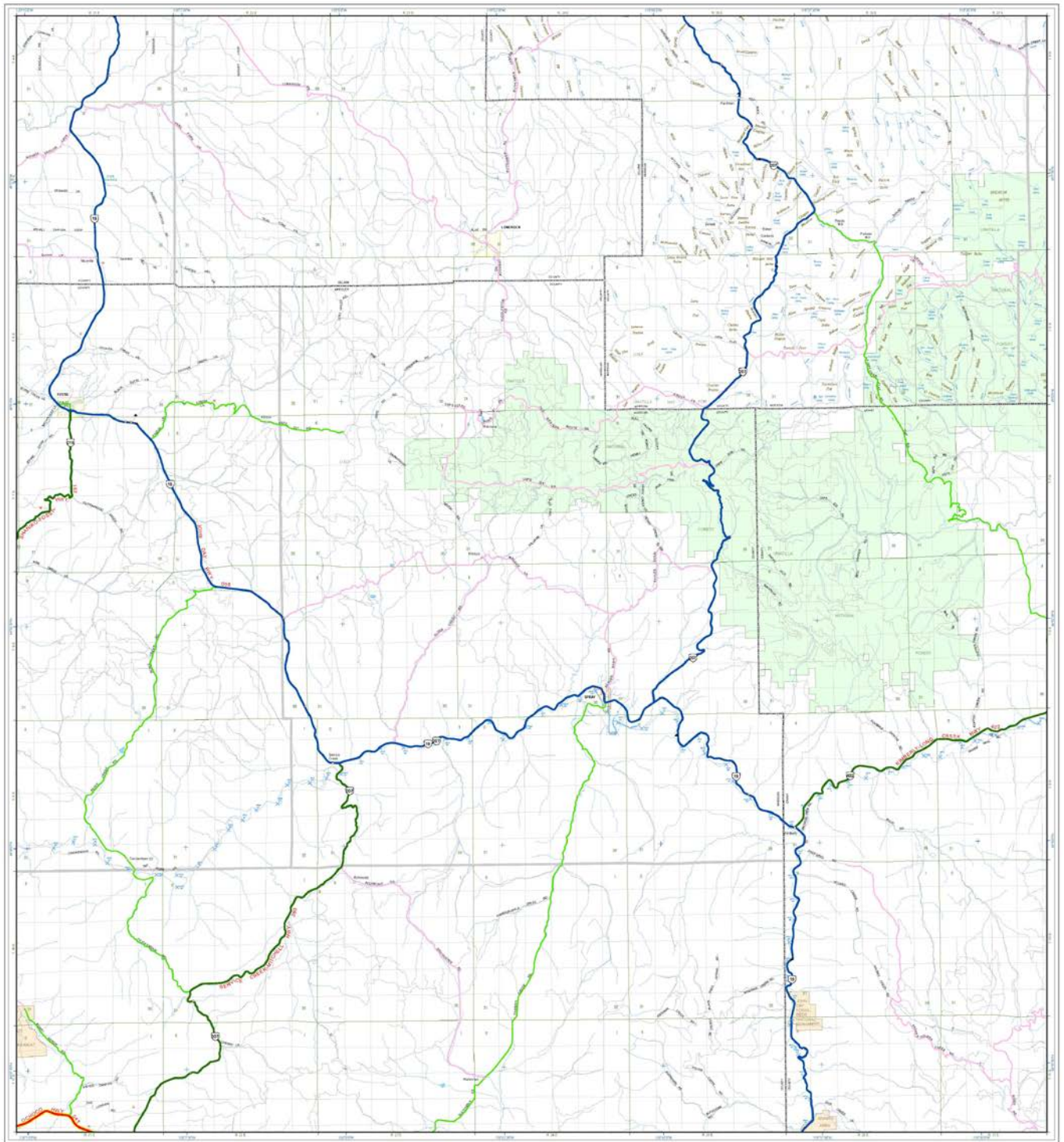
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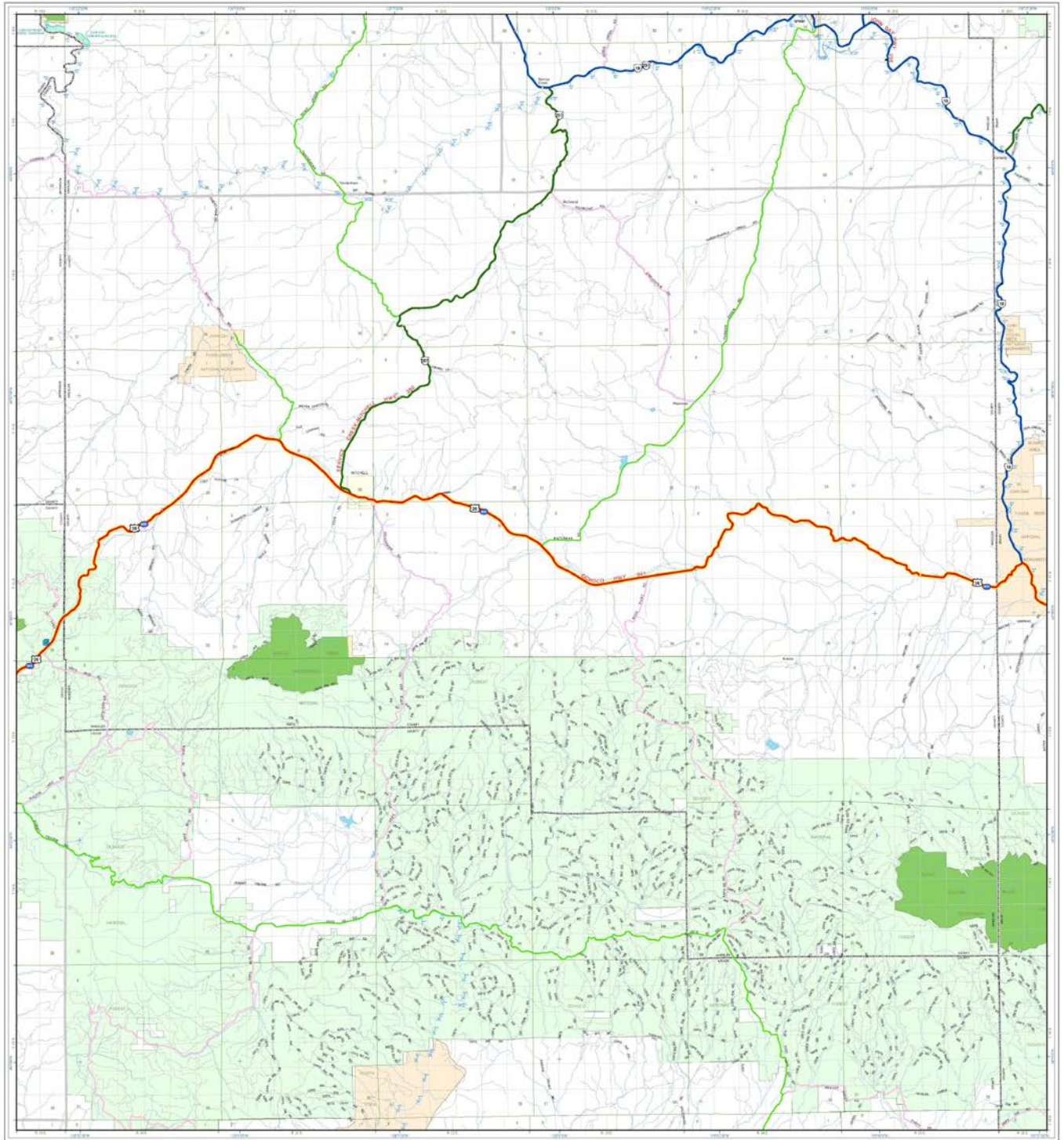
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Appendix I:
Wheeler County Transportation Maps

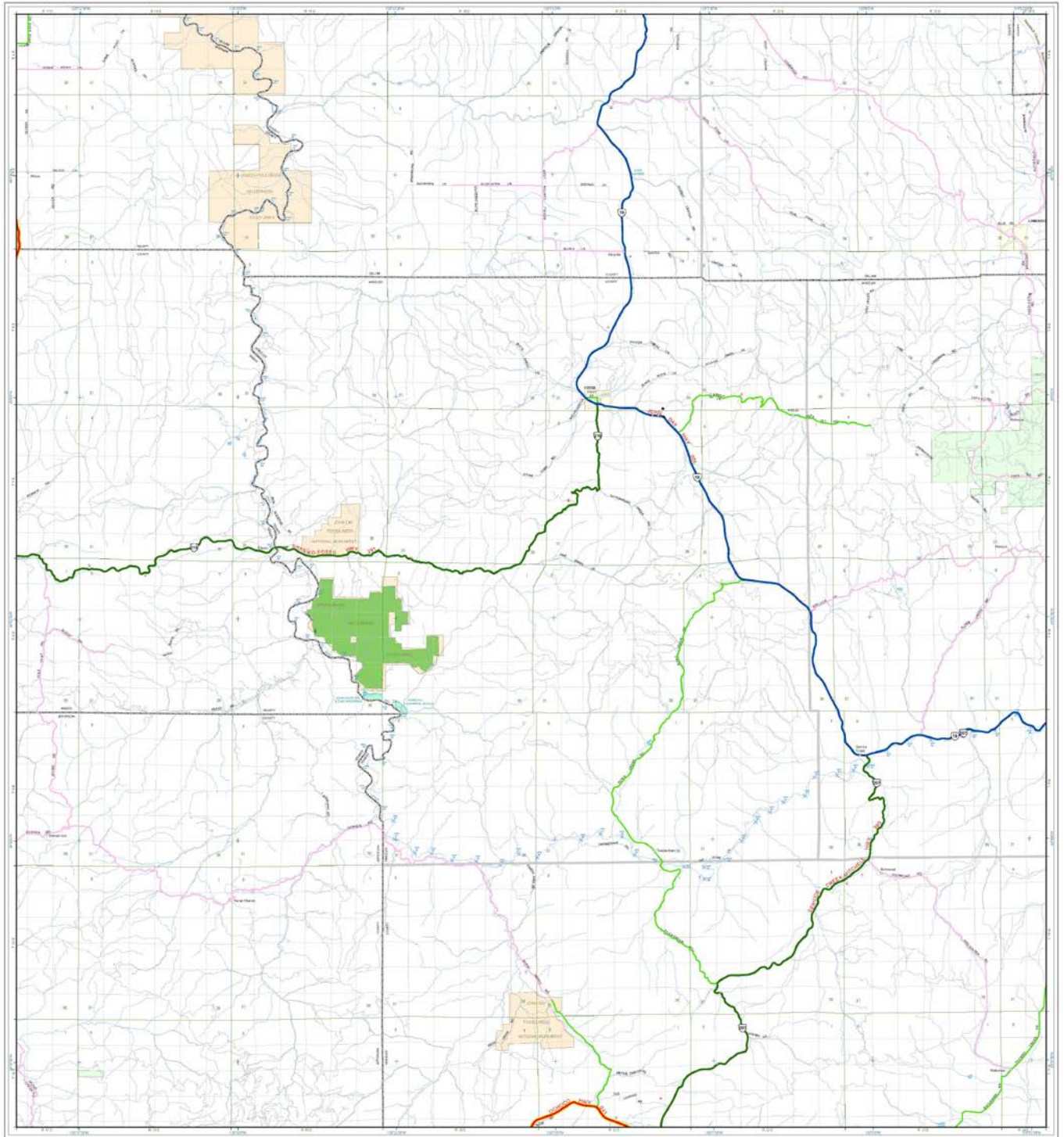
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<p>LEGEND</p> <p>FOR FURTHER FUNCTIONAL CLASSIFICATION, DETERMINATION, CONTACT ODOT REGION OFFICES.</p> <p>STATE JURISDICTION PAIR</p> <p>INTERSTATE</p> <p>MAJOR ARTERIAL</p> <p>MINOR ARTERIAL</p> <p>MAJOR COLLECTOR</p> <p>MINOR COLLECTOR</p> <p>LOCAL</p> <p>UNDEVELOPED ROAD OR TRAIL</p> <p>ONE ROUTE - US ROUTE - INTERSTATE ROUTE</p> <p>NATIONAL HIGHWAY SYSTEM ROUTE</p> <p>CITY LIMIT</p> <p>URBAN GROWTH BOUNDARY</p> <p>AIRPORT</p> <p>AMTRAK RAIL PASSENGER STATION</p> <p>COMMERCIAL - GENERAL AVIATION</p> <p>SAFETY REST AREA - HIGHWAY STATION</p> <p>PUBLIC BUILDING - HIGHWAY STATION & SITE</p> <p>RAILROAD - PRT - STATION</p> <p>RAILROAD - PRT - CROSSING</p>	<p>ARRANGEMENT OF SHEETS</p> <p>INTERCITY TRANSPORTATION SERVICES IDENTIFIED BELOW BY CITY:</p> <p>AIR RAIL BUS PORT</p> <p>CITY MAP AVAILABLE COUNTY MAP AVAILABLE</p>	<p>"This product is for informational purposes and may not be suitable for legal, engineering, or surveying purposes. Users of this product should review and consult the primary data sources to determine the usability of the information. Conclusions drawn from this information are the responsibility of the user."</p> <p>"Make local inquiry of road conditions in remote areas. Some roads are impassable following severe weather conditions."</p> <p>SCALE</p> <p>0 0.5 1 2 3 4 Miles</p> <p>0 1.25 2.5 5 7.5 Kilometers</p>	<p>COUNTY SHEET INDEX</p> <p>Wheeler</p>	<p>OREGON TRANSPORTATION MAP</p> <p>Showing Federal Functional Classification of Roads</p> <p>WHEELER COUNTY</p> <p>Published by Sheet 2 of 3</p> <p>POPULATION 1,460</p> <p>2018 Edition</p> <p>PREPARED DATA BY THE OREGON DEPARTMENT OF TRANSPORTATION IN COOPERATION WITH THE U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION</p> <p>ALL DATA ARE THE PROPERTY OF THE OREGON DEPARTMENT OF TRANSPORTATION. INFORMATION IS PROVIDED AS IS WITHOUT WARRANTY OF ANY KIND.</p> <p></p>
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<p>LEGEND</p> <p>FOR FURTHER FUNCTIONAL CLASSIFICATION, DETERMINATION, CONTACT ODOT REGION OFFICE</p> <p>STATE JURISDICTION PAIR</p> <p>INTERSTATE</p> <p>PRINCIPAL ARTERIAL</p> <p>MAJOR ARTERIAL</p> <p>MAJOR COLLECTOR</p> <p>MINOR COLLECTOR</p> <p>LOCAL</p> <p>UNDEVELOPED ROAD OR TRAIL</p> <p>ONE ROUTE - US ROUTE - INTERSTATE ROUTE</p> <p>NATIONAL HIGHWAY SYSTEM ROUTE</p> <p>CITY LIMIT</p> <p>URBAN GROWTH BOUNDARY</p> <p>AIRPORT PASSENGER STATION</p> <p>COMMERCIAL - GENERAL AVIATION</p> <p>SAFETY REST AREA - WISD STATION</p> <p>PUBLIC BUILDING - HOIST STRUCTURE SITE</p> <p>BRIDGE, PVI - QUARRY</p> <p>STATE HIGHWAY ADMINISTRATION</p>	<p>ARRANGEMENT OF SHEETS</p> <p>INTERCITY TRANSPORTATION SERVICES CENTERED ON OR BY CITY</p> <p>AIR RAIL BUS PORT</p> <p>CITY MAP AVAILABLE</p> <p>WISD MAP AVAILABLE</p>	<p>"This product is for informational purposes and may not be suitable for legal, engineering, or surveying purposes. Users of this product should review and consult the primary data sources to determine the usability of the information. Conclusions drawn from this information are the responsibility of the user."</p> <p>"Make local inquiry of road conditions in remote areas. Some roads are impassable following severe weather conditions."</p> <p>SCALE</p> <p>0 0.5 1 2 3 4 Miles</p> <p>0 1.25 2.5 5 7.5 Kilometers</p>	<p>COUNTY SHEET INDEX</p> <p>Wheeler</p>	<p>OREGON TRANSPORTATION MAP</p> <p>Showing Federal Functional Classification of Roads</p> <p>WHEELER COUNTY</p> <p>Published by Sheet 3 of 3</p> <p>POPULATION 1,460</p> <p>2018 Edition</p> <p>RELEASED DATA BY THE OREGON DEPARTMENT OF TRANSPORTATION IN COOPERATION WITH THE U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION</p> <p></p>
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<p>LEGEND</p> <p>FUNCTIONAL CLASSIFICATION</p> <p>FOR FURTHER FUNCTIONAL CLASSIFICATION INFORMATION, CONTACT ODOT REGIONAL OFFICE.</p> <p>STATE JURISDICTION: FEDERAL, STATE, COUNTY, CITY, TOWN, VILLAGE, PORTLAND METRO AREA</p> <p>ROAD TYPES: INTERSTATE, FEDERAL ARTERIAL, STATE ARTERIAL, MAJOR COLLECTOR, MINOR COLLECTOR, LOCAL, UNIDENTIFIED ROAD OR TRAIL</p> <p>ROUTE TYPES: ONE ROUTE - US ROUTE, INTERSTATE ROUTE, NATIONAL HIGHWAY SYSTEM ROUTE, CITY LIGHT</p> <p>URBAN GROWTH BOUNDARY</p> <p>AIRPORT: AIR PASSENGER STATION, AIRPORT - GENERAL AVIATION</p> <p>RAIL: PASSENGER RAIL, FREIGHT RAIL</p> <p>PORT: PUBLIC DOCKING, COAST GUARD VESSEL MOORING, MARINA, PVT. QUAY</p>	<p>ARRANGEMENT OF SHEETS</p> <p>INTERCITY TRANSPORTATION SERVICES CENTERED BELIEVED BY CITY:</p> <p>AIR, RAIL, BUS, POST</p> <p>CITY MAP AVAILABLE, TOWN MAP AVAILABLE</p>	<p>"This product is for informational purposes and may not be suitable for legal, engineering, or surveying purposes. Users of this product should review and consult the primary data sources to determine the usability of the information. Conclusions drawn from this information are the responsibility of the user."</p> <p>"Make local inquiry of road conditions in remote areas; some roads are impassable following severe weather conditions."</p> <p>SCALE</p> <p>0 0.5 1 2 3 4 Miles</p> <p>0 1.25 2.5 5 7.5 Kilometers</p>	<p>COUNTY SHEET INDEX</p> <p>Wheeler</p>	<p>OREGON TRANSPORTATION MAP</p> <p>Showing Federal Functional Classification of Roads</p> <p>WHEELER COUNTY</p> <p>Published by: GIS</p> <p>Sheet 1 of 3 POPULATION 1,480 2018 Edition</p> <p></p> <p>PREPARED DIGITALLY BY THE OREGON DEPARTMENT OF TRANSPORTATION IN COOPERATION WITH THE U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION</p>
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