

Wheeler County

MULTI- JURISDICTION NATURAL HAZARDS MITIGATION PLAN
Serving Wheeler County, The City of Fossil, The City of Mitchell
and the City of Spray



FEMA

Month Day 2024, through Month Day, 2029

Prepared for:

Wheeler County Emergency Management Department

Prepared by:

Fair Winds Consulting, LLC

The *2024 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.

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- FEMA Region X

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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 2019 NHMP has been retained for the 2024 NHMP update.

About Fair Winds Consulting, LLC

Fair Winds Consulting, LLC is based in Willamette County Oregon and has been in operation since 2022. They provide emergency management consulting services, specializing in all-hazards mitigation planning for rural communities.

**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
- Oregon State Fire Marshal
- Oregon Department of Forestry

Relevant Federal Law (Code of Federal Regulations)
<p>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.</p>

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 Summer of 2022 with the initial steering committee meeting in Fossil, 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.

Fair Winds Consulting, LLC attended the county’s signature annual public event, the Wheeler County Fair and Rodeo in August 2022. Staff talked informally with locals and distributed information about the project, and administered a public survey.

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 202 .

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 nine natural hazards that could potentially have an impact on the county. These hazards include: drought, earthquake, flood, landslide/debris flow, volcanic event, wildfire, windstorm, winter storm and severe weather. 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	10	7	70	High
Severe Weather	10	7	70	High
Volcanic Event	1	7	7	Low
Wildfire (WUI)	10	7	70	High
Windstorm	8	7	56	Medium
Winter Storm	10	7	70	High

Source: Wheeler County NHMP Steering Committee, Updated August 7, 202 .

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 Department 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, landslide/debris flow, severe weather, volcanic events, wildfire, and winter storm.

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

Threat Event/Hazard	Severity	Weight Factor	Subtotal	Probability
Drought	10	5	50	High
Earthquake	8	5	40	High
Flood – Riverine	10	5	50	High
Landslide/Debris Flow	10	5	50	High
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, August 7, 202 .

Table ES.3 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, drought and severe weather tied as the three highest ranked hazards in Wheeler County. Winter storm, flood riverine, and landslide make-up the next three highest ranked hazards, while windstorm, volcanic event and earthquake make-up the three 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	10	2	20	10	7	70	10	5	50	10	10	100	240	1
Winter Storm	9	2	18	10	7	70	10	5	50	10	10	100	238	2
Flood - Riverine	9	2	10	10	7	70	10	5	50	10	10	100	238	2
Landslide	7	2	14	10	7	70	10	5	50	10	10	100	2 4	3
Windstorms		2	6	8	7	56	5	5	25	8	10	80	167	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	1 7	6

Source: Wheeler County NHMP Steering Committee, August 7, 202 .

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 whole community

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 Wheeler County Emergency Manager will submit it to the Hazard Mitigation Coordinator at the Oregon Department of Emergency Management. The Oregon Department 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 local level and

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].

documentation is provided to FEMA, the plan is formally acknowledged by FEMA and the county gains (or maintains) eligibility for the Building Resilient Infrastructure and Communities BRIC 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 **month day, 2024**.

The City of Fossil adopted the plan on **month day, 2024**.

The City of Mitchell adopted the plan on **Month day, 2024**.

The City of Spray adopted the plan on **Month, Day, 2024**.

FEMA Region X approved the Wheeler County Multi-jurisdictional NHMP on **Month Day, 2024**. 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 **Month Day, 2029**.

Table ES.4: 2024 Action Items: Wheeler County, Cities of Fossil, Mitchell and Spray

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
Multi-Hazard													
MH #1	Maintain 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, ODEM, FEMA, Cities of Fossil, Mitchell, and Spray	Routine	X	X		X	X	X	X	This was completed and is now maintained routinely.	Complete /Modified
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, ODEM, FEMA, Cities of Fossil, Mitchell, and Spray	Short Term/High Priority	X	X		X	X	X	X	In progress. Wheeler County is continuously implementing priority projects.	Retained
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, Wasco Electric	Wheeler 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.	Retained
MH#4	Reduce the effects of natural hazards on existing utility lines	Columbia Basin Cooperative, Columbia Power Cooperative, Wasco Electric	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.	Retained
MH#5	Maintain the comprehensive impact database on severe natural hazard events in Wheeler County.	Wheeler County	County Planning Department, Cities of Fossil, Mitchell and Spray, National Weather Service, NOAA, ODOT, Oregon Climate Service, Overhead Utilities.	Routine/ Medium priority	X	X	X	X	X	X	X	A layer for historic fires was added to Wheeler County's GIS application. Working on a flood overlay.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
MH #6	Seek funding for generators for critical facilities.	Wheeler County Emergency management	City of Fossil, City of Spray, City of Mitchell, ODEM, ODHS, FEMA	Short Term/ Medium Priority	X	X		X	X	X	X	In progress.	Retained
MH #7	Seek funding for generators for critical facilities in the County including Jeannie Birch Building, Emergency Operations Center in Spray, County Road Department	Wheeler County Emergency management	City of Fossil, City of Spray, County Road Department, ODEM, ODHS, FEMA	Short Term/ Medium Priority	X	X		X	X	X	X	New Action for the 2024 NHMP. Modified from #6.	
MH #8	Seek funding for generators for critical facilities in Fossil including City Hall, Fire Department, Water Pumping Station	Wheeler County Emergency management	City of Fossil, Fossil Fire Department, Fossil Public Works	Short Term/ Medium Priority	X	X		X	X			New Action for the 2024 NHMP. Modified from #6.	
MH #9	Seek funding for generators for critical facilities in Mitchell including City Hall/EMS Building, Water Reservoir, School District, Community Hall (Cascadia Staging Area)	Wheeler County Emergency management	City of Mitchell, Mitchell Fire/Volunteer Ambulance, Mitchell School District, Mitchell Public Works	Short Term/ Medium Priority	X	X		X		X		New Action for the 2024 NHMP. Modified from #6.	
MH #10	Seek funding for generators for critical facilities in Spray including EMS Complex, City Hall, Water Pumping Station, Sewer, Asher Community Health	Wheeler County Emergency management	City of Spray, Spray Volunteer Fire, Spray Volunteer Ambulance, Spray Public Works, Asher Health Clinic	Short Term/ Medium Priority	X	X		X			X	New Action for the 2024 NHMP. Modified from #6.	
MH #11	Work with critical businesses, such as grocery stores and gas stations on backup generators and internet in Fossil, Mitchell, and Spray.	Wheeler County Emergency Management	City of Fossil, City of Mitchell, City of Spray		X	X		X	X	X	X	New Action for the 2024 NHMP.	

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
MH#12	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.	Retained
MH#13	Secure funding to improve infrastructure that will increase the capacity and availability of water to protect the City of Fossil from the natural Hazards (i.e., drought, wildfire, etc.) that occur annually.	City of Fossil	County Emergency Management, DEQ, Water Master Office District 21, Engineers, Contractors, ODEM, Army Corps of Engineers, FEMA	In Progress/ High Priority	X	X		X	X			Funding has been secured. They are seeking contractors to complete the work.	Retained
MH#14	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.)	Routine/ Medium Priority	X	X	X	X	X	X	X	Part of regular Emergency Management program outreach.	Retained
MH#15	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	X	In progress. Everbridge is undergoing updates and will require increased outreach.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
MH#16	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.	Wheeler County Public Health	Wheeler County Emergency management, Cities of Fossil, Mitchell, and Spray.	Short Term/ Low Priority	X		X	X	X	X	X	Public Health has distributed air condition units and air scrubbers.	Retained
MH#17	Invest in and promote community gardens and local food production.	Wheeler County Extension Service	Cities of Fossil, Mitchell, and Spray	Routine/ Low Priority			X	X	X	X	X	In progress. Gardening promoted throughout the county.	Retained
MH#18	Invest in and promote solar and other alternative energy in public, residential, and commercial properties.	Wheeler County	County Planning, Emergency Management, Cities of Fossil, Mitchell and Spray, Oregon Department of Energy, Energy Trust of Oregon	Long Term/ Low Priority	X		X	X	X	X	X	No Action	Retained
MH#19	Develop hazard-specific evacuation plans that consider impacts on bridges, other key transportation infrastructure and lifelines.	Wheeler County Emergency Management	Wheeler County Road Department, ODOT, OEM,	Medium Term/ Medium Term	X	X	X	X	X	X	X	In progress. The planning group has held multiple meetings.	Retained
MH #20	Develop a welcome packet for new residents/potential new residents on fire risk, winter storms and other hazards, EMS and volunteer fire capabilities and available services and critical facilities. Include volunteer applications for fire, ambulance, and other community services.	Wheeler County Emergency Management	Cities of Fossil, Mitchell and Spray, Planning Department	Short Term/High Priority	X	X	X	X	X	X	X	New action for the 2024 update.	

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
	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	Delete.	X		X	X	X	X	X	Delete. This action was not completed. All agencies agree time and effort can be spent on more efficient methods of hazard preparation.	Delete
	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.	Delete.	X			X	X	X	X	Delete. This action was not completed. All agencies agree time and effort can be spent on more efficient methods of hazard preparation.	Delete
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 Department of Forestry, Watermaster, Oregon Dept of Fish and Wildfire	Routine/ High Priority		X	X	X	X	X	X	Part of regular Emergency Management program outreach.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
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	No Action	Retained
DR#3	Provide water conservation education to kids in schools.	Wheeler county Soil and Water Conservation District	County Schools (Fossil Charter, Mitchell Schools, and Spray Schools) Wheeler Soil and Water Conservation District	Routine/ Medium Priority	X		X	X	X	X	X	The SWCD conducts outreach in schools, including field trips to see water saving tactics.	Modified.
DR#4	Develop a drought emergency plan.	Wheeler County Emergency management	County Planning Department	Long Term/Low Priority	X	X	X	X	X	X	X	No Action.	Retained
DR#5	Consider requiring water conservation during drought conditions.	Wheeler County	County Emergency Management, Cities of Fossil, Mitchell, and Spray	Routine/ High Priority	X		X	X	X	X	X	Cities regulate water and irrigation is shut down by water resources during drought.	Retained
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	Routine/ Moderate Priority		X	X	X	X	X	X	Part of regular Emergency Management program outreach.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
EQ#2	Seek funding through the State office of Emergency Management and/or the Federal Emergency Management Agency to seismically retrofit critical facilities with a high collapse potential rate by the Department of Geology and Mineral Industries.	Wheeler County Emergency management	County Court, School Districts, Oregon Department of Emergency Management, Federal Emergency Management Agency, Oregon Department of Transportation	Long Term/ Moderate Priority	X			X	X	X	X	No action.	Retained
EQ#3	Seek Funding to seismically retrofit critical infrastructure not rated by the Department of Geology and Mineral Industries including the County Emergency Operations Center in Spray.	Wheeler County Emergency management	County Court, City of Spray, ODEM, ODT	Long Term/ Moderate Priority	X			X	X	X	X	New Action for 2024 Update	
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	In progress. Part of regular emergency management outreach.	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 and FEMA	Short Term/ High Priority	X	X		X	X	X	X	The City of Fossil has adopted the ordinance. Spray and Mitchell are in progress.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
FL#3	Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency 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		In progress. Mitchell is working on a project on Nelson Street with FEMA.	Retained
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, Ferfusion Surveying and Engineering, OEM, ODOT, FEMA, US Army Corps of Engineers	Short Term/High Priority	X	X					X	In progress.	Retained
FL#5	Coordinate with the State Floodplain Coordinator and the DLCD to update the FEMA Flood Insurance Rate Maps for Wheeler County and the incorporated cities participating in the National Flood insurance Program and Risk Map.	Wheeler County Planning Department	County Emergency Management, Cities of Fossil, Mitchell and Spray, Oregon Department of Land Conservation and Development, OEM, FEMA	Routine/ High Priority	X	X		X	X	X	X	Wheeler County, The City of Fossil, and the City of Mitchell participate in the NFIP. FIRMS for Wheeler County and incorporated cities are current as of 1989.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
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 Department, 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	Part of regular Emergency management outreach.	Retained
LS#2	Develop education and public outreach to engage adjacent landowners to improve slope management practices.	Wheeler County Soil and Water Conservation District	County Court, County Public Works, County Road Department, 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	In progress. Changed responsibility to the SWCD who regularly provides outreach to landowners on this topic.	Modified
LS#3	Explore low-cost mitigation options, such as maintenance of slide fences, ditches, and other drainage facilities.	Wheeler County Emergency Management, Soil and Water Conservation District	County Road Department, Cities of Fossil, Mitchell, and Spray, ODOT	Medium Term/Moderate Priority	X	X		X	X	X	X	No Action.	Retained
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	Part of regular Emergency management Outreach.	Modified

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
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	Short Term/ Moderate priority	X			X				Wheeler County is looking to update their EOP in 2024.	Retained
Wildfire													
WF#1	Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to reduce wildland fire risk in Wheeler County.	Wheeler County, County Wildfire Protection Plan Local Coordinating Group	County Court, County Road Department, Wheeler County Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens, Oregon State Fire Marshal	Routine / High Priority		X	X	X	X	X	X	While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy. Retained.	Retained
WF#2	Conduct risk assessment activities with the Wheeler County Community Wildfire Protection Plan local Coordinating Group to assess areas in the county at risk to wildland fires.	County Wildfire Protection Plan (CWPP) local Coordinating Group	County Court, County Road Department, Wheeler County Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens Oregon State Fire Marshal	Routine/ High Priority		X	X	X	X	X	X	While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy. Retained.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
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.	CWPP Local Coordinating Group	County Court, County Road Department, Wheeler County Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Oregon State Fire Marshal, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens	Routine/ High Priority		X	X	X	X	X	X	While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy. Retained.	Retained
WF#4	Work with the CWPP Local Coordinating Group to implement fuel reduction strategies to reduce the risk to wildland fires, including conducting a full county-wide wildfire hazard risk assessment.	CWPP Local Coordinating Group	County Court, County Road Department, Wheeler County Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Oregon State Fire Marshal, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens	Routine/ Moderate		X	X	X	X	X	X	In progress. While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy. Retained.	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, Oregon State Fire Marshal, American Red Cross, Human Society, Utilities, BLM, USFS, OSFM, ODF&W, FEMA	Routine/ High priority		X	X	X	X	X	X	Part of regular emergency management outreach	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
WF#6	Provide Wheeler County Road Department with firefighting training and equipment	Wheeler County Road Department	Wheeler County, CWPP Local Coordinating Group, ODF, Fire Districts, OSFM, BLM, USFS	Routine/ High Priority		X	X	X	X	X	X	A tank and pump were purchased for the Road Department. They receive annual required training.	Retained
WF#7	Assist Rural Fire Protection Districts and City Fire Departments in maintaining and upgrading their firefighting equipment, facilities and trainings as needed.	Wheeler County Emergency Management	Rural Fire Districts, City Fire Departments, CWPP local Coordinating Group, ODF, BLM, USFS, Oregon State Fire Marshal	Medium Term/ Moderate Priority	X	X		X	X	X	X	In progress	Retained
WF#8	Distribute fire prevention literature and material to homeowners and visitors.	Wheeler County Emergency management	Rural Fire Districts, City Fire Departments, CWPP local Coordinating Group, ODF, BLM, USFS, Oregon State Fire Marshal	Routine/ High Priority	X		X	X	X	X	X	In progress	Retained
WF#9	Conduct Fire prevention programs in schools.	Wheeler County Emergency Management and Oregon State Fire Marshal	County Schools, Gilliam County, Mic Columbia Fire Prevention Co-Op, Oregon State Fire Marshal	Routine/ High Priority	X	X	X	X	X	X	X	Fossil Fire consistently goes to the schools, OSFM is assisting with outreach to other schools.	Modify
WF#10	Provide information about what type of fire resistive plants to use for landscaping.	Wheeler County Emergency Management	OSU Extension Service, Oregon State Fire Marshal	Short Term/ Medium Priority			X	X	X	X	X	In progress. OSFM regularly distributes materials at events, including Fair.	Modify

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
WF#11	Look into large scale fire mitigation methods, including prescribed burns, vegetative fuel breaks, habitat/native vegetation restoration and juniper mitigation near critical facilities, towns, and highly trafficked tourist areas, including Cougar Mountain and Twickenham.	Wheeler County Emergency management, Soil and Water Conservation District	Cities of Fossil, Mitchell, and Spray, ODF, BLM, Fire Departments, NRCS, Oregon State Fire Marshal	Short Term/ High Priority	X	X	X	X	X	X	X	New Action for the 2024 NHMP.	
WF#12	Promote wildfire mitigation funding opportunities available through BLM, ODF and other grants.	Wheeler County Emergency Management	ODF, BLM, Fossil, Spray and Mitchell Fire Departments	Short Term/ Medium Priority	X	X	X	X	X	X	X	New Action for the 2024 NHMP.	
	Work with ODF, USFS, BLM and local fire district to develop a “lessons learned” assessment of the 2018 wildfire season.	CWPP Local Coordinating Group	County Court, Road Department, Emergency Management, Fire Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Oregon State Fire Marshal, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens	Routine	X	X	X	X				This action did not take place and the Steering Committee agree time and resources were better spent on other actions.	Delete
	Develop seasonal paid count firefighter positions which would provide wildfire Initial Attack in the summer months.	Wheeler County Emergency Management	Wheeler County Commission, The Cities of Fossil, Mitchell, and Spray, CWPP Local Steering Committee, OSFM	Medium Term/ Moderate Priority	X	X		X				No Action. The Steering Committee agree time and resources are better spent on other actions.	Delete

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
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	Routine		X	X	X	X	X	X	Part of regular emergency management outreach.	Retained
Winter Storm													
WTS#1	Make available to county residents and the public information regarding winter storms.	Wheeler County Emergency Management	County Court, County Road Department, ODOT, American Red Cross, FEMA, NWS, Cities of Fossil, Mitchell and Spray and citizens	Routine		X	X	X	X	X	X	Part of regular emergency management outreach.	Retained
	Educate farmers about ways to protect livestock from the effects of winter storms.	Wheeler County	OSU Extension, Oregon Department of Agriculture	Ongoing	X		X	X	X	X	X	Delete	Delete
Severe Weather													
SW#1	Identify county resident and families with home weatherization needs (LMI) and seek funding assistance for repairs.	Wheeler County Public Health	Wheeler County Emergency management, Cities of Fossil, Mitchell, and Spray	Short Term/ Moderate priority	X	X	X	X	X	X	X	Shifted to severe weather since this action helps combat extreme heat and extreme cold.	Modify
SW#2	Work with CAPECO to assist low-income residents with energy needs during severe weather events.	Wheeler County Public Health	CAPECO, Wheeler County Emergency management, Cities of Fossil, Mitchell, and Spray		X	X	X	X	X	X	X	New Action for 2024 NHMP.	

Local Mitigation Plan Review Tool

Cover Page

The Local Mitigation Plan Review Tool (PRT) 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 the local governments, including special districts.

1. The Multi-Jurisdictional Summary Sheet is a worksheet that is used to document how each jurisdiction met the requirements of the plan elements (Planning Process; Risk Assessment; Mitigation Strategy; Plan Maintenance; Plan Update; and Plan Adoption).
2. The Plan Review Checklist summarizes FEMA’s evaluation of whether the plan has addressed all requirements.

For greater clarification of the elements in the Plan Review Checklist, please see Section 4 of this guide. Definitions of the terms and phrases used in the PRT can be found in Appendix E of this guide.

Plan Information	
Jurisdiction(s)	Wheeler County, City of Fossil, City of Mitchell, City of Spray
Title of Plan	Wheeler County Multi-Jurisdictional Natural Hazards Mitigation Plan
New Plan or Update	Update
Single- or Multi-Jurisdiction	Multi-Jurisdictional
Date of Plan	June 2024
Local Point of Contact	
Title	Mitch Elliott
Agency	Wheeler County Emergency Management
Address	701 Adams St, Fossil, OR 97830
Phone Number	541-763-4101
Email	melliott@co.wheeler.or.us

Additional Point of Contact	
Title	Mike Smith
Agency	Wheeler County Sheriff's Office
Address	701 Adams St, Fossil, OR 97830
Phone Number	541-763-4101
Email	msmith@co.wheeler.or.us

Review Information	
State Review	
State Reviewer(s) and Title	Jason Gately, Mitigation Planner
State Review Date	June 27, 2024
FEMA Review	
FEMA Reviewer(s) and Title	
Date Received in FEMA Region	
Plan Not Approved	
Plan Approvable Pending Adoption	
Plan Approved	

Multi-Jurisdictional Summary Sheet

#	Jurisdiction Name	Requirements Met (Y/N)						
		A. Planning Process	B. Risk Assessment	C. Mitigation Strategy	D. Plan Maintenance	E. Plan Update	F. Plan Adoption	G. State Requirements
1	Wheeler County							
2	Fossil							
3	Mitchell							
4	Spray							
5								
6								
7								
8								
9								
10								

Plan Review Checklist

The Plan Review Checklist is completed by FEMA. States and local governments are encouraged, but not required, to use the PRT as a checklist to ensure all requirements have been met prior to submitting the plan for review and approval. 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.” FEMA completes the “required revisions” summary at the bottom of each element to clearly explain the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is “not met.” Sub-elements in each summary should be referenced using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each element and sub-element are described in detail in Section 4: Local Plan Requirements of this guide.

Plan updates must include information from the current planning process.

If some elements of the plan do not require an update, due to minimal or no changes between updates, the plan must document the reasons for that.

Multi-jurisdictional elements must cover information unique to all participating jurisdictions.

Element A: Planning Process

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))		
A1-a. Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan’s development, as well as who was involved?	2, ii, 1- , 1-4, 1-5	
A1-b. Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?	i, ii, iii, 1-1, Appendix C	
A2. Does the plan document 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? (Requirement 44 CFR § 201.6(b)(2))		
A2-a. Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?	ii, 1-5, C-6, C-1 , C-18, C-19, C-21, C-2 , C-24, 5-2	

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))		
A3-a. Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?	C-6, C-7, C-8, C-9, C-10, F-1, Appendix F, 1-5	
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))		
A4-a. Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?	2-44, 2-4 , 2-44, 2-45, - , FS-7, FS-8, MI-5, MI-6, SP-5, SP-6	
Element A Required Revisions		
Required Revision:		

Element B: Risk Assessment

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR § 201.6(c)(2)(i))		
B1-a. Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?	-2, -6, -11, -15, -20, -2 , -26, -28, - 4, - 5	
B1-b. Does the plan include information on the location of each identified hazard?	-6, -12, -1 , -14, -15, -20, -24, -27, -29, -24, - 6	
B1-c. Does the plan describe the extent for each identified hazard?	-6, -12, -1 , -14, -15, -20, -24, -27, -29, -24, - 6	
B1-d. Does the plan include the history of previous hazard events for each identified hazard?	-8, -1 , -15, -16, -17, -21, -24, -27, - 1, - 4, - 6, - 7	

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1-e. Does the plan include the probability of future events for each identified hazard? Does the plan describe the effects of future conditions, including climate change (e.g., long-term weather patterns, average temperature and sea levels), on the type, location and range of anticipated intensities of identified hazards?	- , -4, -5, -10, -1 , -19, -22, -25, -26, - 2, - , - 4, - 8, Appendix	
B1-f. For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?	FS-10, FS-11, FS-12, MI-8, MI-9, MI-10, SP-8, SP-9, SP-10	
B2. Does the plan include a summary of the jurisdiction’s vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii))		
B2-a. Does the plan provide an overall summary of each jurisdiction’s vulnerability to the identified hazards?	- 9, -40, -48, -54, FS-1 , MI-11, SP-11	
B2-b. For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?	FS-1 , MI-11, SP-11, -1 , -19, -22, -25, -26, - 2, - , - 4, - 8	
B2-c. Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?	-48, -49, -50, -51, -52, -5	
Element B Required Revisions		
Required Revision:		

Element C: Mitigation Strategy

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C1. Does the plan document each participant’s existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))		
C1-a. Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use and development ordinances or regulations?	2-29, 2-44, 2-4 , 2-44, 2-45, 2-46, - , FS-7, FS-8, MI-5, MI-6, SP-5, SP-6	
C1-b. Does the plan describe each participant’s ability to expand and improve the identified capabilities to achieve mitigation?	2-44, 2-4 , 2-44, 2-45, - , FS-7, FS-8, MI-4, MI-5, MI-6, SP-4, SP-5, SP-6	
C2. Does the plan address each jurisdiction’s participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 44 CFR § 201.6(c)(3)(ii))		
C2-a. Does the plan contain a narrative description or a table/list of their participation activities?	-48, -49, -50, -51, -52, -5	
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i))		
C3-a. Does the plan include goals to reduce the risk from the hazards identified in the plan?	vi, 4-1	
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 44 CFR § 201.6(c)(3)(ii))		
C4-a. Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?	4-7, 4-8, 4-9, 4-10, 4-11, 4-12, 4-1 , 4-14, 4-15, 4-16, 4-17, 4-18, 4-19, 4-20, 4-21, 4-22, 4-2, Appendix A	
C4-b. Does the plan include one or more action(s) per jurisdiction for each of the hazards as identified within the plan’s risk assessment?	4-7, 4-8, 4-9, 4-10, 4-11, 4-12, 4-1 , 4-14, 4-15, 4-16, 4-17, 4-18, 4-19, 4-20, 4-21, 4-22, 4-2, Appendix A	
C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction? (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))		
C5-a. Does the plan describe the criteria used for prioritizing actions?	5- , 5-4, 5-5, 5-6	

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C5-b. Does the plan provide the position, office, department or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?	4-7, 4-8, 4-9, 4-10, 4-11, 4-12, 4-1 , 4-14, 4-15, 4-16, 4-17, 4-18, 4-19, 4-20, 4-21, 4-22, 4-2, Appendix A, Appendix E	
Element C Required Revisions		
Required Revision:		

Element D: Plan Maintenance

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))		
D1-a. Does the plan describe how communities will continue to seek future public participation after the plan has been approved?	5-7, 5-8, MI-7, SP-7, FS-9	
D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))		
D2-a. Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?	5-6, 5-7	
D2-b. Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process must identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible.	5-7, FS-9, MI-7, SP-7	
D2-c. Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?	5-8, FS-9, MI-7, SP-7	

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D3. Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))		
D3-a. Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?	4-8, FS-5, MI-4, SP-4	
D3-b. Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?	4-8, FS-5, MI-4, SP-4	
D3-c. For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?	4-8, FS-5, MI-4, SP-4	
Element D Required Revisions		
Required Revision:		

Element E: Plan Update

Element E Requirements	Location in Plan (section and/or page number)	Met / Not Met
E1. Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.6(d)(3))		
E1-a. Does the plan describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community's vulnerability since the previous plan was approved?	2- 5, -1 , -16, -19, -22, -25, -26, - 2, - , -24, - 8	
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))		
E2-a. Does the plan describe how it was revised due to changes in community priorities?	-54, C-	
E2-b. Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?	4-2, 4- , 4-4, 4-5, 4-6, 4-7	

Element E Requirements	Location in Plan (section and/or page number)	Met / Not Met
E2-c. Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?	FS-5, MI-4, SP-4	
Element E Required Revisions		
Required Revision:		

Element F: Plan Adoption

Element F Requirements	Location in Plan (section and/or page number)	Met / Not Met
F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F1-a. Does the participant include documentation of adoption?		
F2. For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F2-a. Did each participant adopt the plan and provide documentation of that adoption?		
Element F Required Revisions		
Required Revision:		

Element G: High Hazard Potential Dams (Optional)

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD1. Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?		
HHPD1-a. Does the plan describe how the local government worked with local dam owners and/or the state dam safety agency?		
HHPD1-b. Does the plan incorporate information shared by the state and/or local dam owners?		
HHPD2. Did the plan address HHPDs in the risk assessment?		
HHPD2-a. Does the plan describe the risks and vulnerabilities to and from HHPDs?		
HHPD2-b. Does the plan document the limitations and describe how to address deficiencies?		
HHPD3. Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs?		
HHPD3-a. Does the plan address how to reduce vulnerabilities to and from HHPDs as part of its own goals or with other long-term strategies?		
HHPD3-b. Does the plan link proposed actions to reducing long-term vulnerabilities that are consistent with its goals?		
HHPD4-a. Did the plan include actions that address HHPDs and prioritize mitigation actions to reduce vulnerabilities from HHPDs?		
HHPD4-a. Does the plan describe specific actions to address HHPDs?		
HHPD4-b. Does the plan describe the criteria used to prioritize actions related to HHPDs?		
HHPD4-c. Does the plan identify the position, office, department or agency responsible for implementing and administering the action to mitigate hazards to or from HHPDs?		
HHPD Required Revisions		
Required Revision:		

Element H: Additional State Requirements (Optional)

Element H Requirements	Location in Plan (section and/or page number)	Met / Not Met
This space is for the State to include additional requirements		

Placeholder for City of Spray Adoption of Plan

Section I: Basic Mitigation Plan

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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 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 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 and requires them to have approved mitigation plans in place to qualify to receive post-disaster HMGP funds. In 2018, the Disaster Recovery Reform Act (DRRA) established the Building Resilient Infrastructure and Communities (BRIC) program to support state and local jurisdictions as they undertake hazard mitigation projects. 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 The Oregon Department of Emergency Management (OEM), Oregon Building Codes Division (BCD), Oregon Department of Forestry (ODF), Oregon Department of Geology and Mineral Industries (DOGAMI), the Department of Land Conservation and Development (DLCD) and Oregon State Fire Marshal OSFM .

Plan Development

The first Wheeler County Natural Hazards Mitigation Plan was developed and approved in 2008. The 2024 NHMP update process marks the third update and fourth version of the county’s NHMP. This updated NHMP will consolidate and replace prior version of the plan.

2024 Plan Update Process

The plan was developed following a schedule provided by Fair Winds Consulting 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: Fair Winds Consulting, 202 .

The 2024 update of the Wheeler County Natural Hazards Mitigation Plan was funded through a 202 Planning Grant from FEMA. The Oregon Department of Emergency Management (ODEM) utilized a Hazard Mitigation Program rant HMP to update the natural hazards mitigation plans for Wheeler County HMP -PF-5 94-09-P-OR .

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 August 2022 and February 2024, the steering committee convened for two update meetings. Also during the update process, Fair Winds Consulting and Wheeler County conducted public outreach at the county's 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.

WHEELER COUNTY STEERING COMMITTEE Kickoff and MEETING #1, August 07, 2023

On August 7th, 2023, 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 and update critical and vulnerable infrastructure, facilities and lifelines (6) identify vulnerable and underserved communities (7) to complete a natural hazard vulnerability analysis for Wheeler 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, wildfire and severe weather. They noted that minor landslides also occur almost annually.

For the discussion, Fair Winds 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. Fair Winds 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 2018 NHMP results, however the scores for all natural hazards tended to be higher. 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, wildfire and severe weather were identified as high level hazards with risk scores of 240. These were followed by floods (238), winter storms (238) and landslides (204) respectively.

WHEELER COUNTY STEERING COMMITTEE MEETING #2, FEBRUARY 12th, 2024

On February 12, 2024 the Wheeler County Natural Hazard Mitigation Plan (NHMP) Update Steering Committee met for their second work session. The focus of this meeting was on reviewing the status of existing mitigation actions as well as updating them and crafting new ones. Additionally, they reviewed Sherman and Willam County Mitigation Actions for ideas and coordination planning. The Steering committee also reviewed vulnerable communities and the critical infrastructure list that was updated at the previous meeting.

PUBLIC OUTREACH

Wheeler County is a remote, rural county in Eastern Oregon. It is the smallest county in Oregon by population with approximately 1,451 people. Residents tend to be dispersed across the county with the main population areas being Fossil pop.447 , Spray pop.1 9 and Mitchell pop. 1 8 . 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 202 . 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.

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. A survey based on FEMA s template from the Local Mitigation Planning Handbook was administered to the county, through direct email, posters around town and paper copies at the Wheeler County Fair. The Survey consisted of several questions regarding natural hazard information community vulnerabilities and hazard mitigation strategies mitigation and preparedness activities in the household and general household information. 8 unique surveys were completed and received. The results of the survey are detailed in Appendix F.

PREPARATION OF FINAL DRAFT PLAN (FERUARY- MAY 2024)

Fair Winds Consulting included all input from public review, public opinion surveys and commiunications with the NHMP Steering Committee into the final draft of the plan in May 2024. The Final draft was submitted to Wheeler County Emergency Management on une 1, 2024.

PUBLIC REVIEW OF FINAL DRAFT PLAN (MAY 2024)

A final draft of the plan was made available to the general public and the Steering Committee for review throughout the entire month of May and une, 2024.

REVIEW OF FINAL DRAFT PLAN BY THE OREGON DEPARTMENT OF EMERGENCY MANAGEMENT (ODEM) AND FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA). (JUNE 2024- MONTH 2024)

PLAN ADOPTION BY LOCAL JURISDICTIONS (Month 2024)

Local jurisdictions adopted the plan on the following dates: Wheeler County - Month, Day 2024; City of Fossil - Month, Day 2024; City of Mitchell - Month Day, 2024; City of Spray - Month Day, 2024.

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;
- 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: 2023 WHEELER COUNTY PUBLIC OPINION SURVEY

An Public Opinion survey was done from June 2023 through February 2024. A flyer promoting the survey and a link to it were placed on the Wheeler County website, emailed directly to residents and administered on paper at the Wheeler County Fair. Eight (08) unique surveys were completed and received. The results are contained in this appendix.

APPENDIX G: FUTURE CLIMATE PROJECTIONS REPORT FOR WHEELER COUNTY

This appendix presents future climate projections for Wheeler County relevant to specific natural hazards for the 2020s (2010-2019 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.

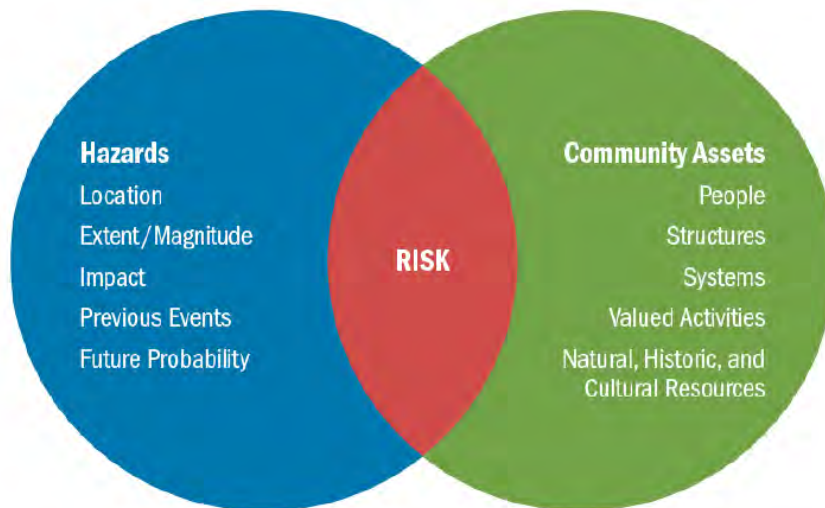
Chapter 2: Community Profile

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, 2023.

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

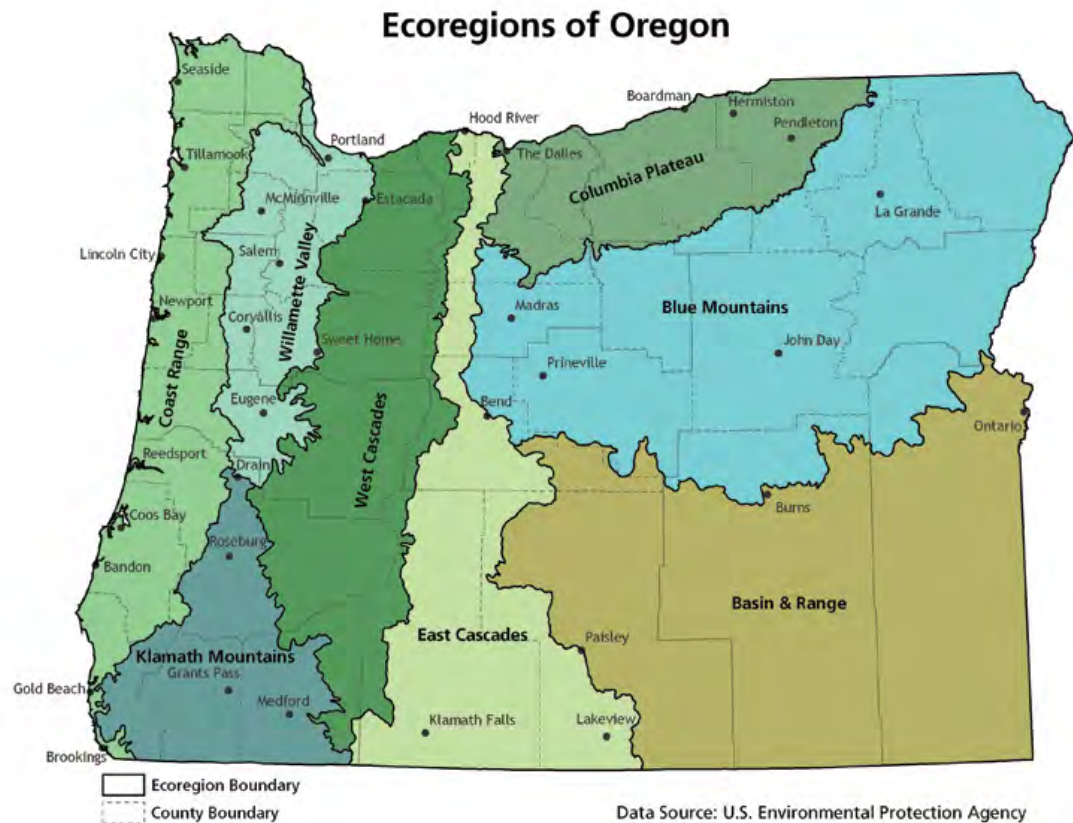
Wheeler County is located in central Oregon and has a total area of 1,715 square miles (about four times the area of Oregon's most populated county Multnomah - pop. 815,428), including one square mile of water. The county is rugged and uneven, and the terrain varies widely from deep river canyons edged 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. <https://www.wheelercountyoregon.com/>

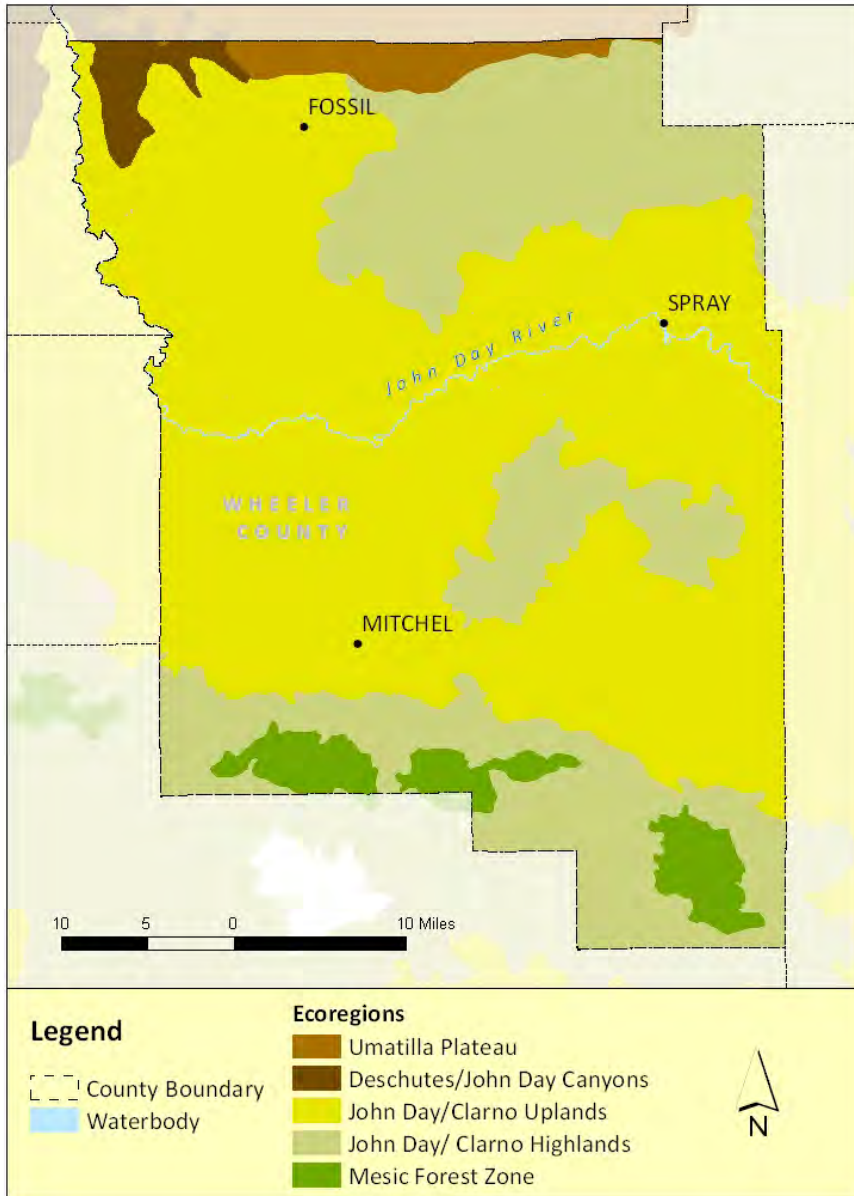
Figure 2.2.



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. <https://www.wheelercountyoregon.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/phyci/taylor/eisi/orr_orr2.PDF.

⁵ Environmental Protection Agency. "Ecoregions of Oregon." <https://www.epa.gov/eco-research/ecoregion-download-files-state-region-10#pane-5>

⁶ Environmental Protection Agency. "Ecoregions of Oregon." <https://www.epa.gov/eco-research/ecoregion-download-files-state-region-10#pane-5>.

⁷ Environmental Protection Agency. "Ecoregions of Oregon." <https://www.epa.gov/eco-research/ecoregion-download-files-state-region-10#pane-5>.

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 Wallows 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." <https://www.epa.gov/eco-research/ecoregion-download-files-state-region-10#pane-5>

⁹ Environmental Protection Agency. "Ecoregions of Oregon." <https://www.epa.gov/eco-research/ecoregion-download-files-state-region-10#pane-5>

¹⁰ Environmental Protection Agency. "Ecoregions of Oregon." <https://www.epa.gov/eco-research/ecoregion-download-files-state-region-10#pane-5>

¹¹ Environmental Protection Agency. "Ecoregions of Oregon." <https://www.epa.gov/eco-research/ecoregion-download-files-state-region-10#pane-5>

¹² U.S. Department of Interior. Bureau of Land Management. "John Day River". <https://www.blm.gov/programs/recreation/permits-and-passes/lotteries-and-permit-systems/oregon-washington/john-day-river>

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. December and January 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 (3.9 inches total). July through September tend to be the driest months. Total precipitation in Fossil during July and August averages 0.96 inches with only a few isolated and potentially hazardous thunderstorms. Furthermore, Fossil averages a total of 14.2 inches of snow annually, most of which occurs in January (4.9 inches).

¹³ U.S. Department of Interior. Bureau of Land Management. “John Day River”.
<https://www.blm.gov/programs/recreation/permits-and-passes/lotteries-and-permit-systems/oregon-washington/john-day-river>

¹⁴ U.S. Department of Interior. Bureau of Land Management. “John Day River”.
<https://www.blm.gov/programs/recreation/permits-and-passes/lotteries-and-permit-systems/oregon-washington/john-day-river>

Table 2.1: Monthly Averages and Extremes, Fossil, Oregon, 1923-2023

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	41.7	70	24.4	-26	1.57	4.9
February	46.5	76	26.7	-22	1.14	2.4
March	51.8	78	28.9	2	1.34	1.6
April	58.9	87	32.	12	1.21	0.4
May	67	100	37.1	15	1.54	0.1
June	74.5	108	42.8	25	1.29	0
July	84.8	111	46.1	25	0.41	0
August	84.1	106	45.9	28	0.55	0
September	75.8	100	40.6	18	0.71	0
October	64.9	98	34.4	3	1.1	0.2
November	49.5	75	29.8	-16	1.67	1.4
December	42.5	70	26	-24	1.72	3.1
Annual	59.8	111	34.4	-26	14.02	14.2

Source: Western Regional Climate Center, NCDC Monthly Tabular Data, 1923-202

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. December and January 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 192 , Mitchell averages 1 .81 inches of precipitation annually, most of which occurs from March through une (6 inches total). July through September tend to be the driest months (1.5 inches total). Furthermore, Mitchell averages a total of 22 inches on snow annually, the most of which occurs in January (5.4 inches).

Table 2.2: Monthly Averages and Extremes, Mitchell, Oregon, 1923-2023

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	43.1	70	26.4	-7	1.10	5.4
February	45.9	68	26.7	-3	1.15	4.3
March	52.1	77	30.2	5	1.17	2.8
April	56.9	84	32.6	17	1.54	2.4
May	65.4	92	39.4	21	1.87	0.1
June	72.4	98	44.9	31	1.42	0
July	83.8	103	51.8	35	0.40	0
August	82.9	103	51.3	35	0.55	0
September	74.4	98	45.3	27	0.55	0
October	61.9	89	37.6	0	1.15	1.0
November	50.1	77	31.3	-2	1.22	2.3
December	41	67	25.4	-11	1.20	4.7
Annual	60.4	103	36.6	-11	13.81	22

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, 1937-2016

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, 1937-2016

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 12.8-percent of the land is owned by BLM (140,217 acres) and 14.4-percent of the land is owned by the USFS (169,159 acres).¹⁶ A majority of the land is privately owned. In fact, nearly 71.2-percent of the land in the county is privately owned (781,800 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 Wildfire Risk Detailed Report, US Forest Service, <https://wildfirerisk.org/explore/overview/41/41069/>

Table 2.4: Landownership

Management	Acres	Percent
Private Land (Residential, Ranches, Timber Companies, etc.)	781,8 0	71.2%
USDA Forest Service, Umatilla National Forest, Ochoco National Forest	169,159	15.4%
U.S. Department of Interior, Bureau of Land Management (BLM)	140,217	12.8%
State of Oregon, Division of State Lands and Department of Fish & Wildlife	,509	0. %
National Parks Service	,845	0.4%
Conservation Easement	219	0.1%
Wheeler County	502	<0.1%
Total	1,098,561	100.0%

Source: Wheeler County Detailed Report, US Forest Service Wildfirerisk.org

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.
- 71.2% of the county is in private ownership, while 15.4% is owned by the United States Forest Service (USFS) and 12.8% by the Bureau of Land Management (BLM).

Socio Demographic Capacity

Population

According to the U.S. Census Bureau, the population of Wheeler County increased by 0.7% from the year 2010 to 2020. In 2020, the population of the county was 1,451 making it the least populated county in the State of Oregon. The county has approximately 0.85 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 2010 to 2020.

Table 2.5: Population Changes, 2010-2020

County	Population (2010)	Population (2020)	Population Change (2010 - 2020)	Percentage Change (2010 - 2020)
Wheeler	1,441	1,451	10	0.7%
Crook	20,978	24,788	,760	17.9%
Gilliam	1,871	1,995	124	6.6%
Grant	7,445	7,223	-212	-2.8%
Jefferson	21,720	24,502	2,782	12.8%
Morrow	11,117	12,186	1,069	9.1%
Wasco	25,211	26,670	1,459	5.8%
Oregon	3,810,074	4,277,256	467,182	10.6%

Source: U.S. Census Bureau, compiled by PSU Population Research Center.

There are three incorporated cities in Wheeler County: Fossil, Mitchell, and Spray. The population in Mitchell, located in the John Day/Clarno Uplands in southern Wheeler County increased slightly from 2010 to 2020. The population in both Spray, along the John Day River in eastern Wheeler County, and Fossil, the county seat, decreased during the same time period. Overall, 49.9-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 American Community Survey and Geography Brief, U.S. Census Bureau https://www2.census.gov/geo/pdfs/reference/ua/Defining_Rural.pdf

Table 2.6: Population Changes, 2010-2020

Jurisdiction	Population (2010)	Population (2020)	Population Change (2010 - 2020)	Percentage Change (2010 - 2020)
Fossil	473	447	-26	-5.5%
Mitchell	1 0	1 8	8	6.2%
Spray	160	1 9	-21	-1 .1%
Wheeler County	1,441	1,451	10	0.7%

Source: U.S. Census Bureau, Compiled by PSU Population Research Center.

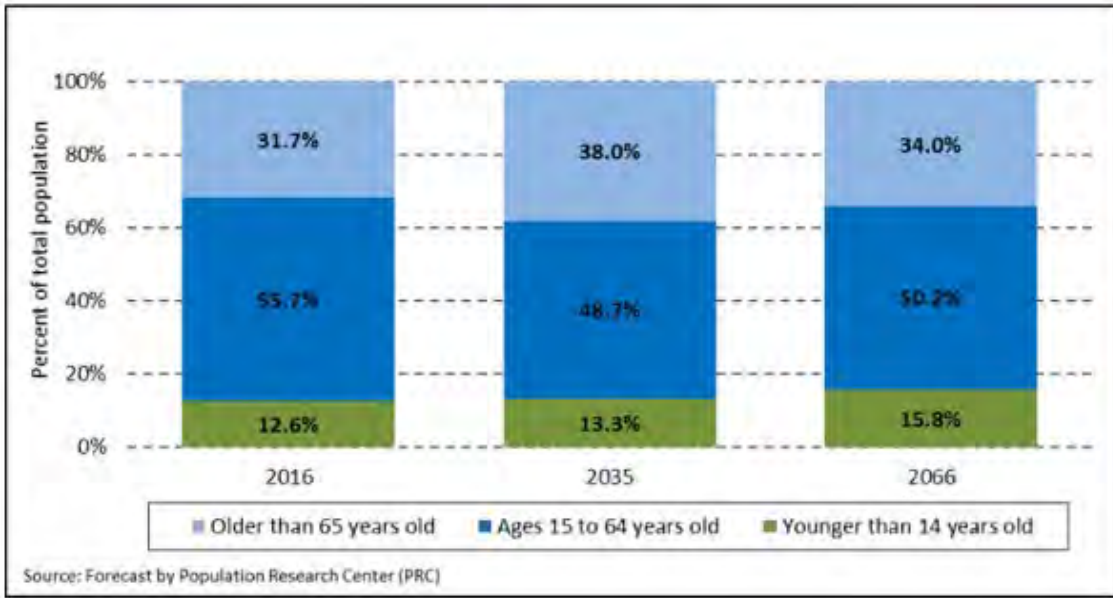
Population size itself is not an indicator of vulnerability. More important is the location, composition, and capacity of the population within the community. Research by social-scientists demonstrates that human capital indices such as age, race, education, and income can affect the integrity of a community. 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-percent) of the population in the county is over the age of 65; 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, 2016, 2035 and 2066



Source: Coordinated Population Forecast for Wheeler County, its Urban Growth Boundaries and Area Outside Urban Growth Boundaries 2016-2066

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 12.6-percent of the county’s population is under the age of 14, it is still important to consider this segment of the population when planning mitigation strategies. School age children rarely make decisions about emergency management.

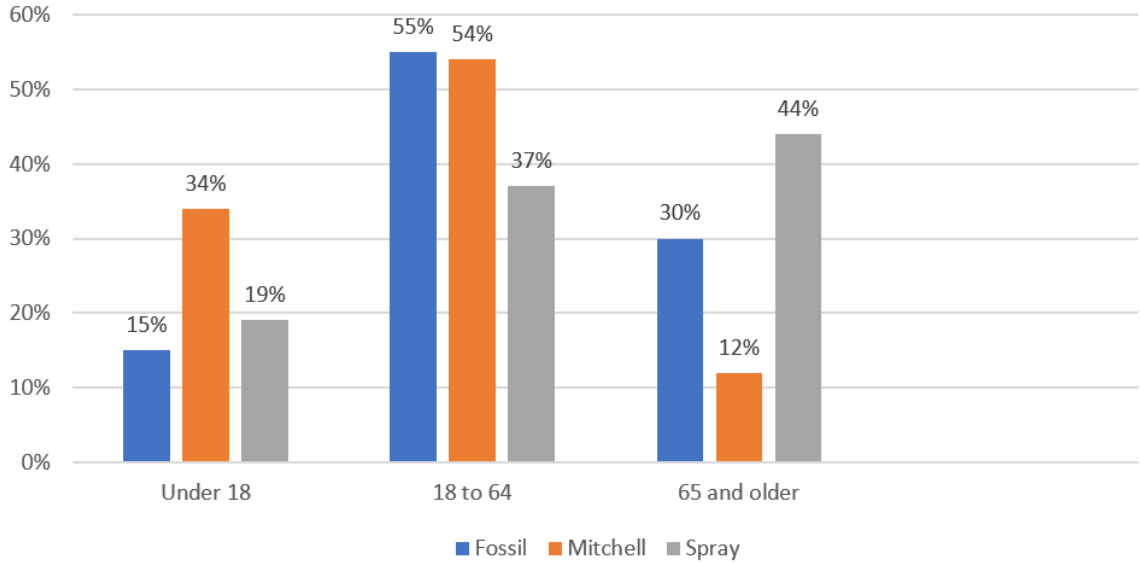
Therefore, a larger youth population in an area will increase the importance of outreach to schools and parents on effective ways to teach children about fire safety, earthquake response, and evacuation plans. Children are also more vulnerable to the heat and cold, have few transportation options and 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 6 Central Oregon.

Figure 2.5: Percent of Population by Age in Incorporated Cities, 2021



Source: U.S. Census Bureau, 2021 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. Fifty three percent of the 60 households in the county have individuals living in them who are 65 or older, 21-percent of which live alone. In fact, nearly 0 percent of the households in the City of Fossil and City of Spray 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 Mitchell (17.3-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	17 (21.7%)	77 (1.7%)	21(40.4%)	8 (12. %)
<i>Single householder with own children under 18</i>	29 (4.6%)	12 (4.9%)	9 (17. %)	1 (1.5%)
Households with individuals 65 and over	5 (5.2%)	14(55.1%)	17 (2.7%)	47 (72. %)
<i>Householder 65 years and over living alone</i>	12 (21%)	71 (29.2%)	9 (17. %)	19 (29.2%)
Total households	630	243	52	65

Source: U.S. Census Bureau, 2021 American Community Survey 5-Year Estimates

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	1,477	
One Race	1, 5	91.6%
White	1,300	88.0%
Black or African American	0	0.0%
American Indian or Alaska Native	4	0.27%
Asian	9	0.6%
Native Hawaiian and other Pacific Islande	1	0.07%
Other race	9	2.6%
Two or more races	124	8.4%
Hispanic or Latino Origin		
Total Population	1,477	
Hispanic or Latino (of any race)	146	1.9%
Not Hispanic or Latino	1,3 1	98.1%

Source: U.S. Census Bureau, 2021 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 16-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	1,1 5	
High school graduate or higher	1,017	89.6%
Bachelor's degree or higher	22	19.6%

Source: U.S. Census Bureau, 2021 American Community Survey 5-Year Estimates

Table 2.9b: Educational Attainment – Oregon

Oregon	Count	Percent
Population 25 and over	,04 ,9 0	
High school graduate or higher	2,789, 4	91.6%
Bachelor's degree or higher	1,106,2 9	36. %

Source: U.S. Census Bureau, 2021 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.

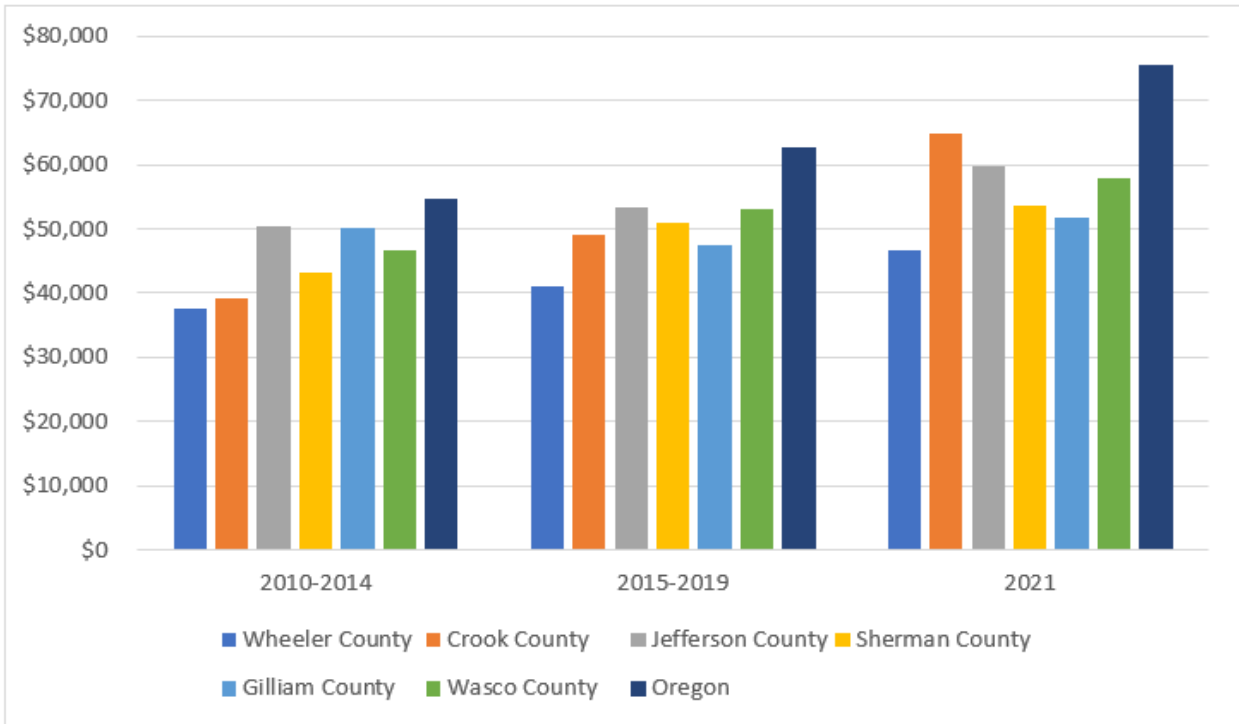
Income

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 2021 in Wheeler County and the surrounding communities. In 2021 the median household income in Wheeler County was \$46,648. This is significantly lower compared to the state median household income level (\$75,657), and is also the lowest in the entire north central Oregon region.

²⁰ State of Oregon Natural Hazards Mitigation Plan, Region 6: Central Oregon.

Figure 2.6: Median Household Income, 2010-2021



Source: U.S. Census Bureau, 2021 American Community Survey 5-Year Estimates.

Source: PSU Population Research Center, Population, Housing, Social and Economic Profile Oregon and its Counties

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 2021, the poverty guideline for a family of four was for annual household income levels at or below \$ 20,000.²¹ The Census Bureau estimates that 12.1-percent of the total population and 17.8-percent of children live below the poverty level in Oregon.

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 24.5-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. <https://aspe.hhs.gov/topics/poverty-economic-mobility/poverty-guidelines>

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

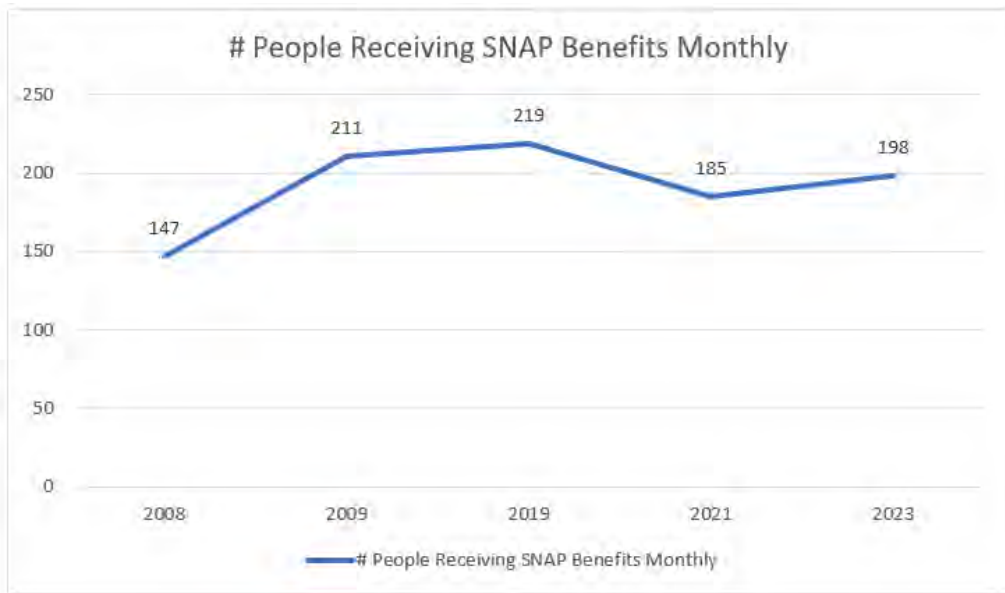
Jurisdiction	2016 Poverty All Ages	2021 Poverty All Ages	2016 Poverty Under 18	2021 Poverty Under 18
Wheeler County	258	204	77	65

Jurisdiction	2016 Percent Poverty All Ages (%)	2021 Percent Poverty All Ages (%)	2016 Percent Poverty Under 18 (%)	2021 Percent Poverty Under 18 (%)
Wheeler County	19.6%	14%	9.9%	24. %
Oregon	1 .4%	12.1%	17.2%	1 .8%
United States	14%	12.6%	19.5%	16. %

Source: U.S. Census Bureau, American Community Survey 2021 Estimates.

The number of people receiving a benefit from the Supplemental Nutrition Assistance Program (SNAP – i.e. food stamps) in the county, has overall increased in the last 15 years.

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



Source: Oregon Hunger Task Force, 2021.

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 2022 that the number of uninsured residents in the county under the age of 65 equaled 84 (5.7-percent). This uninsured rate is approximately equal to the state as a whole (5.9-percent), and the rate of uninsured persons under 19 in the county (1.4-percent) was half of the state as a whole .0-percent . Both of this rates have declined

in the county since 2016.

Table 2.11: Health Insurance Coverage in Wheeler County

Year	Jurisdiction	Percent Uninsured - Under Age 65	Percent Uninsured - Under Age 19
2006	Wheeler County	2.2%	25.0
	Oregon	19.1%	12.9
2007	Wheeler County	22.8%	1 .6%
	Oregon	18.8%	12.8%
2008	Wheeler County	28.5%	18.5%
	Oregon	18.0%	12. %
2009	Wheeler County	1.9%	22.9%
	Oregon	19.4%	11.0%
2010	Wheeler County	26. %	17.8%
	Oregon	19.7%	9.2%
2011	Wheeler County	21.0%	11.7%
	Oregon	18.1%	7.6%
2012	Wheeler County	20. %	10.2%
	Oregon	17.4%	6.9%
201	Wheeler County	2 .8%	1 .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%	.5%
2022	Wheeler County	5.7%	1.4%
	Oregon	5.9%	.0%

Source: U.S. Census Bureau, Small Area Health Insurance Estimates, 2005-2016 American Community Survey 2022 1 year estimate

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 slowly increasing. From 2010 to 2020, it increased by 0.7%;
- Wheeler County has an aging population. By 2035, it is forecast that 8% of the population will be over the age of 65;
- The percentage of residents with a higher education degree is well below the state average (19.6% vs 36. %);
- Median annual household income in the county is \$46,648 - about \$ 0,000 lower than the state average;
- 24. % 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. <https://asherhealth.org/>.

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 2016 and 2022 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*	2021^	Change (2000-2021)	Percent change (2000-2021)
Wheeler	\$28,750	\$33,403	\$33,400	46,648	\$17,898	62.2
Oregon	\$40,916	\$46,560	\$53,270	75,657	\$34,741	84.9
United States	\$41,994	\$50,046	\$55,322	74,755	\$32,761	78.01

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

Source :U.S. Census Bureau, 2021 American Community Survey

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 583 to 555 between 2016 and 2021.²³

During the same time period, unemployment levels in Wheeler County declined significantly reflecting national trends. According to the U.S. Census Bureau, unemployment dropped as low as .0-percent in 202 .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. ACS 5-Year Estimate. Economic Characteristics.

²⁴ Oregon Employment Department - “Local Area Employment Statistics”, <https://www.qualityinfo.org/east-cascades>

Table 2.13: Regional Unemployment (Seasonally Adjusted)

Jurisdiction	2007	2012	2017	2022
Wheeler County	5.6%	6.9%	3.9%	3.0%
Crook County	6.2%	13.6%	6.3%	5.4%
Gilliam County	4.5%	10.1%	4.2%	4.0%
Grant County	8.0%	14.0%	6.8%	5.0%
Jefferson County	6.8%	11.8%	5.6%	4.5%
Morrow County	5.4%	8.1%	4.4%	3.3%
Sherman County	4.9%	10.7%	4.8%	3.8%
Wasco County	4.9%	8.4%	4.1%	3.7%
Oregon	5.2%	9.5%	4.1%	4.5%

Source: Oregon Employment Department, 202 .

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 2021

Table 2.14: 2021 Employment & Wages

Jurisdiction	Number of Employees	Annual Payroll	Average Pay
Wheeler County	307	\$10,170,625	\$33,129
Gilliam County	865	\$44,425,413	\$51,359
Morrow County	6,044	\$361,337,146	\$59,784
Sherman County	914	\$50,010,865	\$54,716
Oregon	1,726,340	\$177,680,091,820	\$102,923

Source: Oregon Employment Department, County Covered Employment and Wages, 2021.

In 2021, there were 28 employment establishments operating in Wheeler County with a majority of those establishments having 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 Wheeler County Oregon Quick Facts, U.S. Census Bureau - https://www.census.gov/quickfacts/fact/table/wheelercountyoregon/EDU6_5221#EDU6_5221

wheelercountyoregon/EDU6_5221#EDU6_5221

²⁶ State of Oregon Natural Hazards Mitigation Plan, Region 6: Central Oregon

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. In 2021, the total of nonfarm jobs in wheeler county was 60.

Agriculture

According to 2021 Census of Agriculture by the U.S. Department of Agriculture, 150 farms were located in Wheeler County with a total of 556,967 acres of land. This is a decrease from 15 farms in 2012 with a total of 556,967 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, 2017

Selected crops harvested	Number of Farms	Number of Acres	Number of Bushels
Corn for grain	1	0	0
Vegetables		2	N/A
Wheat for grain, all	2	0	0
Winter wheat for grain	84	11,379	1,106,567
Spring wheat for grain	1	0	0
Orchards	5	11	N/A
Forage - land used for all hay and all haylage, grass silage, and greenchop	6	7,921	26,775

Livestock	Number of Farms	Total Number
Cattle and calves inventory	91	15,228
Hogs and pigs inventory	4	16
Sheep and lambs inventory	1	0
Layers inventory	16	267

Source: U.S. Department of Agriculture, 2017 Census of Agriculture – County Data

In 2017, the gross farm and ranch sales in Wheeler County was \$11,10 ,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 Total Farm and Ranch Sales, 2010, 2012 & 2017

County	2010 Dollars	2012 Dollars	2017 Dollars
Wheeler	\$13,023,000	\$14,158,000	\$11,103,000
Crook	\$37,287,000	\$42,298,000	\$44,563,000
Gilliam	\$25,664,000	\$44,054,000	\$26,659,000
Grant	\$46,082,000	\$25,369,000	\$24,129,000
Jefferson County	\$63,133,000	\$65,032,000	\$67,438,000
Morrow County	\$395,759,000	\$568,111,000	\$596,487,000
Wasco County	\$89,741,000	\$89,783,000	\$93,853,000

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

Source: U.S. Department of Agriculture, 2017 Census of Agriculture-County Data

In 2017 the average estimated market value of land and buildings per farm equaled \$, 60,966. The total value of all 150 farms in the county equaled \$504,145,000. Table 2.18 describes the farm values in 2012 & 2017 by group in Wheeler County according to the U.S. Department of Agriculture.

Table 2.18: Farm Value of Sales, 2012 & 2017

2012 Value of Sales	Number of Farms	2017 Value of Sales	Number of Farms
Less than \$2,500	56	Less than \$2,500	60
\$2,500 to \$4,999	17	\$2,500 to \$4,999	11
\$5,000 to \$9,999	11	\$5,000 to \$9,999	1
\$10,000 to \$24,999	19	\$10,000 to \$24,999	18
\$25,000 to \$49,999	11	\$25,000 to \$49,999	7
\$50,000 to \$99,999	15	\$50,000 to \$99,999	20
\$100,000 or more	0	\$100,000 or more	21

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

Source: U.S. Department of Agriculture, 2017 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, 2017 & 2021

Industry	2017 Employment	2017 Percent of Industry	2021 Employment	2021 Percent of Industry
Total Private Coverage	196	62.8%	189	61.6%
Natural Resources & Mining	36	11.5%	25	8.1%
Trade, Transportation & Utilities	55	17.6%	5	11.4%
Retail	44	14.1%	46	15%
Education & Health Services	52	16.6%	57	18.6%
Leisure & Hospitality	28	8.9%	20	6.5%
Other Services	5	1.6%	6	2.0%
Total All Government	116	37.1%	118	38.4%
Total All Ownerships	312	100.0%	307	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 (3.0% in 2022)²⁷.
- 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 Wheeler County, OR, 2022, <https://datausa.io/profile/geo/wheeler-county-or>

²⁸ State of Oregon Natural Hazards Mitigation Plan, Region 6: Central Oregon.

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 2.20 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 21.5-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 .4-percent of the housing units have two or more units.

Table 2.20: Housing Type Summary

Number of Units	2016	Percent	2021	Percent
1 unit	758	77.8%	691	73.9%
2 to 4 units	9	0.9%	16	1.7%
5 to 9 units	0	0.0%	0	0.0%
10 to 19 units	12	1.2%	11	1.18%
20 or more units	5	0.5%	4	.4 %
Mobile home	190	19.5%	201	21.5%
Boat, RV, van, etc.	0	0.0%	0	0.0%
Total housing units	974	100.0%	935	100.0%

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

Source: U.S. Census Bureau, 2021-2026 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 6: Central Oregon

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 2.21 describes the age of the housing units throughout the county. According to the U.S. Census Bureau, roughly 5 .6-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 2.21: 2021 Housing Units, Year Built

Year Built	Number	Percent
2020 or later	0	0.0%
2010 to 2019	55	5.9%
2000 to 2009	100	10.7%
1990 to 1999	26	25.2%
1980 to 1989	4	4.6%
1970 to 1979	124	11.7%
1960 to 1969	15	1.6%
1950 to 1959	51	5.5%
1940 to 1949	77	8.2%
1939 or earlier	24	25%
Total housing units	935	100.0%

Source: U.S. Census Bureau, 2021-2026 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 2.22 below, approximately 28.6-percent of the housing units in Wheeler County are renter-occupied.

³⁰ Oregon Earthquake Hazard Mitigation Legislation, Western States Seismic Policy Council. <https://www.wsspc.org/public-policy/legislation/oregon/>

³¹ Oregon Earthquake Hazard Mitigation Legislation, Western States Seismic Policy Council. <https://www.wsspc.org/public-policy/legislation/oregon/>

Table 2.22: Housing Occupancy Summary

Occupancy	Number	Percent
Occupied housing units	6 0	67. %
<i>Owner-occupied units</i>	450	48.1%
<i>Renter-occupied units</i>	180	19. %
Vacant housing units	05	2.6%
Total housing units	935	100.0%

Source: U.S. Census Bureau, 2021-2026 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 2.2 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 2.23: 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 6: Central Oregon.

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. <https://www.wheelercountyoregon.com/road-department>.

³⁴ Travel Oregon: Journey Through Time Scenic Byway. <https://traveloregon.com/things-to-do/trip-ideas/scenic-drives/journey-through-time-scenic-byway/>

³⁵ State of Oregon Natural Hazards Mitigation Plan, Region 6: Central Oregon.

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 4,000 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, ViaSat, Inc and Starlink.³⁹

³⁶ Columbia Basin Electric Co-op, Inc. About US. <https://cbec.cc/about-us>

³⁷ Wasco Electric Cooperative. About Wasco Electric Cooperative. <https://www.wascoelectric.com/about/>.

³⁸ Bonneville Power Administration. 2022 BPA Facts. <https://www.bpa.gov/-/media/Aep/about/publications/general-documents/bpa-facts.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

Frontier Regional 911 is the call center responsible for answering emergency calls for police, firefighting and ambulance services in Wheeler, Gilliam, Sherman and Jefferson 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 2.24 below.

Table 2.24: 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. Asher Community Health Center Provides services on Wednesdays.

- Emergency Services: Ambulance Service, Life Flight Network Service

SHERIFF/ POLICE

The Oregon State Police Department and the Wheeler County Sheriff's Office, which is located in Fossil, both serve Wheeler County. Five full-time law enforcement officers and one

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

⁴² Wheeler County Health Care, Wheeler County Website. <https://www.wheelercountyoregon.com/health-care>

part-time officer make up the force for the Wheeler County Sheriff's Office: 4.5 Deputies, 1 Sheriff and Reserve Deputies and volunteers.

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 Fire and Rescue, 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 had an insignificant increase in population which has resulted in no significant new development within the cities since the 2019 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 2.25 outlines voter participation and turnout percentages from the 2016 Presidential General Election compared to the 2022 General Election. The 2016 Presidential General Election resulted in an 85-percent voter turnout in the county, while the 2022 General Election resulted in a turnout of 79.4-percent voter participation.⁴³ These results are higher than the overall voter participation reported in Oregon.

⁴³ Oregon Secretary of State, Election History, 2022.

Table 2.25: Voter Turnout Percentages

Jurisdiction	2016 Presidential General Election		2022 General Election	
	Wheeler County*	Oregon^	Wheeler County*	Oregon^
Total - Registered Voters	986	2,553,806	1,074	2,985,820
Total - Ballots Cast	840	2,051,448	85	1,997,689
Voter Turnout Percentage	85.2%	80.3%	79.4	66.9

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. <https://www.nps.gov/joda/planyourvisit/ptd-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, Huntley Homestead, Lee Residence, Mitchell State Bank 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 2.26 lists the libraries and museums located in Wheeler County.

Table 2.26: List of Libraries and Museums in Wheeler County

Site Name	Location
Fossil Public Library	Fossil
Spray Public/School Library	Spray
Oregon Paleo Lands Center	allery Fossil
Fossil 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 2.27 identifies owner occupied housing units across the region; the remaining households are either renter occupied or are vacant.

Table 2.27: Regional Homeownership

Jurisdiction	Homeownership Rate
Wheeler County	75.5%
Crook County	75.5%
Gilliam County	75.1%
Grant County	75.4%
Jefferson County	68.1%
Morrow County	75.1%
Sherman County	69.1%
Wasco County	64.3%
Oregon	62.8%

Source: U.S. Census Bureau, 2020

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:

- **Community Development:** The Wheeler County Community Economic Development Team is dedicated to helping build businesses in Wheeler County. They work with new businesses and existing one to assist with business financing. Their goal is to retain and create permanent jobs that provide families with adequate means to sustain their standard of living, coordinate public and private investments in the community and provide job training/entrepreneurship opportunities in the County. They can help provide outreach to businesses that provide essential services to Wheeler County, assisting them with business mitigation to ensure they can operated in the event of a natural disaster.
- **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. Community Development <https://www.wheelercountyoregon.com/community-development>

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.⁵⁰
- **Sheriff'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. <https://www.wheelercountyoregon.com/emergency-management>

⁴⁸ Wheeler County Website. Planning Department. <https://www.wheelercountyoregon.com/planning-dept>

⁴⁹ Wheeler County Website. Road Department. <https://www.wheelercountyoregon.com/road-department>

⁵⁰ Wheeler County Website. Community Transportation. <https://www.wheelercountyoregon.com/transportation>

housing city, county, state, and federal prisoners; animal control; and enforcing nuisance abatement.⁵¹

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.⁵²

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. The following is a list of relevant County Plans to the Natural Hazard Mitigation Plan.

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.

⁵¹ Wheeler County Website. Sheriff s Office <https://www.wheelercountyoregon.com/sheriffs-office>

⁵² Burby, Raymond J., ed. 1998. Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities.

Wheeler County Community Wildfire Protection Plan

Date of Last Revision: 2019

Author/Owner: Wheeler County

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

Relationship 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.

Ability to expand or improve: The CWPP is reviewed annually for project prioritization and accuracy. This plan can be expanded as the County sees fit.

Wheeler County Comprehensive Plan

Date of Last Revision: June 2003

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 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 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 known 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.

Ability to Expand or Improve: Wheeler County can continue to update its comprehensive plan to keep pace with State of Oregon and FEMA best practices and to accommodate new development.

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).

Relationship 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 recovery 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.

Ability to Expand or Improve: Wheeler County can update their EOP to accommodate changes in development, population and resources needed. The NHMP is concerned with mitigation and preparedness. The EOP should incorporate mitigation actions where appropriate. The County can expand the EOP as needed to accommodate Natural Hazards Planning.

Wheeler County Transportation System Plan

Date of Last Revision: June 2001

Author/Owner: Davide Evens and Associates, Inc. /Wheeler County

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 Plan and satisfies the requirement 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.

Relationship of the Transportation System Plan to the 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.

Ability to expand or improve: Wheeler County has the authority to include hazard mitigation items as necessary.

State of Oregon Building Codes

Date of Last Revision: Current With State Standards

Author/Owner: State of Oregon

Description: The Wheeler County Building Codes are adopted from the State of Oregon Guidelines. They are regularly enforced; the Planning Department reports all known violations. The building codes identify standards for construction and development to mitigate damage and to avoid unsound structures.

Relationship of Building Codes to the Natural Hazards Mitigation Plan: Building Codes enforce structural standards, including fire- and storm-resistant building materials, seismic stability and defensible space. Mitigation actions focusing on resident resiliency can be incorporated into Building codes.

Ability to expand or improve: Wheeler County does not have the authority to update these codes.

Wheeler County Zoning Ordinances

Date of Last Revision: 2020

Author/Owner: Wheeler County

Description: The Wheeler County Zoning Ordinances include Site Plan Review Requirements, Subdivision Ordinances, and acquisition of land for public use. Zoning Ordinances are regularly enforced.

Relationship of Zoning Ordinances to the Natural Hazards Mitigation Plan: Zoning Ordinances guide development and protection of natural resources. Mitigation actions can be implemented through Zoning Ordinances.

Ability to expand or improve: Wheeler County has the authority to update their zoning ordinances as development, population, or hazard information changes.

Summary

Implementing the natural hazards mitigation plan's action items through existing plans and policies increase 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, 202

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. In 2020 the State of Oregon identified extreme heat as a new hazard. The 2021 Wheeler County NHMP Steering Committee determined that extreme heat fit in their severe weather category, instead of being a stand alone issue. 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	Extreme Heat
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 August 7, 2021 .

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 July, 2021 FEMA has approved a total of 85 federal disaster declarations in Oregon and 10 for Wheeler County. The declarations for Wheeler County include 4 severe storms, 1 floods, 1 coastal storm (statewide for the Hurricane Katrina Evacuation), 1 drought and one pandemic.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 Date	Incidents	Incident Period
DR-4499	28MAR2020	Covid-19 Pandemic	20JAN2020 to 11MAY2023
DR-4452	09JUL2019	Severe Storms, Flooding, Landslides and Mudslides	06APR2019 to 19APR2019
DR-1683	22FEB2007	Severe Winter Storms, Flooding	14DEC2006 to 15DEC2006
DR-1632	20MAR2006	Severe Storms, Flooding, Landslides and Mudslides	18DEC2005 to 21JAN2006
DR-1510	19FEB2004 (04MAR2004)	Severe Winter Storms	26DEC2003 to 14JAN2004
DR-1160	23JAN1997	Severe Winter Storms, Land and Mudslides, Flooding	25DEC1996 to 06JAN1997
DR-3039	29APR1977	Drought	29APR1997
DR-184	24DEC1964	Heavy Rain, Flooding	24DEC1964

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.” <https://www.fema.gov/disaster/how-declared>.

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.

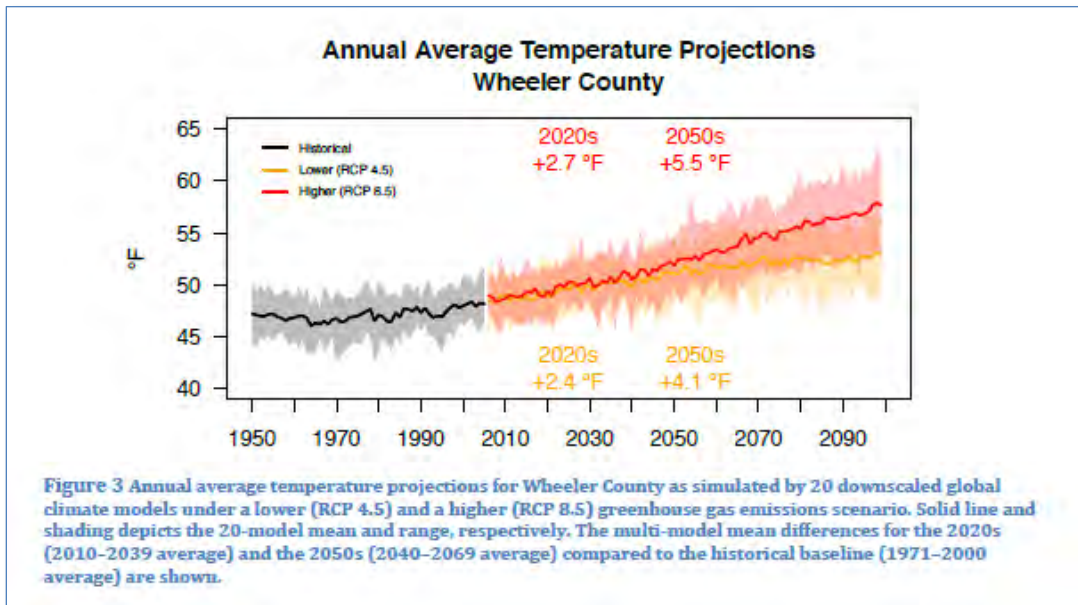
Heat Waves

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/EXTENT

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 9 out of the last 20 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, 2020.







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 May, 2024. Wheeler County is not currently experiencing any form of drought for the first time since 2020.

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 Wheeler County



Legend	
Drought & Dryness Categories	% of Wheeler County
 D0 - Abnormally Dry	0%
 D1 - Moderate Drought	0%
 D2 - Severe Drought	0%
 D3 - Extreme Drought	0%
 D4 - Exceptional Drought	0%
 Total Area in Drought (D1-D4)	0%

Source: Drought Conditions for Wheeler County, NOAA, NIDIS Drought.gov

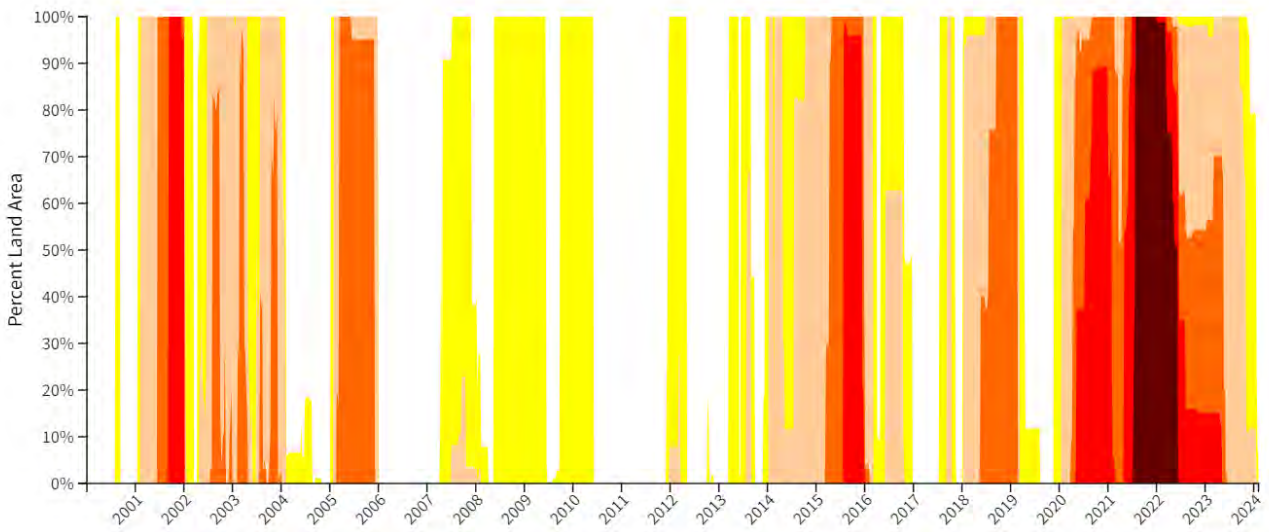
SIGNIFICANT DROUGHTS

Table 3.4 Significant Droughts in Wheeler County

Time Period	Description
1904-05	Drought period of about 18 months.
1917-31	A 15-year dry period in Oregon punctuated by brief wet spells in 1920, 1921 and 1927.
1939-41	Three-year intense drought.
1959-64	Drought primarily affecting eastern Oregon.
1965-68	Three-year drought following the big regional floods of 1964-65.
1977	A federal emergency declaration was made on April 29, 1977, for 19 counties in Oregon including Wheeler due to drought conditions.
1985-97	Generally dry period, capped by statewide droughts in 1992 and 1994. In 1994, the Governor declared drought in 11 counties within regions 4, 5, 6, 7, and 8 (Executive Order 94-15).
2001	Governor John Kitzhaber issued a state of drought emergency in Gilliam County on May 30, 2001. Executive Order No. 01-06 was issued due to conditions caused by drought, low water conditions 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 5, 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 snowpack 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.
2020	Determination of a State of Drought Emergency due to unusually low water supplies and hot, dry conditions.
2021	Determination of a State of drought emergency due to lack of precipitation and unusually low snowpack and streamflow.
2022	Determination of a State of Drought Emergency

Sources: State of Oregon Natural Hazards Mitigation Plan, Office of the Oregon Governor Executive Orders, <https://www.oregon.gov/gov/pages/executive-orders.aspx>

Figure 3.4: Drought Conditions in Wheeler County 2000-2024



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

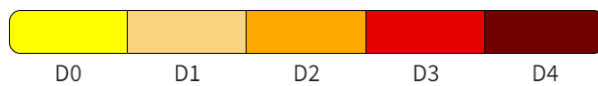
D3 = Extreme Drought

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

D4 = Exceptional Drought

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

U.S. Drought Monitor



Source: Drought Conditions for Wheeler County, NOAA, NIDIS Drought.gov

PROBABILITY, VULNERABILITY AND IMPACT

According to the Wheeler County Natural Hazards Mitigation Plan Steering Committee, the probability of drought recurrence in the county is high meaning several events are likely in the next 5 years and county vulnerability is high meaning more than 10% of the population and property would be impacted by an average event. History suggests that droughts occur in Wheeler County every 3-6 years, making them a common hazard.

Climate models for Oregon suggest the future regional climate change include increases in temperature around 0.2-1 degree Fahrenheit per decade in the 21st Century, along with warmer and drier summers and some evidence that extreme precipitation will increase in the future. Increased droughts may occur throughout Oregon under various climate change scenarios as a result of multiple factors, including reduced snow pack, rising temperatures and likely reductions in summer precipitation⁶.

According to the OCCRI report for Wheeler County, drought conditions represented by low spring snow pack, low summer moisture and low summer runoff are projected to become more frequent by the 2050s. Additionally, 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 stream flow. Early education and planning for droughts that will happen is a good strategy for Wheeler County to prepare for this natural hazard⁷.

Drought can have a significant impact on the economy of Wheeler County, which is highly dependent on natural resource industries such as ranching and hay growing which are both particularly susceptible to droughts.

Potential impacts to farming and community water supplies are the greatest threat to Wheeler County. Since the 2019 update, there has been no significant development that changes the county's risk to drought. Wheeler County's poverty rate of 14% makes them more vulnerable to conditions such as drought, populations with lower incomes are less able to prepare for and recover from natural disasters. Looking to the future, in the next ten years their elderly population is projected to increase to 8%, which will increase their vulnerability to drought as elderly populations are more sensitive to extreme temperatures and drought conditions. Their relatively stable population will offset other increases in vulnerability.

⁶ Oregon Natural Hazard Mitigation Plan, Region 6: Central Oregon Risk Assessment

⁷ Future Climate Projections Wheeler County, August 2018, The Oregon Climate Change Research Institute

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---Columbia Plateau. Consequently, its geology and earthquake susceptibility varies considerably.⁸

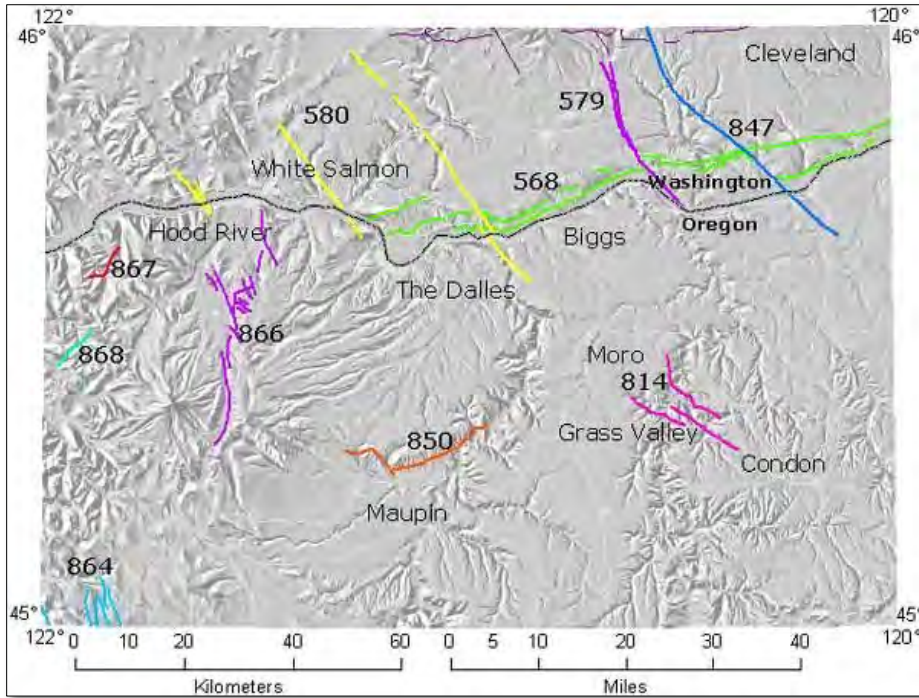
There have been several significant earthquakes in the region; however all have been located in Klamath and Lake Counties. Additionally, faults have been located throughout the region, including in Wheeler County.

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.

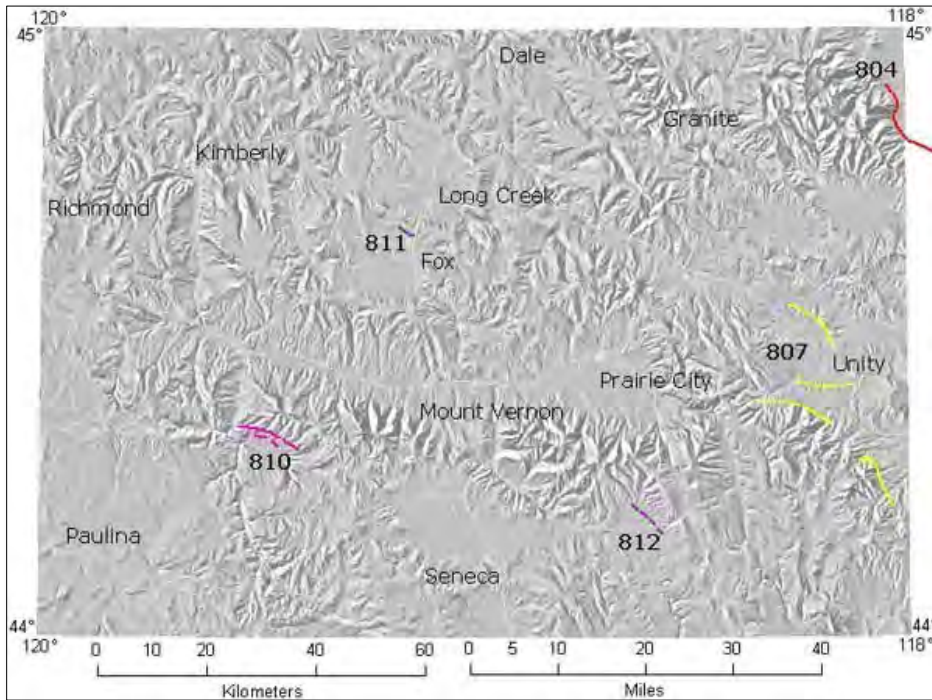
⁸ Deschutes County Natural Hazards Mitigation Plan, 2015.

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

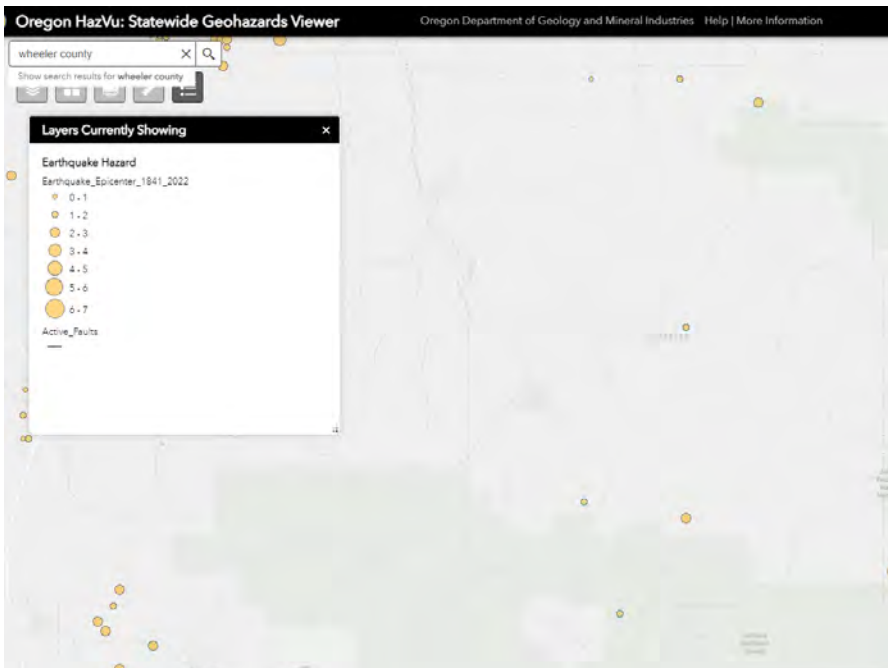
LOCATION/EXTENT

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.

HISTORY

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 1970-2022



Source: Oregon HazVu: Statewide Geohazards Viewer. Accessed May 20, 2024

PROBABILITY, VULNERABILITY AND IMPACT

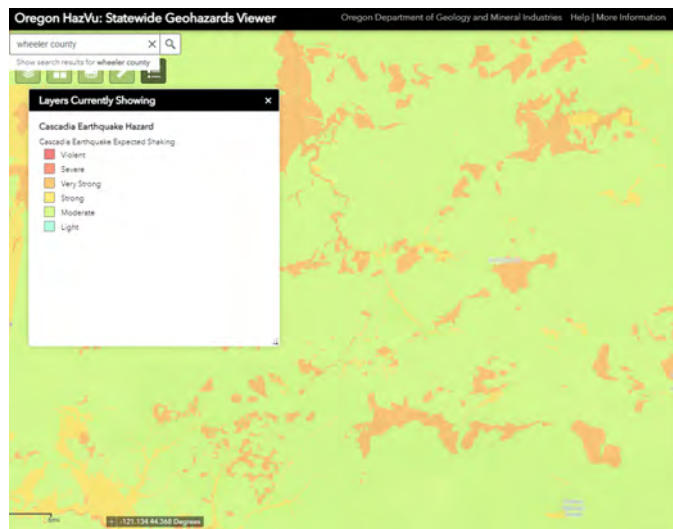
The 2024 Wheeler County Natural Hazards Mitigation Plan Steering Committee determined that the probability for an earthquake is low meaning it is likely to be longer than 10 years in between events, but the vulnerability to an earthquake is high meaning more than 10 of the population and property would be impacted by an average event. 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. Climate change is not expected to impact Earthquake Hazard.

Figure 3.8 below, shows that shaking from an earthquake is expected to be moderate for most of the county, even in the works case magnitude 9.0 Cascadia Subduction Zone Earthquake. If a CSZ earthquake were to occur, it is highly likely the damage in Wheeler County would be light, however the indirects impacts to Wheeler County would be significant.

A particular vulnerability is Oregon's liquid fuel supply. Oregon depends on liquid fuels transported into the state from Washington State, which is also vulnerable to a Cascadia earthquake and Tsunami. Once here, fuels are stored temporarily at Oregon's critical energy infrastructure hub, a six mile stretch of the lower Willamette River where industrial facilities occupy liquefiable riverside soils. Disrupting the transportation, storage and distribution of liquid fuels would rapidly disrupt most, if not all, sectors of the economy critical to emergency response and economic recovery. Wheeler County's Economy is heavily reliant on the ready availability of liquid fuel for the farming industry, as well as for personal transportation and to heat some residences.

Wheeler County is also relatively remote and isolated with access primarily limited to HWY 26, 207 and 19. Any significant damage to these lifelines could cut off the county to surface transportation for a prolonged period of time would could impact the county's food and water supply in addition to rescue and recovery efforts.

Figure 3.8: Expected Shaking Intensity from a Magnitude 9.0 Cascadia Subduction Earthquake



Source: Oregon HazVu: Statewide Hazard Viewer. Accessed on May 20, 2024.

No new developments have taken place since 2019 that are impacted by earthquake risk. Looking to the future, in the next ten years their elderly population is projected to increase to 8%, which will increase their vulnerability to earthquakes, as elderly populations are more sensitive to natural hazards. Their relatively stable population will offset other increases in vulnerability.

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/EXTENT

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).

HISTORY

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.

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 3.5 also identifies historical flood records above major flood stage at the USGS gauge site in Service Creek.

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

Table 3.5: Significant Floods and Flash Floods in Wheeler County

Date	Location	Description
June 1884	Painted Hills (vicinity)	Flash flood killed four people, including three children
March 19, 1932	Service Creek	River flood, 16.75 feet (baseline of 11.5 feet).
May 22, 1948	Service Creek	John Day River Flood, 15.25 feet (baseline of 11.5 feet)
March 26, 1952	Service Creek	John Day River Flood, 15.5 feet (baseline of 11.5 feet)
December 23, 1964	Service Creek	“Christmas Day Flood” referred to crested at 17.85 feet in Service Creek, streamflow was 8 times the average and washed out several roads in Wheeler County
July 1956	Mitchell	Flash flood destroyed approximately 20 buildings in Mitchell
June 1990	City of Mitchell	Flash Flood in the City of Mitchell caused extensive damage
January 1, 1997	Service Creek	River Flood, 16.49 feet (baseline of 11.5 feet)
July 30, 1998	Alder Creek	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 northeast of Service Creek.
April 26, 2001	Highway 26	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 maker 94. A local rancher mentioned that water covered the road to a depth of 1.5 feet, leaving debris that accumulated to a depth of 6 inches.
August 25, 2002	Spray	Flash flooding was reported between Spray and Service Creek.
June 26, 2004	Highway 26	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	Twickenham	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 a 2.60 inches storm total. Public property damage occurred due to several county roads being washed out in the Twickenham area.
June 3, 2010	John Day River	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 5am. The flood stage is 11.5 feet.

Date	Location	Description
May 5, 2011	John Day River	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 snowpack 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 and High Ridge SNOTEL. The John Day River near Service Creek crested at 15.2 ft.
May 17, 2011	Service Creek	John Day River Flood: an upper-level low pressure system moved over the PNW. Moist and unstable conditions ahead of the low triggered widespread thunderstorms with heavy rainfall and isolated large hail. This combined with abundant spring snowpack and wet ground caused flooding a flash flooding. Service creek crested at 15.2 feet.
February 2, 2017	John Day	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. This was the result of an ice jam near Monument, OR, blocking the river and then breaking free.
March 16, 2017	John Day River	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 crested at 12.0 feet at 1815 on March 16 th , fell below flood stage and then rose again to 12.1 feet at 1900 on March 19 th . Fell below flood stage 0600 on 20 th .
April 9, 2019	Wheeler County	DD-4452. Grant, Umatilla, and Wheeler Counties declared. 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.
April 20, 2019	Mitchell	Total rainfall of 1.67 inches was recorded just east of Mitchell. This heavy rain over a short period of time triggered a flash flood through Huddleston Height and Nelson Street, and off of High Street and Rosenbaum with mud and debris blocking roads in and around the town of Mitchell. (flash flood)
May 21, 2020	Service Creek	Heavy rain with QPF amounts of 2-4 inches across the Blue Mountains, Blue Mountain Foothills and John Day Highlands produced area and river flooding on May 20 th and ending on May 21 st . Most of the flooding was minor. John Day River at Service Creek crested at 13.6 feet, flood stage is 11.5 feet.

Sources: Wheeler County NHMP Steering Committee, State of Oregon 2020 NHMP, Office of the Oregon Governor Executive Orders, <https://www.oregon.gov/gov/pages/executive-orders.aspx>

PROBABILITY, VULNERABILITY AND IMPACT

According to the Wheeler County Natural Hazards Mitigation Plan Steering Committee, the probability of flooding in the county is high meaning several events are likely in the next 5 years and county vulnerability is high meaning more than 10% of the population and property would be impacted by an average event. Flooding appears to happen regularly, with 12 events over the past 20 years with varying levels of damage.

A single flood event can cause millions of dollars in property damage, and pose a significant threat to human life and safety. The economic impacts of flooding on businesses, private citizens, the public sector and infrastructure e.g. roads and bridges can be significant. Businesses are often forced to close or curtail their operations, some are unable to reopen for weeks or months and many never reopen. Business owners and employees lose money in sales, damaged inventory, and wages. Individual property owners experience both property and structural losses.

The OCCRI report Appendix describes that the risk for flooding and heavy rain is expected to increase with climate change. 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% and 11% respectively by the 2050s. 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 temperatures causing precipitation to fall more as rain and less as snow.

The overall population of Wheeler County is expected to stay relatively stable, but the population of elderly residents is expected to increase to 8%, increasing their overall risk to flooding and other natural hazard events. There have been no new developments since 2019 that increase Wheeler County's overall risk to flooding. Wheeler County should be a high priority for updating Flood Insurance Rate Maps, as several areas of the county that have flooded significantly are not included on the FIRMs.

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).

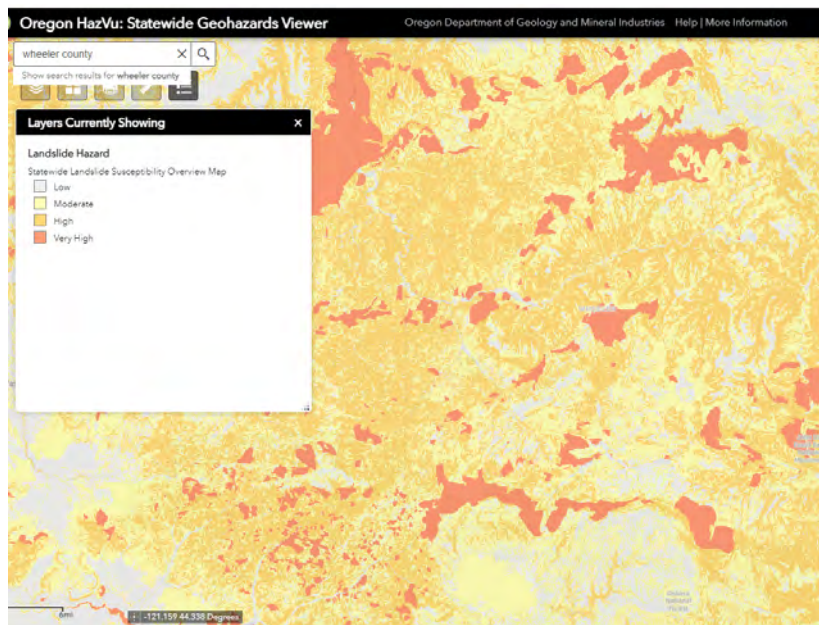
LOCATION/EXTENT

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

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. When a landslide 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

Figure 3.9 Landslide Susceptibility Wheeler County



Source: Oregon HazVu: Statewide Hazard Viewer

¹³ See Appendix I: Transportation Maps of Wheeler County.

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

HISTORY

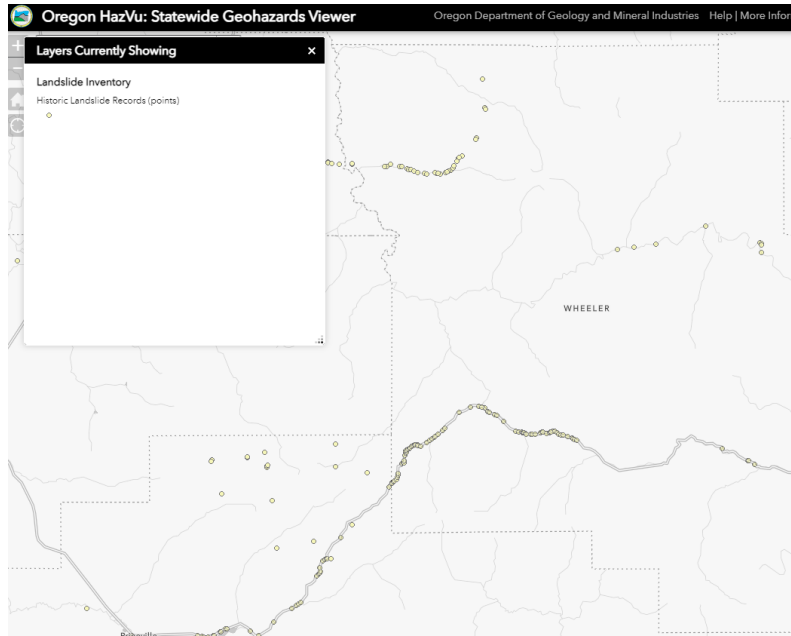
Table 3.6 identifies landslides/debris flows that have occurred recently in Wheeler County.

Table 3.6: 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).

Figure 3.10 Landslides in Wheeler County



Source: Oregon HazVu: Statewide Hazard Viewer

PROBABILITY, VULNERABILITY AND IMPACT

According to the Wheeler County Natural Hazards Mitigation Plan Steering Committee, the probability of a landslide event is high meaning several events are likely in the next 5 years and the vulnerability is high meaning more than 10% of the population and property would be impacted by an average event. While major landslides do not occur very often, small landslides occur on an almost annual basis, making them a common hazard. Figure 3.10 shows the landslide history for Wheeler County, including all landslides reported by the Oregon Department of Transportation. ODOT is responsible for clearing small rockfalls that do not count as major landslides, but under different circumstances could have a severe impact on the county, cutting off major transportation routes. Most landslides take place along Highway 26 running east to west across the southern end of the county, and along Highway 218 in the North West corner. Table 3.7 shows that the landslide risk for Wheeler County is high throughout most of the county, with areas of very high.

The OCCRI Report Appendix 3 states that the frequency of days with at least 1/4" of precipitation and the frequency of days exceeding the threshold for landslide risk is not projected to change substantially.

The overall population of Wheeler County is expected to stay relatively stable, but the population of elderly residents is expected to increase to 8%, increasing their overall risk to landslides and other natural hazard events. There have been no new developments since 2019 that increase Wheeler County's overall risk to landslides.

¹³ See Appendix I: Transportation Maps of Wheeler County.

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

Table 3.7: Landslide Susceptibility in Wheeler County

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 O-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 In the 2020 update to the State of Oregon NHMP, Extreme Heat was identified as a new natural hazard. The Wheeler County NHMP Steering Committee decided that extreme heat fit under the umbrella of severe weather, and include extreme heat in their definition of severe weather. Hot days are defined as days at or above 90 degrees. The State of Oregon has seen an increase in extreme heat events over the past several years, declaring a State of Emergency for extreme heat 4 times since 2020.

¹⁵ National Oceanic and Atmospheric Administration. “Severe Weather”. <https://www.noaa.gov/explainers/severe-storms#:~:text=When%20they%20contain%20strong%20winds%2C%20hail%20and%20tornadoes,of%20a%20quarter%29%20or%20larger%20and%20for%20a%20tornado.>

LOCATION/EXTENT

All of Wheeler County is subject to severe weather. Thunderstorm winds and hailstorms are a frequent occurrence in the county, as well as extreme heat events. 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. Wheeler County has not suffered any major damages from extreme heat events either.

HISTORY

Table 3.8 identifies significant severe weather events in Wheeler County, including ‘state of emergency for extreme heat,’ severe thunderstorms and hailstorms.

Table 3.8: Significant Severe Weather in Wheeler County

Date	Location	Description
May 17, 1997	May Ridge	Lighting struck and killed a man and the horse he was riding on May Ridge
August 1, 1997	Winlock/Fossil	Hail between 0.5 and 1.25 inches in magnitude reported. Many vehicles and sides of homes were damaged.
May 4, 1998	Mitchell	Heavy Rains and quarter inch hail reported. Culverts along the West Branch of Bridge Creek were washed out near Waterman.
July 10-14, 2002	Region 5-7	A record-breaking heat wave shattered many daily record high temperatures across the state, with a few locations breaking all-time records
July 19, 2004	Mitchell	A severe thunderstorm produced strong wind gusts estimated at 80-90 MPH. These winds knocked down numerous tree limbs.
August 15-17, 2008	Region 5-7	Excessive Heat Event: An upper-level ridge and dry air brought excessive heat into eastern Oregon. Many locations experienced multiple days of at least 100-degree temperatures.
June 4, 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.
August 4, 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 gusts to 69 mph.
April 23, 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 inch hail reported.
June 8, 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 of about 70 mph was reported 14 miles east of Mitchell. That same area received golf ball (1.75 inch) hail. Other areas that received hail ranging from penny to golf ball in size were: 1.75 in Monument, and 0.759 miles southeast of Spray.

Date	Location	Description
June 26, 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.
August 1-4 2017	Region 2-4, 6	Excessive Heat Event: Strong high pressure brought record breaking heat to many parts of southwest, south central, and northwest Oregon. Region 6 reported high temperatures during this interval ranged from 82 to 102 degrees.
May 30, 2020	Spray	A major severe weather event occurred over central and northeast Oregon and southeast Washington. A powerful upper-level storm system moved across the area during the afternoon and evening helping to trigger severe thunderstorms. The airmass was unusually unstable for this area of the country with surface dewpoints well into the 60s. With strong upper-level winds in place the stage was set for numerous fast-moving intense storms through the afternoon and early evening. Numerous reports of large hail and damaging winds, including 1.75-inch hail in Spray
June 25-26 2021	Multiple Counties	Determination of State of Emergency in Gilliam and 22 other counties due to excessive high temperatures causing a threat to life, health, and infrastructure.
2021	Statewide	Determination of State of Emergency in the State of Oregon due to excessive high temperatures causing a threat to life, health, and infrastructure.
July 2, 2022	Spray	An upper low in the eastern Pacific guided a moisture plume over the region, resulting in numerous rain showers developing across the region. Increasing instability from southerly flow aloft also resulted in thunderstorms developing, with a few storms producing hail stones over an inch in diameter, strong winds and brief, heavy downpours. Hail stones of up to 1 inch were reported 3 miles North of Spray.
2022	Multiple Counties	Determination of a State of Emergency in 25 Oregon Counties, including Wheeler due to Excessive high temperatures causing a threat to life, health, and infrastructure. 2022-13

Sources: Wheeler County NHMP Steering Committee, State of Oregon 2020 NHMP, Office of Oregon Governor Executive Orders, <https://www.oregon.gov/gov/pages/executive-orders.aspx>, NOAA National Center for Environmental Information and Storm Events Database

PROBABILITY, VULNERABILITY AND IMPACT

The Wheeler County Natural Hazards Mitigation Plan Steering Committee determined County probability for severe weather is high (meaning several events are likely in the next 5 years) and vulnerability is high (meaning more than 10% of the population and property would be impacted by an average event).

Weather patterns in the county have historically produced extreme heat, severe thunderstorms and hailstorms. Most county residents are prepared for these extremes, and county infrastructure can handle extreme temperature very well.

The OCCRI report (Appendix G) identifies that 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 degrees F is projected to increase on average by 29 days by the 2040s, while the temperature of the hottest day of the year is projected to increase by 8 degrees. Limited research suggest very little, if any, change in the frequency and intensity of windstorms, and the intensity of extreme precipitation events is expected to increase.

The most likely impact of extreme heat events is risks to agriculture, involving the health and welfare of farmers and other farm workers, crops and livestock. In hotter conditions, crops, livestock, and humans require more water. For example, on average, for each degree Fahrenheit increase in temperatures, plants use 2.5%-5% more water. High temperature and insufficient water stunt plant growth and cause areas of crops to wither. Due to the agriculturally based economy, there could be significant impacts to the local economy if extreme heat resulted in crop failure.

The impacts of large hail and extreme thunderstorms is damage to physical infrastructure, risk of human injury and life, and damage to crops. These events are extremely rare and while there has not been any significant damage as a result of them, Wheeler County remains vulnerable.

The overall population of Wheeler County is expected to stay relatively stable, but the population of elderly residents is expected to increase to 38%, increasing their overall risk to severe weather and other natural hazard events. There have been no new developments since 2019 that increase Wheeler County's overall risk to severe weather, but future developments, especially public high-capacity buildings should be fitted for generators so heat and cool can be maintained during power outages and severe weather events.

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.

¹⁶ Oregon Natural Hazards Mitigation Plan, Region 6: Central Oregon

¹⁷ Ibid.

¹⁸ Ibid.

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 regional volcanic history in the Cascade Mountain Range west of Wheeler County.²⁰

Table 3.9 Volcanic History in the Cascade Range

Date	Location	Description
About 4,000 to 3,000 YBP	Sand Mountain, central Cascades	Lava flows and cinder cones in Sand Mountain field.
About 3,000 to 1,5000 YBP	Belknap Volcano, central Cascades	Lava flows and tephra.
About 1,500 YBP	Timberline eruptive period, Mount Hood	Lava dome, pyroclastic flows, lahars, and tephra.
About 1,300 YBP	Newberry Volcano, central Oregon	Eruption of Big Obsidian flow.
1760–1810	Crater Rock/Old Maid Flat on Mount Hood	Pyroclastic flows in upper White River; lahars in Old Maid Flat; dome building at Crater Rock.
1980	Mount St. Helens (Washington)	Mt. St. Helens erupts: Debris avalanche, ashfall, and flooding on Columbia River. 57 people died.

Source: Oregon State Natural Hazards Mitigation Plan, 2020.

PROBABILITY , VULNERABILITY AND IMPACT

The Wheeler County Natural Hazards Mitigation Plan Steering Committee determined that the probability of a volcanic event is low meaning it is likely to be longer than 10 years in between events , but the vulnerability to an earthquake is high meaning more than 10 of the population and property would be impacted by an average event . It is unlikely that Wheeler County will be affected by lahars or pyroclastic flows directly, but ash fall out would be a problem and would likely fall over the entire county.

Mount St. Helens remains a probable source of ash fall. It has repeatedly produced voluminous amounts of this material and has erupted much more frequently in recent historical time than any other Cascade volcano. The location, size and shape of the area affected by ash fall are determined by the vigor and duration of the eruption and the wind direction. Because wind direction and velocity vary in both time and altitude, it is impossible to predict the direction and speed of ash transport more than a few hours in advance.

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

²⁰ Ibid.

Geoscientists have provided some estimates of future activity in the vicinity of Crater Rock, a well-known feature on Mount Hood. They estimate a 1 in 100 chance that some dome activity will take place in a 10 year period 1996-2026.²¹

Persons with respiratory problems are endangered, transportation, communications and other lifeline services are interrupted, drainage systems become overloaded/clogged, buildings can become structurally threatened and the economy takes a major hit when a region is impacted by a fall tephra fallout. Any future eruption of a nearby volcano e.g. Hood, St. Helens or Adams, occurring during a period of westerly winds would likely have adverse consequences for the county.

With Wheeler County's stable population and lack of developments that will be negatively impacted by volcanic ash, Wheeler County's risk from volcanic activity is not expected to increase.

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.²²

²¹ Oregon Natural Hazard Mitigation Plan, Region 6: Central Oregon

²² 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.

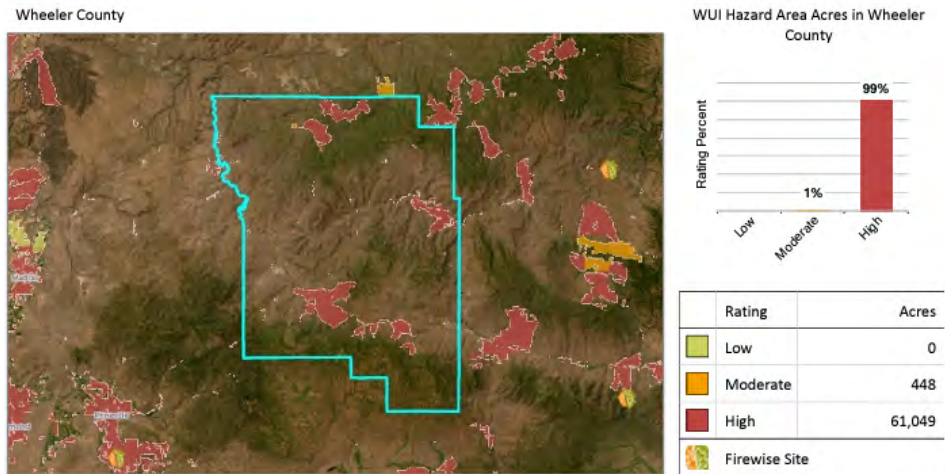
LOCATION/EXTENT

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

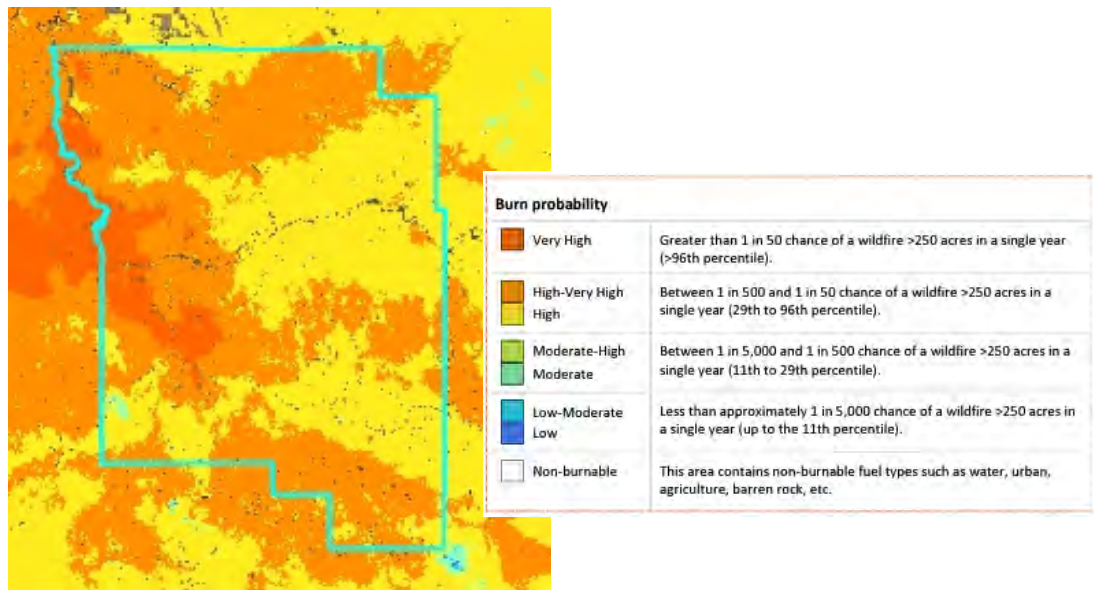
Community Wildfire Protection Plans. Areas of the county within the Wildland-Urban Interface include: Fossil (city), Mitchell (city), Spray (city), Barnhouse, Baty Subdivision, Camp Hancock, Crystal Springs, Kinzua Junction, the Painted Hills (John Day Fossil Beds National Monument), Richmond, Service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

Figure 3.11 Wildland Urban Interface Hazard Acres



92% of Wheeler County has a high very-high burn probability, with 6% of the county having a very high burn probability, with an expected flame length of 4.1 to 8 feet for 75% of the county under normal weather conditions. However, conditions vary wildly and with local topography, fuels and local weather including wind conditions. Under warm, dry, windy and drought conditions expect high likelihood of fire starts, higher intensity, more ember activity and a more difficult to control wildfire that will include more fire effects and impacts.

Figure 3.12: Extent of Wildfire Hazard (Burn Probability)

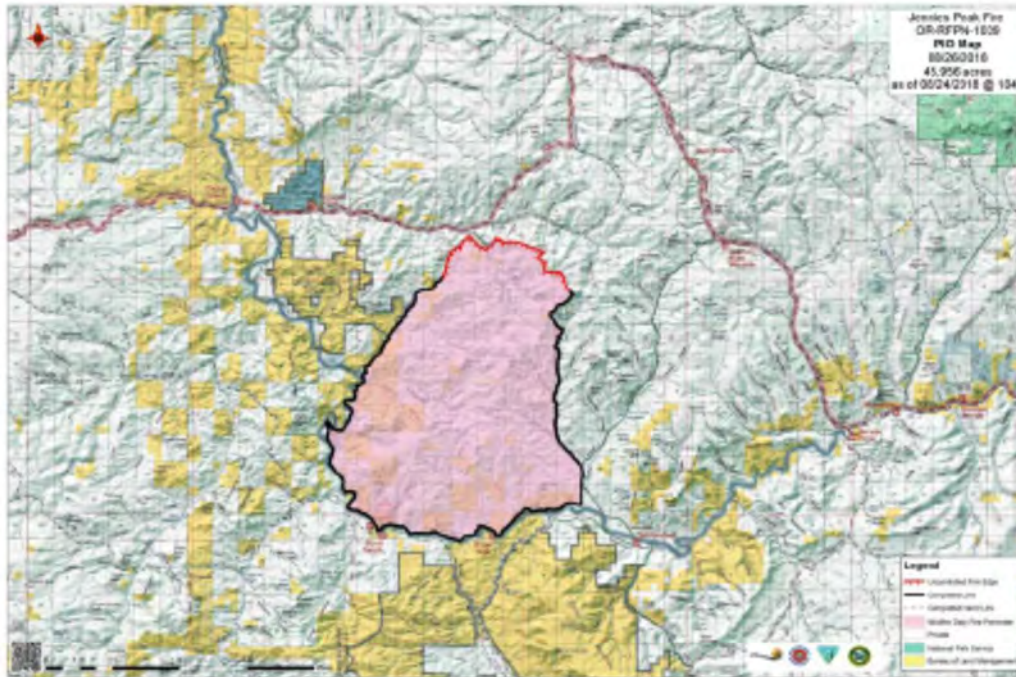


Source: Oregon Wildfire Risk Explorer-Advanced Report Wheeler County

HISTORY

Wheeler County has a long history of wildfires with large impacts to the community. In August of 1996, the Wheeler Point Fire burned more than 21,000 acres and caused \$600,000.00 in property damage and over \$2,381,822.00 in crop, timber and wildlife damages. In August of 2000, the Tamarack Creek Fire caused \$20,000.00 in property damage and over \$640,539.00 in crop, timber and wildlife damage. In 2018, Wheeler County had the Jeannie’s Peak Fire, the largest fire in their history which consumed 45,956 acres. Because of the rural nature and low population density of the County, the direct impact of the fire was limited in the scope to people and infrastructure. However, the fire did consume vast areas of range and timber land, mostly privately owned.

Figure 3.13: 2018 Jennie’s Peak Fire



Source: InciWeb Incident Information System, USFS.

Table 3.10 lists other significant historic wildfires in Wheeler County.

Table 3.10 Significant Historic Wildfires in Wheeler County

Date	Location	Description	Size
July 5, 1968	68953136	Lightning	4,009 acres
June 10, 1973	73953242	Lighting burned	643 acres
July 25, 1985	85953210	Equipment Use	2,436 acres
March 28, 1994	Reno Canyon	Debris burning got out of control	600 acres
July 9, 1994	First Creek	Lightning	3,220 acres
July 27, 1994	Parrish Creek	Lightning strike	1,740 acres
August 3, 1994	Big Springs	Lightning strike	1,770 acres
August 4, 1994	Badger	Lightning strike	1,000 acres

Date	Location	Description	Size
August 10, 1996	Wheeler Point	Equipment Use	21,980 acres
August 4, 2000	Tamarack Creek	Debris Burning	7,900 acres
July 10, 2001	Sentinel Peak	Equipment Use	3,500 acres
July 11, 2001	Blue Banks	Lightning	600 acres
November 7, 2002	Chamber Springs	Debris burning got out of control	1,080 acres
July 28, 2003	Frog Hollow	Lightning	752 acres
August 21, 2005	Wills Canyon	Lightning strike	895 acres
July 24, 2006	Maxwell	Lightning	7,000 acres
August 2, 2007	Shelton	Smoking	2,726 acres
August 7, 2008	Bridge Creek	Lightning	4,891 acres
July 24, 2009	McGinnis Creek	Equipment	3,417 acres
July 13, 2014	Pine Creek Complex	Lightning strike	30,257 acres
July 14, 2014	Bailey Butte	Lightning	10,276 acres
August 17, 2018	Jennie's Peak	Unknown	45,956 acres
August 17, 2018	Ricks Creek	Lightning	100 acres
August 19, 2020	Laurel	Lightning	1,280 acres
August 5, 2020	Buckhorn Creek	Lightning	233 acres
2020	Haystack	Debris burning	117
June 30, 2021	Lewis Rock 21160	Lightning	368 acres
July 30, 2021	Cottonwood Creek 21279	Lightning	159 acres
2022	Staube	Debris Burning	69.5 acres

Sources: Wheeler County NHMP Steering Committee, State of Oregon 2020 NHMP, Office of Oregon Governor Executive Orders, <https://www.oregon.gov/gov/pages/executive-orders.aspx>, Oregon Department of Forestry <https://data.oregon.gov/Natural-Resources/ODF-Fire-Occurrence-Data-2000-2022/fbvw-q84y>

PROBABILITY, VULNERABILITY AND IMPACT

The Wheeler County Natural Hazards Mitigation Plan Steering Committee determined that the probability of wildfires in the County is high meaning several events are likely in the next 5 years and county vulnerability is high meaning more than 10% of the population and property would be impacted by an average event. Wildfires occur annually but they rarely impact people. More often they consume agricultural fields, pasture, forestland and utility infrastructure. All communities in Wheeler County are considered part of the Wildland Urban Interface.

The OOCRI report (Appendix G) identifies that the risk of wildfires is increasing. Wildfire risk, as expressed through the frequency of very high fire danger days, is projected to increase by 14 days by the 2050s, with the frequency of very high fire danger days projected to increase by about 39%. Warmer and drier conditions during the summer months have contributed to an increase in fuel aridity and enabled more frequent large fires. The lengthening of the fire season is largely due to declining

mountain snow pack and earlier spring snow melt. Additionally, warmer drier summers coupled with decreases in summer soil moisture contribute to more high fire danger days.

Disruption to the municipal water supply and irrigation water supply from wildfires would negatively impact all of the residents and agricultural operators that depend on this resource by reducing water quality and availability. Roads, bridges and evacuation routes could be compromised, limiting the ability of firefighters to reach the fire as well as inhibiting evacuation procedures. Utilities, such as electrical and gas distribution lines as well as communications infrastructure are also at risk.

Wheeler County's population is expected to remain relatively stable over the next 20 years, but the population is expected to change to over 38% of residents being 65 or older. This will result in less volunteers for local fire departments, which are already struggling to recruit, increasing overall wildfire risk. Developments in the last five years have not increased wildfire risk, but all future developments need to consider wildfire mitigation activities and structures should be built with wildfire resistant practices in the forefront. Distance from an active fire department has recently become a large issue for receiving wildfire insurance, so all future developments should take fire department location into consideration prior to breaking ground.

The Deschutes Collaborative Forest Project

An excellent source of information for 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.

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 3.11 identifies the probability of severe wind events in the region as identified in the State of Oregon Natural Hazards Mitigation Plan in 2020.

Table 3.11: 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)	70 mph	80 mph	90 mph

Source: State of Oregon Natural Hazards Mitigation Plan, Region 6: Central Oregon Risk Assessment.

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

HISTORY

While regular strong winds are prevalent throughout Wheeler County, they rarely cause widespread damage to the sparsely populated community. Residents of the county plan on windstorms, and are not overwhelmed even during strong wind events.

²⁶ Oregon Natural Hazards Mitigation Plan, Regional Risk Assessments, Region 6: Central Oregon

TABLE 3.12 Significant Windstorms in Wheeler County

Date	Location	Description
May 25, 2012	Mount Vernon	A brief gust with swirling winds caused minor damage to a residence 4 miles southeast of Mt. Vernon. Sheet metal was pulled off a building and boards were twirled around Mount Vernon, a community just east of Wheeler County in the John Day Basin.
February 17, 2018	Foothills of the Southern Blue Mountains	High wind. A Pacific storm system moved across the region causing strong winds over a good portion of the area from late morning into the evening. Measured peak gust of 61 mph occurred 4 miles SSW of Fossil.
April 2019	Curry, Douglas, Linn, Wheeler, Grant, and Umatilla	FEMA-4452-DR: Severe storms, straight-line winds, flooding, landslides, and mudslides

Sources: Wheeler County NHMP Steering Committee, State of Oregon 2020 NHMP, NOAA, <https://www.ncdc.noaa.gov/stormevents>

PROBABILITY, VULNERABILITY AND IMPACT

The Wheeler County Natural Hazards Mitigation Plan Steering Committee determined that the probability windstorms in the County is medium meaning 5-10 years is expected between major events and that the vulnerability to windstorms is medium meaning 1-10% of the population and property would be impacted by an average event. Strong winds occur regularly, but rarely do they have any impact on the community.

The OCCRI report (Appendix G) states that limited research suggest very little, if any, change in the frequency and intensity of windstorms in Wheeler County as a result of climate change.

High winds occur yearly in Wheeler County. Many buildings, utilities and transportation systems are vulnerable to wind damage, especially those near forested areas where trees have potential to blow over. Structures most vulnerable to high winds include insufficiently anchored manufactured homes and older buildings in need of roof repair.

The overall population of Wheeler County is expected to stay relatively stable, but the population of elderly residents is expected to increase to 8%, increasing their overall risk to windstorms and other natural hazard events. There have been no new developments since 2019 that increase Wheeler County's overall risk to flooding.

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 and 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.

HISTORY

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.

Table 3.1 contains a list of other significant winter storms in Wheeler County.

Table 3.13: Significant Winter Storms in Wheeler County

Date	Location	Description
January 1950	Statewide; Fossil and Mitchell	Snow was heaviest during this January than ever before since the beginning of weather record keeping which began in 1890. Fossil had 49.3 inches of snow and Mitchell: 25.8 inches.
February 2004	Wheeler County and several other counties	Designated as a disaster by FEMA due to severe winter storms. Wheeler County was one of two counties to be amended into the declaration on March 4, 2004.
November 26, 2006	Ochoco John Day Highlands	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	Blue Mountains	A vigorous upper-level trough combined with a stationary front lying northeast to southwest across the Blue Mountains produced heavy snow.
January 8, 2008	Wheeler County	An upper-level trough and associated cold front brought heavy snow.
January 26-28, 2008	Wheeler and across Oregon	Two low pressure areas combined with a slow-moving cold front produced sustained heavy snow and freezing rain across Oregon. Snowfall in inches included Condon (10), 1 mile northeast of Fossil (9.5), 6 miles northeast of Mitchell (6), 2 miles east of Mitchell (9) and Mitchell (7).
December 12-14, 2008	Wheeler	An arctic front brought heavy snow and much below normal temperatures.
November 21, 2010	Wheeler and across Oregon	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 24 th . Sub-zero temperatures were observed at several locations Mitchell (-1).

Date	Location	Description
February 7, 2014	Wheeler County, Mitchell	Snowfall of 6 inches at Mitchell. Widespread snow across north-central Oregon.
December 24, 2014	Wheeler County	A storm system moved into the interior Pacific Northwest on Christmas Eve providing significant snow accumulations of the Blue Mountains and the Ochoco and John Day highlands. Snow accumulations of 6 inches near Mitchell.
December 12-13, 2015	Wheeler County	Several pacific storm systems moved across the region. Each storm system brought several inches of snow to the mountain areas. Snowfall amount of 13 miles southwest of Mitchell.
December 14, 2016	15 Miles West of Mitchell	Estimated heavy snow accumulation of 10 inches in the Ochoco Mountains.
February 23-27, 2019	Central and North Central Oregon	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. Snowfall rates were enhanced over central Oregon with the proximity of a stationary surface boundary where snowfall rates were in excess of 1 inch per hour. Snowfall amounts were measured at 16 inches in Mitchell.
November 26, 2019	Central and North Central Oregon	Heavy snow fell across central and north central Oregon producing 4 to 10 inches of snow. Heavy snow resulted in 10 inches of Accumulation 14 SE of Mitchell.
January 10-13 2020	Southern Blue Mountains	Heavy snow was reported over the mountains and High Valleys with 6 to 12 inches of accumulations reported in many locations. Eight inches of snow fell 1 mile south of Long Creek and 11 miles NNE of Spray.
February 11-13 2021	John Day Basin	A series of winter systems moved through the region and produced moderate to heavy snow across much of the forecast area. Persistent northwest flow aloft also sustained snow showers across the mountains between systems. The second system was far more productive, with many lower elevation areas seeing 4-7 inches and locally higher additional accumulating snow during this period. A CO-OP observer 1 mile SE of Spray measured 6 inches of snow.
December 30-31, 2021	Fossil	A strong upper-level shortwave with a modified arctic cold front brought moderate to heavy snow showers across the Cascades, Blues and Wallowa's, with moderate to heavy snow being observed along the Blue Mountain foothills and in valley locations across the northeast Oregon Mountains. 5 miles SE of Fossil 11 inches of new snow was measured.
April 10, 2022	Mitchell	An upper trough pushed several low-pressure systems across the PNW in the middle of April. The trough allowed for a much colder than normal air mass to settle into portions of eastern Washington and Oregon, allowing snow levels to drop to the surface across a majority of these areas. This resulted in snow accumulations in the mountains and lower elevations with significant snow accumulations being observed in some mountain zones. The Ochoco Meadows SNOTEL 13 miles southwest of Mitchell measured 8 inches of new snow in a 24-hour period.

Sources: Wheeler County NHMP Steering Committee, State of Oregon 2020 NHMP, Office of Oregon Governor Executive Orders, <https://www.oregon.gov/gov/pages/executive-orders.aspx>

PROBABILITY, VULNERABILITY AND IMPACT

The Wheeler County Natural Hazards Mitigation Plan Steering Committee determined that the probability of winter storms in the County is high meaning several events are likely in the next 5 years and county vulnerability is high meaning more than 10% of the population and property would be impacted by an average event .

The OCCRI Report (Appendix G) identifies that the risk for cold extremes is 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, and the temperature of the coldest night of the year is projected to increase by 9 degrees by the 2050s under the higher emissions scenario compared to the historical baseline.

While winter storm events have relatively predictable and longer speeds of onset, the effects of winter storms can often be long lasting. The most likely impact of snow and ice events on Wheeler County are road closures limiting access/egress to/from some locations, especially roads to higher elevations. Winter storms with heavy wet snow or high winds and ice storms may also result in power outages from downed transmission lines and/or poles. Heavy ice has been known to damage structures as well. Winter storms which bring snow, ice and high winds can cause significant impacts on life and property. Deaths related to winter storms can occur as a result of traffic accidents on icy roads and hypothermia from prolonged exposure to the cold. Low temperatures and temporary loss of home heating can be particularly hard on the elderly, young children, and other vulnerable individuals. In the rural areas of Wheeler County, severe winter storms can isolate small communities, farms, and ranches. If Wheeler County's population remains the same, and decreases in unincorporated areas, risk will decrease. However, the predicted increase in the elderly population will increase Wheeler County's risk, as older adults are much more vulnerable to extreme cold. There have been no new developments in the past five years that have increased the county's vulnerability to winter storm events. New developments should be built with transportation routes in mind and should be easily accessible even during winter storms.

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

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

Table 3.14 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, landslide/debris flow, severe weather, wildfire, and winter storm.

Table 3.14: 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	10	7	70	High
Severe Weather	10	7	70	High
Volcanic Event	1	7	7	Low
Wildfire (WUI)	10	7	70	High
Windstorm	8	7	56	Medium
Winter Storm	10	7	70	High

Source: Wheeler County NHMP Steering Committee, Updated August 7, 2021.

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 3.15 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 2022 American Community Survey estimates, Census figures from the U.S. Census Bureau, persons 60 and older made up 46-percent of the population in Wheeler County.²⁹ Furthermore, out of the 6 0 household located in the county, 1 2 21-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 978 0

Licensed for Residential Care, not for Assisted Living

Licensed for 4 residents

Facilities: 19 apartments

²⁹ American Community Survey (5-Year) Estimates, U.S. Census Bureau S0101 Age and Sex

Youth

Wheeler County has a small youth population, with only 17 out of 60 households having individuals under 18. Only 16.9% of the population is under 18 years old.

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 2023, Wheeler County had an estimated 85,60 overnight visitor stays.¹ 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 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 2022 American Community Survey from the U.S. Census Bureau, 42.24% - percent of all residents in Wheeler County have some form of a disability.

Hearing disability: According to 2022 Census estimates, 21.15-percent of all county residents have a hearing disability.² 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.

¹ The Economic Impact of Travel Oregon, Dean Runyan and Associates. April 2024. Prepared for Travel Oregon <https://industry.traveloregon.com/wp-content/uploads/2024/05/Final-Economic-Impact-Report-2023.pdf>

² 2022 American Community Survey 5-Year Estimates, U.S. Census Bureau S1810 Disability Characteristics

Vision disability: According to 2022 Census estimates, 70.5-percent of all county residents have a vision disability. 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 2022 Census estimates, 141.10.7-percent of all county residents have a cognitive disability.⁴ 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 2022 Census estimates, 152.11.6-percent of all county residents have an ambulatory disability.⁵ The US Census defines ambulatory disability as a person having serious difficulty walking or climbing stairs.

Independent living: According to 2022 Census estimates, 52.4.4-percent of all county residents have an independent living disability.⁶ 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 2022, the poverty guideline for a family of four equaled income levels at or below \$20,000. The Census Bureau estimates that 12.1 percent of the total population and 17.8-percent of children live below the poverty level across the country, and both of these levels have increased since 2005. 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 24.3-percent and the percentage of the total population living in poverty is 14.1-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.

2022 American Community Survey 5-Year Estimates, U.S. Census Bureau S1810 Disability Characteristics

⁴2022 American Community Survey 5-Year Estimates, U.S. Census Bureau S1810 Disability Characteristics.

⁵2022 American Community Survey 5-Year Estimates, U.S. Census Bureau S1810 Disability Characteristics.

⁶2022 American Community Survey 5-Year Estimates, U.S. Census Bureau S1810 Disability Characteristics

Table 3.15: 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
Elderly residents	X	X	X	X	X		X	X	X
Disabled residents	X		X	X	X		X	X	X
Low income residents	X		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									
Elderly 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		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, August 7, 202 .

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.⁷

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.⁸

Table .16 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 6: Central Oregon

Table 3.16 Vulnerable Critical Infrastructure, Assets and Services in Wheeler County

Wheeler County Critical Infrastructure and Facilities	Drought	Earthquake	Flood	Landslide	Severe Weather	Volcanic Event	Wildfire	Windstorm	Winter Storm
Wheeler County									
Agricultural land (farms/ranches)	X				X	X	X	X	X
Bridge(s) over Bridge Creek		X	X						
Communications and Electrical Power		X	X		X			X	X
Federal Aviation Administration Radar Dome					X		X	X	x
County Roads (31 total and 260 miles) Rowe Creek Road, Kahler Basin Road, Bridge Creek/Burnt Ranch Road, and Parish Creek/Waterman Road		X	X	X	X		X		X
US Highway 26, Oregon Route 19, Oregon Route 207, Oregon Route 218		X	X	X	X		X		X
Oregon State Police and Wheeler County Sheriff's Office (Fossil)	X		X		X		X		X
Wheeler County Fair Grounds	X	X			X	X	X	X	X
Painted Hills and John Day Fossil Beds National Monument	X	X	X	X	X	X	X	X	X
John Day River	X	X	X	X	X	X	X	X	X
Forest(s)/woodland areas (Ochoco National Forest, Umatilla National Forest)	X			X	X		X	X	X
County Parks (Bear Hollow County Park, Shelton Wayside County Park)	X		X		X		X		X
Mt. Pisgah Lookout, eight miles southwest of Mitchell		X		X	X		X		X
Rancheria (Rancheria) Rock Lookout, seven miles southeast of Fossil		X		X	X		X		X
Oregon Paleo Learning Institute	X	X		X	X		X		X
Hancock Field Station	X				X		X		X
City of Fossil									
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 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 County Critical Infrastructure and Facilities	Drought	Earthquake	Flood	Landslide	Severe Weather	Volcanic Event	Wildfire	Windstorm	Winter Storm
City of Fossil									
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		
Fossil City Parks (4)	X			X	X		X		X
City of Mitchell									
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		X				X
Mitchell Fire and Ambulance		X	X	X			X	X	X
Mitchell City Park	X			X	X		X		X
City of Spray									
City Hall		X	X		X				X
Spray School (built in 1955)		X	X		X				X
Spray Volunteer Fire Department					X		X		X
Spray River Front Park	X		X		X				X

Source: Wheeler County NHMP Steering Committee, August 2023.

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 3.17 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 3.17: 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%)

Source: Oregon Department of Geology and Mineral Industries, Statewide Seismic Needs Assessment, 2006

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 3.18 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 3.18: 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	10	5	50	High
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, August, 202

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 3.19: 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: FEMA OPEN FEMA Dataset NFIP Community Status Book-v1; ^ P = Participating, NP = Not Participating

Table 3.20 illustrates that as of May 20, 2024, 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 3.20: NFIP Repetitive Loss and Severe Repetitive Loss Summary

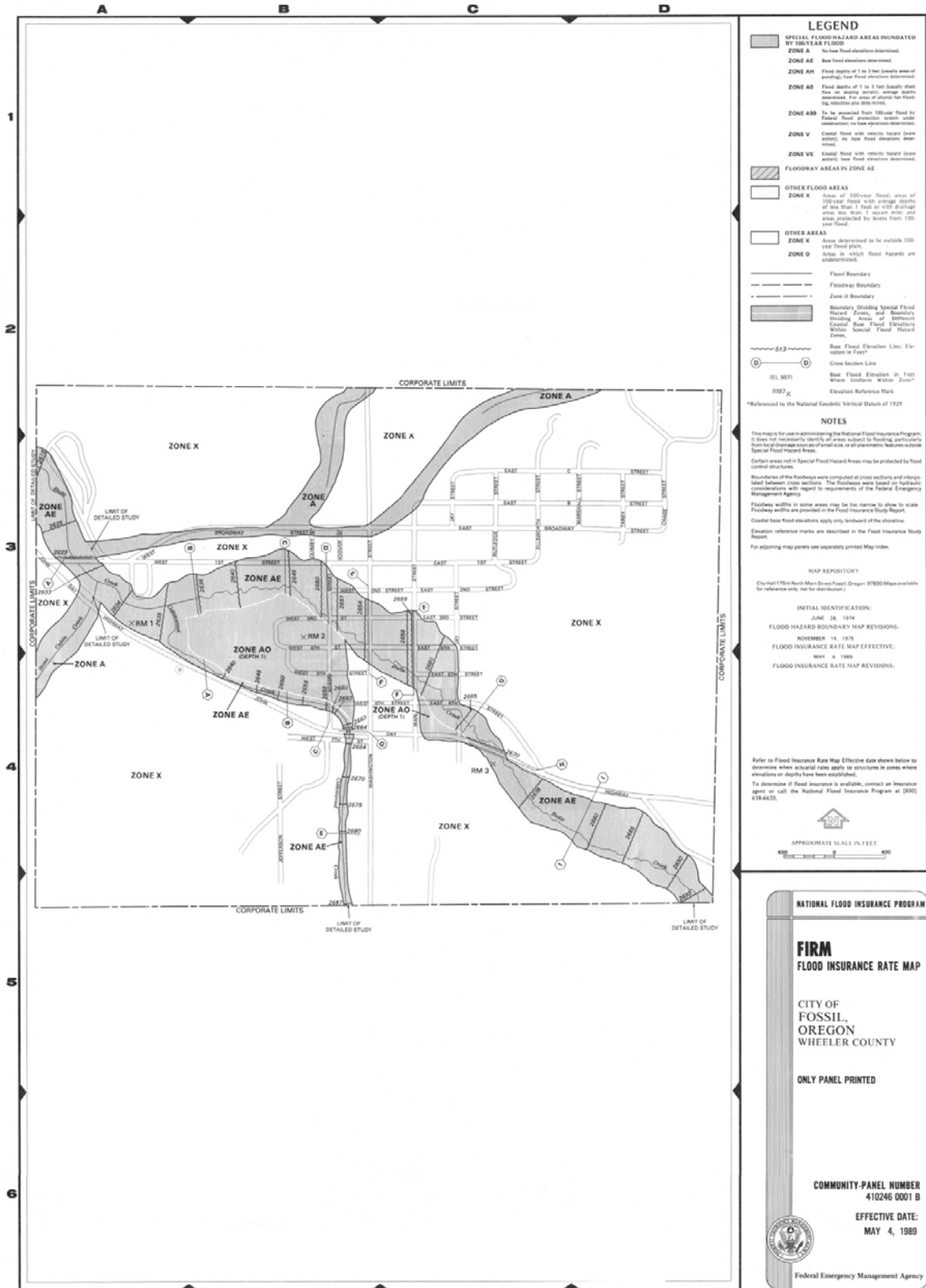
Jurisdiction	#RL Properties	# SRL Properties-Validated	# SRL Properties-Pending
Wheeler County	0	0	0
Fossil	0	0	0
Mitchell	0	0	0
Spray	0	0	0
Totals	0	0	0

Source: FEMA Community Information System CIS database

NATIONAL FLOOD INSURANCE POLICY MAPS

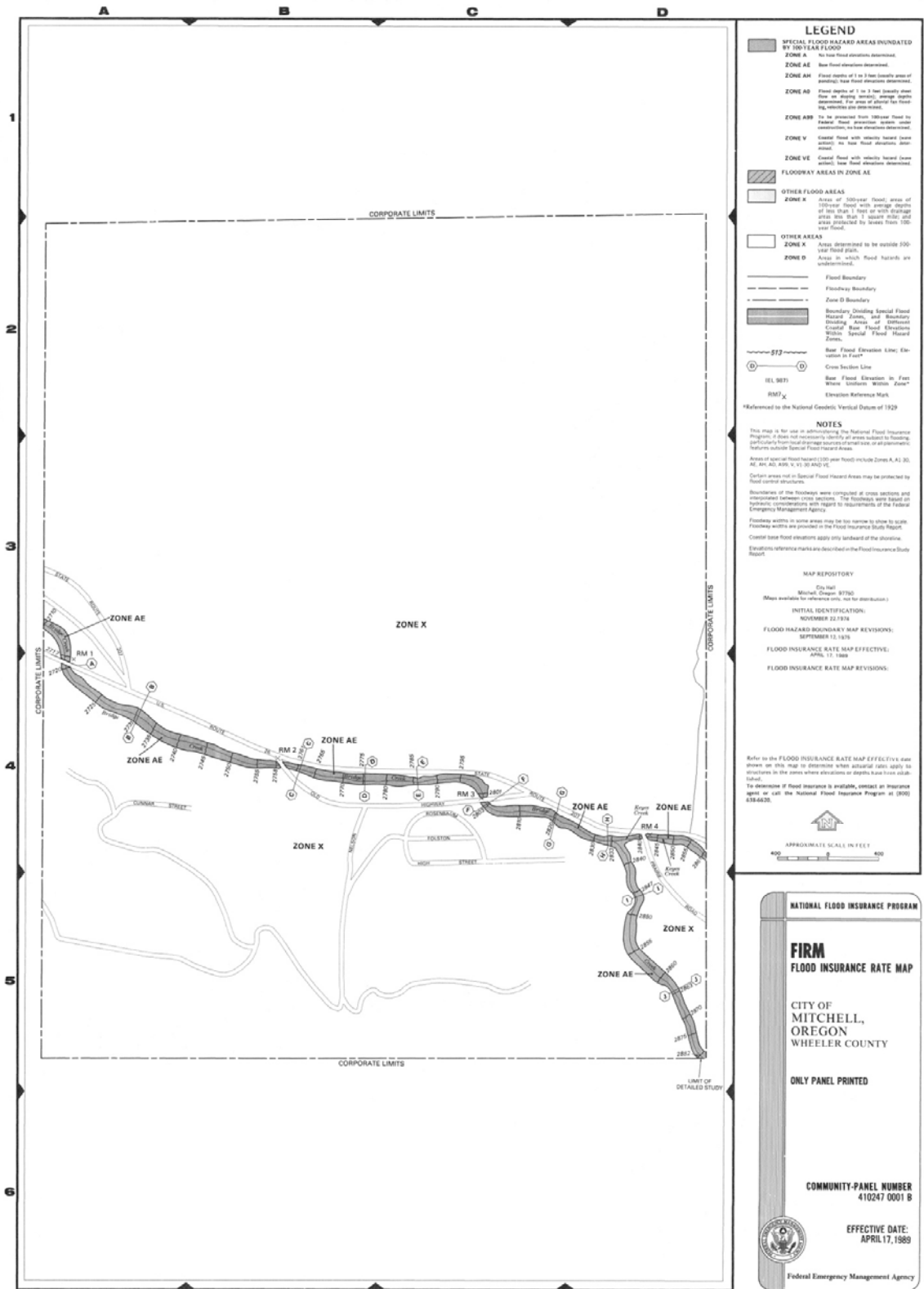
The following maps are National Flood Insurance Policy Maps (FIRMs) from FEMA. Figure 3.14 is the City of Fossil, Figure 3.15 is the City of Mitchell, and Figure 3.16 is the City of Spray. Each map is from 1989 and elevation levels are determined on each map.

Figure 3.14: City of Fossil FIRM



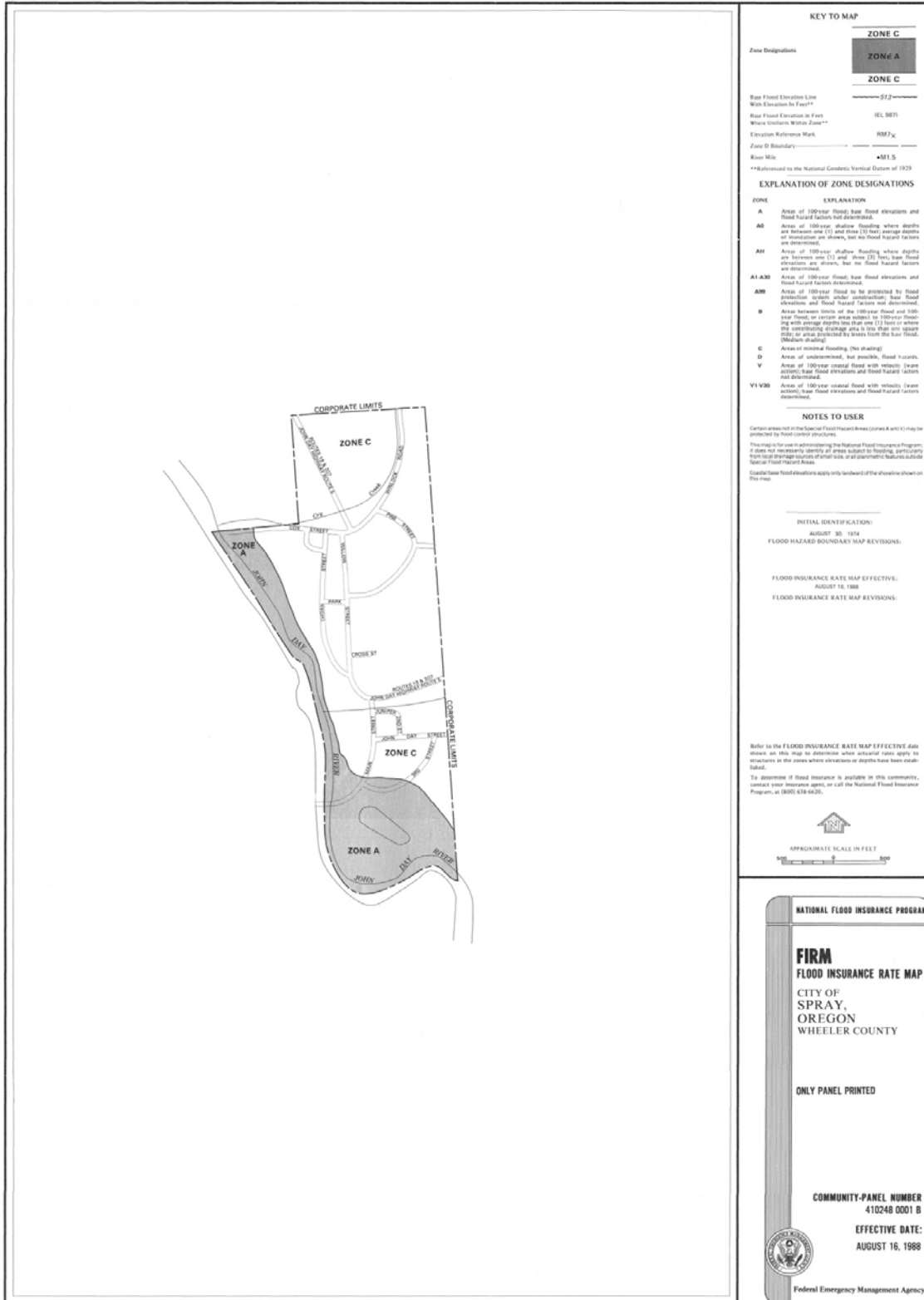
Source: FEMA

Figure 3.15: City of Mitchell FIRM



Source: FEMA

Figure 3.16: City of Spray FIRM



Source: FEMA

Table 3.21 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, drought and severe weather are tied as the three highest ranked hazards in Wheeler County. Winter storm and floods are tied for second highest hazard scores, with landslide/debris flow closely behind. Windstorms, volcanic events and earthquakes make-up the three 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, windstorms have a lower maximum threat than earthquakes, but their probability of occurring is significantly higher. The hazard scores are influenced by not one or two of the categories, but all four combined.

Table 3.21: Hazard Analysis Matrix – Wheeler County

Hazard	History			Vulnerability			Probability			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	5	50	10	7	70	10	10	100	240	1
Drought	10	2	20	10	5	50	10	7	70	10	10	100	240	1
Severe Weather	10	2	20	10	5	50	10	7	70	10	10	100	240	1
Winter Storms	9	2	18	10	5	50	10	7	70	10	10	100	238	2
Floods	9	2	18	10	5	50	10	7	70	10	10	100	238	2
Landslide/Debris Flow	7	2	14	10	5	50	10	7	70	10	10	100	234	3
Windstorms	3	2	6	5	5	25	8	7	56	8	10	80	167	4
Volcanic Events	0	2	0	10	5	50	1	7	7	10	10	100	157	5
Earthquakes	0	2	0	8	5	40	1	7	7	9	10	90	137	6

Source: Wheeler County NHMP Steering Committee, August 202 .

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 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 C.

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 whole community 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 2024 Wheeler County NHMP Steering Committee.

Existing Mitigation Actions

The 2024 Wheeler County Natural Hazard Mitigation Plan (NHMP) contains a number of action items that have been continued from the 2019 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 progress), Short Term (1-3 years), Medium Term (4-7 years) and Long Term (7-10 years). Mitigation actions have also been given a high, medium, or low priority status.

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 project for grant funding. These action item commentaries are located in Appendix A.

Listed below are mitigation action items identified in the previous version of the Wheeler County NHMP that are in progress or have been completed with further activities to occur identified in Appendix A, Action Item Forms. The following descriptions comprise the status update of the 2019 mitigation actions.

2019/2024 Multi-Hazard Action Item #1-Maintain an inventory of public buildings that may be particularly vulnerable to natural hazards in Wheeler County.

- Ongoing: This was completed after the 2019 plan update. This document is now routinely maintained and updated as buildings are constructed or taken out of service.

2019/2024 Multi-Hazard Action Item #2-Seek funding for the implementation of priority projects that reduce the vulnerability of critical public facilities in Wheeler County.

- Ongoing: Wheeler County is continuously implementing a small number of projects.

2019/2024 Multi-Hazard Action Item #3-Work with utilities operating in Wheeler County to establish ongoing tree-pruning programs around transmission lines and trunk distribution lines.

- Ongoing: This is a routine task that is done on a regular basis.

2019/2024 Multi-Hazard Action Item #4- Reduce the effects of natural hazards on existing utility lines.

- Ongoing: This is a routine task that is done on a regular basis.

2019/2024 Multi-Hazard Action Item #5-Maintain the comprehensive impact database on severe natural hazard events in Wheeler County.

- Ongoing: This was completed after the 2019 plan update. This document is now routinely maintained and a layer for historic fires has been added to Wheeler County’s GIS application. Work is being done on a flood overlay for the GIS application.

2019/2024 Multi-Hazard Action Item #6-Seek funding for generators for critical facilities.

- Ongoing: In progress, Wheeler County is currently attempting to purchase generators for several buildings.

2019/2024 Multi-Hazard Action Item #12-Identify opportunities to reduce existing barriers to interagency cooperation and work together to reduce risks and loss from natural hazards.

- Ongoing: This is a routine task that is done on a regular basis.

2019/2024 Multi-Hazard Action Item #13-Secure funding to improve infrastructure that will increase the capacity and availability of water to protect the City of Fossil from natural hazards (i.e., drought, wildfire, etc.) that occur on an annual basis.

- Ongoing: Funding has been secured for this project. The City of Fossil is currently seeking contractors to complete the work.

2019/2024 Multi-Hazard Action Item #14-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: newsletter, social media platforms, such as Facebook, radio, television, internet vlogs, videos, podcasts and presentations to local civic and business groups.

- Ongoing: In progress. Part of regular Emergency Management Outreach. In 2024 Wheeler County Emergency Management began working closely with OSFM and ODF on Wildfire outreach.

2019/2024 Multi-Hazard Action Item #15-Increase by 25 the number of people in Wheeler County signed up for the Everbridge Frontier Regional Alert System.

- Ongoing: In progress. Everbridge is undergoing significant updates and will require increased outreach in 2024 and beyond.

2019/2024 Multi-Hazard Action Item #16- 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.

- Ongoing: Public Health distributed air conditioning units and air scrubbers to a limited number of individuals throughout the county.

2019/2024 Multi-Hazard Action Item #17-Invest in and promote community gardens and local food production.

- Ongoing: In progress. Gardening is being promoted throughout the county, Mitchell is starting a “take some, leave some” garden program and produce stand.

2019/2024 Multi-Hazard Action Item #18-Invest in and promote solar and other alternative energy in public, residential and commercial properties.

- Ongoing: No Action. Retained for 2024 update.

2019/2024 Multi-Hazard Action Item #19-Develop hazard specific evacuation plans that consider likely impacts to bridges, other key transportation infrastructure and lifelines.

- Ongoing: In progress. A planning group has been formed to complete this task, they met several times in 2023 and are planning to meet several times in 2024.

2019/2024 Drought Action Item #1-Make available to county residents and the public information regarding droughts.

- Ongoing: In progress. Part of regular emergency management outreach.

2019/2024 Drought Action Item #2-Promote the planting of native and drought resistant plants that require less water during drier conditions.

- Ongoing: No Action. Retained for 2024 update.

2019/2024 Drought Action Item #3-Provide water conservation education to kids in schools.

- Ongoing: In progress. The Soil and Water Conservation District conducts outreach in schools, including field trips to see water savings strategies enacted.

2019/2024 Drought Action Item #4-Develop a drought emergency plan.

- Ongoing: No Action. Retained for the 2024 update.

2019/2024 Drought Action Item #5-Consider requiring water conservation during drought conditions.

- Ongoing: In progress. Cities regulate water usage during drought and irrigation is shut down by Water Resources during drought.

2019/2024 Earthquake Action Item #1-Make available to county residents and the public information regarding earthquakes.

- Ongoing: In progress. Part of regular emergency management outreach.

2019/2024 Earthquake Action Item #2-Seek funding through the State office of Emergency Management and/or the Federal Emergency Management Agency to seismically retrofit critical facilities with a high collapse potential rate by the Department of Geology and Mineral Industries.

- Ongoing: No Action. Retained for the 2024 update.

2019/2024 Flood Action Item #1-Make available to county residents and the public information regarding floods and their potential impact on Wheeler County.

- Ongoing: In progress. Part of regular emergency management outreach.

2019/2024 Flood Action Item #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.

- Ongoing: In progress. The City of Fossil has adopted the ordinance. Spray and Mitchell are in progress.

2019/2024 Flood Action Item #3- Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency to construct, install and maintain a “Flash Flood Warning System” that has been designed to protect lives and property in the City of Mitchell.

- Ongoing: In progress. Mitchell is working on this on Nelson Street with FEMA.

2019/2024 Flood Action Item #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.

- Ongoing: In progress.

2019/2024 Flood Action Item #5- Coordinate with the State Floodplain Coordinator and the DLCDC to update the FEMA Flood Insurance Rate Maps for Wheeler County and the incorporated cities participating in the National Flood insurance Program and Risk Map.

- Ongoing: No Action. Wheeler County, The City of Fossil and the City of Mitchell participate in the NFIP. FIRMS for Wheeler County and incorporated Cities are current as of 1989. Wheeler County was informed they are a low priority for the State of Oregon to update.

2019/2024 Landslide/Debris Flow Action Item #1- Make available to county residents and the public information regarding landslides/debris flow.

- Ongoing: In progress. Part of regular emergency management outreach.

2019/2024 Landslide/Debris Flow Action Item #2- Develop education and public outreach to engage adjacent landowners to improve slope management practices.

- Ongoing: In progress. Changed responsibility to the Soil and Water Conservation District who regularly provides outreach to landowners on slope management and soil conservation.

2019/2024 Landslide/Debris Flow Action Item #3- Explore low-cost mitigation options, such as maintenance of slide fences, ditches, and other drainage facilities.

- Ongoing: No Action. Retained for the 2024 update.

2019/2024 Volcanic Event Action Item #1- Make available to county residents and the public information regarding volcanic events.

- Ongoing: In progress. Part of regular emergency management outreach.

2019/2024 Volcanic Event Action Item #2- Evaluate the County’s Emergency Operations Plan with regard to preparing for a volcanic event.

- Ongoing: In progress. Wheeler County is looking to update their EOP in 2024.

2019/2024 Wildfire Action Item #1- Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to reduce wildland fire risk in Wheeler County.

- Ongoing: In progress. While this is a routine mitigation action, it is a crucial part of the County's wildfire resilience strategy.

2019/2024 Wildfire Action Item #2-Conduct risk assessment activities with the Wheeler County Community Wildfire Protection Plan local Coordinating Group to assess areas in the county at risk from wildland fires.

- Ongoing: In progress. While this is a routine mitigation action, it is a crucial part of the County's wildfire resilience strategy.

2019/2024 Wildfire Action Item #3-Coordinate information and outreach activities with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to promote fire prevention and risk reduction.

- Ongoing: In progress. While this is a routine mitigation action, it is a crucial part of the County's wildfire resilience strategy.

2019/2024 Wildfire Action Item #4-Work with the CWPP Local Coordinating Group to implement fuel reduction strategies to reduce the risk to wildland fires, including conducting a full count-wide wildfire hazard risk assessment.

- Ongoing: In progress. While this is a routine mitigation action, it is a crucial part of the County's wildfire resilience strategy.

2019/2024 Wildfire Action Item #5-Make available to County residents and the public information regarding wildfires.

- Ongoing: In progress. Part of regular emergency management outreach.

2019/2024 Wildfire Action Item #6-Provide Wheeler County Road Department with firefighting training and equipment.

- Ongoing: In progress. A tank and pump were purchased for the Road Department. They receive annual required training.

2019/2024 Wildfire Action Item #7-Assist Rural Fire Protection Districts and City Fire Departments in maintaining and upgrading their firefighting equipment, facilities and trainings as needed.

- Ongoing: In progress. Retained for the 2024 update.

2019/2024 Wildfire Action Item #8-Distribute fire prevention literature and material to homeowners and visitors.

- Ongoing: In progress. Part of regular emergency management outreach.

2019/2024 Wildfire Action Item #9-Conduct Fire Prevention programs in schools.

- Ongoing: In progress. Fossil Fire consistently goes to the schools, OSFM is assisting with outreach to other schools.

2019/2024 Wildfire Action Item #10-Provide information about what types of fire resistive plants to use for landscaping.

- Ongoing: In progress. OSFM regularly distributes materials at community events, including Fair.

2019/2024 Windstorm Action Item #1-Make available to county residents and the public information regarding windstorms.

- Ongoing: In progress. Part of regular emergency management outreach.

2019/2024 Winter Storm Action Item #1- Make available to county residents and the public information regarding winter storms.

- **Ongoing:** In progress. Part of regular emergency management outreach.

2019/2024 Severe Weather Action Item #1-Identify county residents and families with home weatherization needs (LMI) and seek funding assistance for repairs.

- Ongoing: In progress. Retained for 2024 update.

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 Plans & 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. This includes reviewing the NHMP prior to and during updates of any plans or when looking into changing building codes or zoning ordinances. This will ensure mitigation is taken into account for all levels of programs and policies.

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: 2024 Action Items: Wheeler County, Cities of Fossil, Mitchell and Spray

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
Multi-Hazard													
MH #1	Maintain 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, ODEM, FEMA, Cities of Fossil, Mitchell, and Spray	Routine	X	X		X	X	X	X	This was completed and is now maintained routinely.	Complete /Modified
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, ODEM, FEMA, Cities of Fossil, Mitchell, and Spray	Short Term/High Priority	X	X		X	X	X	X	In progress. Wheeler County is continuously implementing priority projects.	Retained
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, Wasco Electric	Wheeler 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.	Retained
MH#4	Reduce the effects of natural hazards on existing utility lines	Columbia Basin Cooperative, Columbia Power Cooperative, Wasco Electric	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.	Retained
MH#5	Maintain the comprehensive impact database on severe natural hazard events in Wheeler County.	Wheeler County	County Planning Department, Cities of Fossil, Mitchell and Spray, National Weather Service, NOAA, ODOT, Oregon Climate Service, Overhead Utilities.	Routine/ Medium priority	X	X	X	X	X	X	X	A layer for historic fires was added to Wheeler County's GIS application. Working on a flood overlay.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
MH #6	Seek funding for generators for critical facilities.	Wheeler County Emergency management	City of Fossil, City of Spray, City of Mitchell, ODEM, ODHS, FEMA	Short Term/ Medium Priority	X	X		X	X	X	X	In progress.	Retained
MH #7	Seek funding for generators for critical facilities in the County including Jeannie Birch Building, Emergency Operations Center in Spray, County Road Department	Wheeler County Emergency management	City of Fossil, City of Spray, County Road Department, ODEM, ODHS, FEMA	Short Term/ Medium Priority	X	X		X	X	X	X	New Action for the 2024 NHMP. Modified from #6.	
MH #8	Seek funding for generators for critical facilities in Fossil including City Hall, Fire Department, Water Pumping Station	Wheeler County Emergency management	City of Fossil, Fossil Fire Department, Fossil Public Works	Short Term/ Medium Priority	X	X		X	X			New Action for the 2024 NHMP. Modified from #6.	
MH #9	Seek funding for generators for critical facilities in Mitchell including City Hall/EMS Building, Water Reservoir, School District, Community Hall (Cascadia Staging Area)	Wheeler County Emergency management	City of Mitchell, Mitchell Fire/Volunteer Ambulance, Mitchell School District, Mitchell Public Works	Short Term/ Medium Priority	X	X		X		X		New Action for the 2024 NHMP. Modified from #6.	
MH #10	Seek funding for generators for critical facilities in Spray including EMS Complex, City Hall, Water Pumping Station, Sewer, Asher Community Health	Wheeler County Emergency management	City of Spray, Spray Volunteer Fire, Spray Volunteer Ambulance, Spray Public Works, Asher Health Clinic	Short Term/ Medium Priority	X	X		X			X	New Action for the 2024 NHMP. Modified from #6.	
MH #11	Work with critical businesses, such as grocery stores and gas stations on backup generators and internet in Fossil, Mitchell, and Spray.	Wheeler County Emergency Management	City of Fossil, City of Mitchell, City of Spray		X	X		X	X	X	X	New Action for the 2024 NHMP.	

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
MH#12	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.	Retained
MH#13	Secure funding to improve infrastructure that will increase the capacity and availability of water to protect the City of Fossil from the natural Hazards (i.e., drought, wildfire, etc.) that occur annually.	City of Fossil	County Emergency Management, DEQ, Water Master Office District 21, Engineers, Contractors, ODEM, Army Corps of Engineers, FEMA	In Progress/ High Priority	X	X		X	X			Funding has been secured. They are seeking contractors to complete the work.	Retained
MH#14	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.)	Routine/ Medium Priority	X	X	X	X	X	X	X	Part of regular Emergency Management program outreach.	Retained
MH#15	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, Gilliam, Sherman and Jefferson Counties	Short Term/ High Priority	X	X	X	X	X	X	X	In progress. Everbridge is undergoing updates and will require increased outreach.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
MH#16	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.	Wheeler County Public Health	Wheeler County Emergency management, Cities of Fossil, Mitchell, and Spray, ODHS, CAPECO, Oregon Public Health, USDOE, USDA	Short Term/ Low Priority	X		X	X	X	X	X	Public Health has distributed air condition units and air scrubbers.	Retained
MH#17	Invest in and promote community gardens and local food production.	Wheeler County Extension Service	Cities of Fossil, Mitchell, and Spray, NRCS, USDA, Oregon Public Health, OSU Extension	Routine/ Low Priority			X	X	X	X	X	In progress. Gardening promoted throughout the county.	Retained
MH#18	Invest in and promote solar and other alternative energy in public, residential, and commercial properties.	Wheeler County	County Planning, Emergency Management, Cities of Fossil, Mitchell and Spray, Oregon Department of Energy, Energy Trust of Oregon	Long Term/ Low Priority	X		X	X	X	X	X	No Action	Retained
MH#19	Develop hazard-specific evacuation plans that consider impacts on bridges, other key transportation infrastructure and lifelines.	Wheeler County Emergency Management	Wheeler County Road Department, ODOT, OEM,	Medium Term/ Medium Term	X	X	X	X	X	X	X	In progress. The planning group has held multiple meetings.	Retained
MH #20	Develop a welcome packet for new residents/potential new residents on fire risk, winter storms and other hazards, EMS and volunteer fire capabilities and available services and critical facilities. Include volunteer applications for fire, ambulance, and other community services.	Wheeler County Emergency Management	Cities of Fossil, Mitchell and Spray, Planning Department, ODF, OSFM, USFS, Utility Companies	Short Term/High Priority	X	X	X	X	X	X	X	New action for the 2024 update.	

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
	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	Delete.	X		X	X	X	X	X	Delete. This action was not completed. All agencies agree time and effort can be spent on more efficient methods of hazard preparation.	Delete
	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.	Delete.	X			X	X	X	X	Delete. This action was not completed. All agencies agree time and effort can be spent on more efficient methods of hazard preparation.	Delete
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 Department of Forestry, Watermaster, Oregon Dept of Fish and Wildfire	Routine/ High Priority		X	X	X	X	X	X	Part of regular Emergency Management program outreach.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
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	No Action	Retained
DR#3	Provide water conservation education to kids in schools.	Wheeler county Soil and Water Conservation District	County Schools (Fossil Charter, Mitchell Schools, and Spray Schools) Wheeler Soil and Water Conservation District	Routine/ Medium Priority	X		X	X	X	X	X	The SWCD conducts outreach in schools, including field trips to see water saving tactics.	Modified.
DR#4	Develop a drought emergency plan.	Wheeler County Emergency management	County Planning Department, , USDA, NRCS, OSU, ODEM, FEMA	Long Term/Low Priority	X	X	X	X	X	X	X	No Action.	Retained
DR#5	Consider requiring water conservation during drought conditions.	Wheeler County	County Emergency Management, Cities of Fossil, Mitchell, and Spray, USDA, Water Resources, NRCS, SWCD	Routine/ High Priority	X		X	X	X	X	X	Cities regulate water and irrigation is shut down by water resources during drought.	Retained
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, ODHS	Routine/ Moderate Priority		X	X	X	X	X	X	Part of regular Emergency Management program outreach.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
EQ#2	Seek funding through the State office of Emergency Management and/or the Federal Emergency Management Agency to seismically retrofit critical facilities with a high collapse potential rate by the Department of Geology and Mineral Industries.	Wheeler County Emergency management	County Court, School Districts, Oregon Department of Emergency Management, Federal Emergency Management Agency, Oregon Department of Transportation	Long Term/ Moderate Priority	X			X	X	X	X	No action.	Retained
EQ#3	Seek Funding to seismically retrofit critical infrastructure not rated by the Department of Geology and Mineral Industries including the County Emergency Operations Center in Spray.	Wheeler County Emergency management	County Court, City of Spray, ODEM, ODOT, DOGAMI, FEMA	Long Term/ Moderate Priority	X			X	X	X	X	New Action for 2024 Update	
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, Spray, American Red Cross, FEMA, ODEM	Short Term/High Priority		X	X	X	X	X	X	In progress. Part of regular emergency management outreach.	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 and FEMA	Short Term/ High Priority	X	X		X	X	X	X	The City of Fossil has adopted the ordinance. Spray and Mitchell are in progress.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
FL#3	Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency 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, ODEM, FEMA, US Postal Service	Short Term/ High Priority	X	X				X		In progress. Mitchell is working on a project on Nelson Street with FEMA.	Retained
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, Ferfuson Surveying and Engineering, OEM, ODOT, FEMA, US Army Corps of Engineers	Short Term/High Priority	X	X					X	In progress.	Retained
FL#5	Coordinate with the State Floodplain Coordinator and the DLCD to update the FEMA Flood Insurance Rate Maps for Wheeler County and the incorporated cities participating in the National Flood insurance Program and Risk Map.	Wheeler County Planning Department	County Emergency Management, Cities of Fossil, Mitchell and Spray, Oregon Department of Land Conservation and Development, OEM, FEMA	Routine/ High Priority	X	X		X	X	X	X	Wheeler County, The City of Fossil, and the City of Mitchell participate in the NFIP. FIRMS for Wheeler County and incorporated cities are current as of 1989.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
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 Department, 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	Part of regular Emergency management outreach.	Retained
LS#2	Develop education and public outreach to engage adjacent landowners to improve slope management practices.	Wheeler County Soil and Water Conservation District	County Court, County Public Works, County Road Department, 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	In progress. Changed responsibility to the SWCD who regularly provides outreach to landowners on this topic.	Modified
LS#3	Explore low-cost mitigation options, such as maintenance of slide fences, ditches, and other drainage facilities.	Wheeler County Emergency Management, Soil and Water Conservation District	County Road Department, Cities of Fossil, Mitchell, and Spray, ODOT, ODEM, FEMA	Medium Term/Moderate Priority	X	X		X	X	X	X	No Action.	Retained
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	Part of regular Emergency management Outreach.	Modified

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
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	Short Term/ Moderate priority	X			X				Wheeler County is looking to update their EOP in 2024.	Retained
Wildfire													
WF#1	Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to reduce wildland fire risk in Wheeler County.	Wheeler County, County Wildfire Protection Plan Local Coordinating Group	County Court, County Road Department, Wheeler County Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens, Oregon State Fire Marshal	Routine / High Priority		X	X	X	X	X	X	While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy. Retained.	Retained
WF#2	Conduct risk assessment activities with the Wheeler County Community Wildfire Protection Plan local Coordinating Group to assess areas in the county at risk to wildland fires.	County Wildfire Protection Plan (CWPP) local Coordinating Group	County Court, County Road Department, Wheeler County Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens Oregon State Fire Marshal	Routine/ High Priority		X	X	X	X	X	X	While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy. Retained.	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
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.	CWPP Local Coordinating Group	County Court, County Road Department, Wheeler County Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Oregon State Fire Marshal, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens	Routine/ High Priority		X	X	X	X	X	X	While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy. Retained.	Retained
WF#4	Work with the CWPP Local Coordinating Group to implement fuel reduction strategies to reduce the risk to wildland fires, including conducting a full county-wide wildfire hazard risk assessment.	CWPP Local Coordinating Group	County Court, County Road Department, Wheeler County Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Oregon State Fire Marshal, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens	Routine/ Moderate		X	X	X	X	X	X	In progress. While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy. Retained.	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, Oregon State Fire Marshal, American Red Cross, Human Society, Utilities, BLM, USFS, OSFM, ODF&W, FEMA	Routine/ High priority		X	X	X	X	X	X	Part of regular emergency management outreach	Retained

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
WF#6	Provide Wheeler County Road Department with firefighting training and equipment	Wheeler County Road Department	Wheeler County, CWPP Local Coordinating Group, ODF, Fire Districts, OSFM, BLM, USFS	Routine/ High Priority		X	X	X	X	X	X	A tank and pump were purchased for the Road Department. They receive annual required training.	Retained
WF#7	Assist Rural Fire Protection Districts and City Fire Departments in maintaining and upgrading their firefighting equipment, facilities and trainings as needed.	Wheeler County Emergency Management	Rural Fire Districts, City Fire Departments, CWPP local Coordinating Group, ODF, BLM, USFS, Oregon State Fire Marshal	Medium Term/ Moderate Priority	X	X		X	X	X	X	In progress	Retained
WF#8	Distribute fire prevention literature and material to homeowners and visitors.	Wheeler County Emergency management	Rural Fire Districts, City Fire Departments, CWPP local Coordinating Group, ODF, BLM, USFS, Oregon State Fire Marshal	Routine/ High Priority	X		X	X	X	X	X	In progress	Retained
WF#9	Conduct Fire prevention programs in schools.	Wheeler County Emergency Management and Oregon State Fire Marshal	County Schools, Gilliam County, Mic Columbia Fire Prevention Co-Op, Oregon State Fire Marshal	Routine/ High Priority	X	X	X	X	X	X	X	Fossil Fire consistently goes to the schools, OSFM is assisting with outreach to other schools.	Modify
WF#10	Provide information about what type of fire resistive plants to use for landscaping.	Wheeler County Emergency Management	OSU Extension Service, Oregon State Fire Marshal	Short Term/ Medium Priority			X	X	X	X	X	In progress. OSFM regularly distributes materials at events, including Fair.	Modify

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
WF#11	Look into large scale fire mitigation methods, including prescribed burns, vegetative fuel breaks, habitat/native vegetation restoration and juniper mitigation near critical facilities, towns, and highly trafficked tourist areas, including Cougar Mountain and Twickenham.	Wheeler County Emergency management, Soil and Water Conservation District	Cities of Fossil, Mitchell, and Spray, ODF, BLM, Fire Departments, NRCS, Oregon State Fire Marshal	Short Term/ High Priority	X	X	X	X	X	X	X	New Action for the 2024 NHMP.	
WF#12	Promote wildfire mitigation funding opportunities available through BLM, ODF and other grants.	Wheeler County Emergency Management	ODF, BLM, Fossil, Spray and Mitchell Fire Departments	Short Term/ Medium Priority	X	X	X	X	X	X	X	New Action for the 2024 NHMP.	
	Work with ODF, USFS, BLM and local fire district to develop a “lessons learned” assessment of the 2018 wildfire season.	CWPP Local Coordinating Group	County Court, Road Department, Emergency Management, Fire Defense Board, ODF, USFS Umatilla and Ochoco, NPS, Oregon State Fire Marshal, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens	Routine	X	X	X	X				This action did not take place and the Steering Committee agree time and resources were better spent on other actions.	Delete
	Develop seasonal paid count firefighter positions which would provide wildfire Initial Attack in the summer months.	Wheeler County Emergency Management	Wheeler County Commission, The Cities of Fossil, Mitchell, and Spray, CWPP Local Steering Committee, OSFM	Medium Term/ Moderate Priority	X	X		X				No Action. The Steering Committee agree time and resources are better spent on other actions.	Delete

2024 Action Item	2024 Action Item Title	Coordinating Organization	Partner Organization (Internal and External)	Timeline /Priority	Alignment with Goals			Applicable Jurisdiction				Status and Explanation	Retain, Delete and/or Modify
					Goal 1	Goal 2	Goal 3	Wheeler County	Fossil	Mitchell	Spray		
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	Routine/ High Priority		X	X	X	X	X	X	Part of regular emergency management outreach.	Retained
Winter Storm													
WTS#1	Make available to county residents and the public information regarding winter storms.	Wheeler County Emergency Management	County Court, County Road Department, ODOT, American Red Cross, FEMA, NWS, Cities of Fossil, Mitchell and Spray and citizens	Routine/ High Priority		X	X	X	X	X	X	Part of regular emergency management outreach.	Retained
	Educate farmers about ways to protect livestock from the effects of winter storms.	Wheeler County	OSU Extension, Oregon Department of Agriculture	Ongoing	X		X	X	X	X	X	Delete	Delete
Severe Weather													
SW#1	Identify county resident and families with home weatherization needs (LMI) and seek funding assistance for repairs.	Wheeler County Public Health	Wheeler County Emergency management, Cities of Fossil, Mitchell, and Spray	Short Term/ Moderate priority	X	X	X	X	X	X	X	Shifted to severe weather since this action helps combat extreme heat and extreme cold.	Modify
SW#2	Work with CAPECO to assist low-income residents with energy needs during severe weather events.	Wheeler County Public Health	CAPECO, Wheeler County Emergency management, Cities of Fossil, Mitchell, and Spray		X	X	X	X	X	X	X	New Action for 2024 NHMP.	

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 Department of 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 Building Resilient Infrastructure and Communities 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. The Natural Hazards Mitigation Plan Convener will provide the following:

- Steering Committee meeting dates, times, locations, agendas, and member notification;
- Document outcomes of Committee meetings;
- Serve as a communication conduit between the Steering Committee and key plan stakeholders;
- Track status of identified hazard mitigation actions.
- Identify emergency management-related funding sources for natural hazard mitigation projects; and
- 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 Building Resilient Infrastructure 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
- Oregon Department of Forestry
- Oregon State Fire Marshal
- United States Forest Service

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:

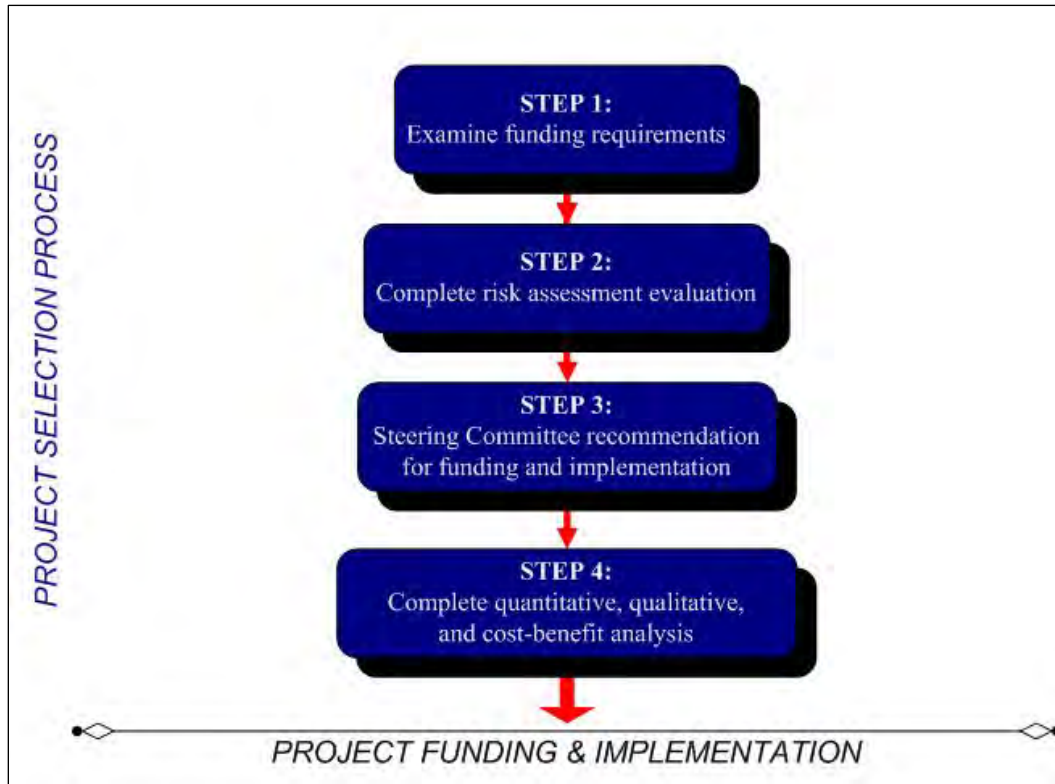
- Review existing and new risk assessment data;
- Discuss methods for continued public involvement; and
- Document successes and lessons learned during the year.

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. A short list of proposed mitigation actions were prioritized during this plan update. When the actions are reviewed and considered for implementation, the following process will be used to prioritize additional actions.

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 Building Resilient Infrastructure and Communities BRIC , 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.

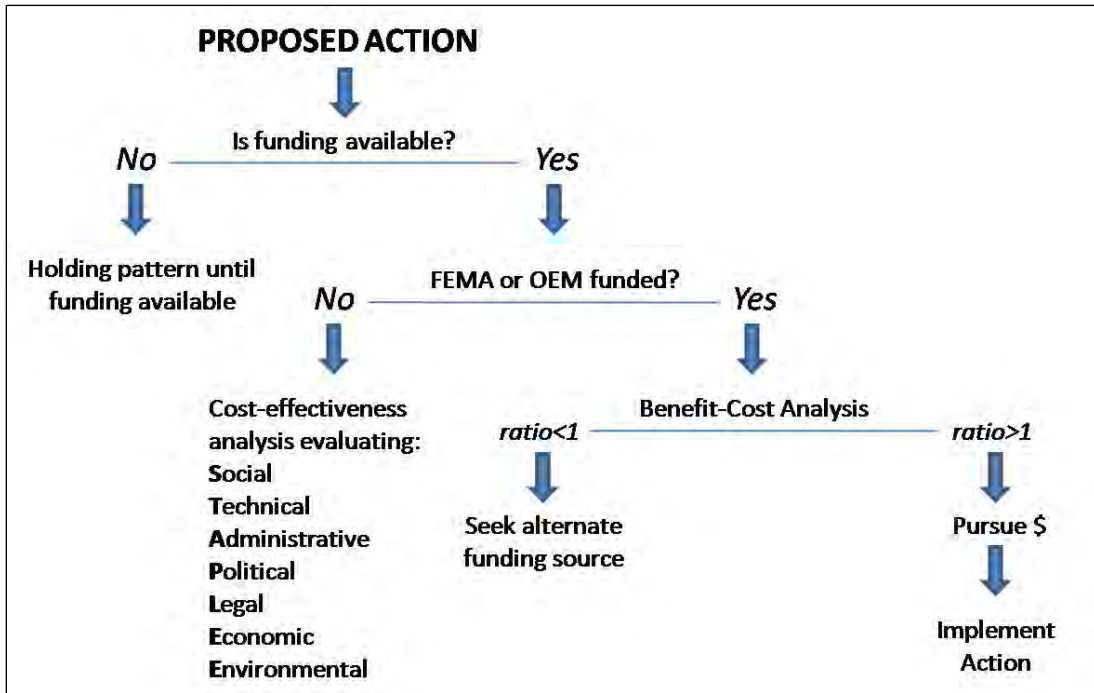
Step 3: Committee recommendation

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.

Monitoring the Plan

The plan will be monitored by the Convener and the Steering Committee. Status of mitigation action items will be discussed at the semi-annual meetings, and the Convener will keep a record of the overall status of each item in a master list, whether they are in progress, deferred or no longer relevant. When evaluating the plan at the semi-annual meetings, it will also double as monitoring the plan, for in evaluating it for effectiveness the status of all items are also being monitored.

Evaluating the Plan for Effectiveness

Evaluating the plan for effectiveness is an essential element in keeping the Wheeler County Natural Hazard Mitigation Plan a relevant and useful document. Continuously evaluating the plan after approval, during the plan's implementation and prior to the update will ensure the plan is as effective as possible. The Steering Committee and the Convener will be responsible for this continuous evaluation process and at the semi-annual meetings they will assess the plan and ask the following questions to help determine its effectiveness.

- Are any jurisdictions covered in the plan currently implementing any of the mitigation actions identified in the plan
- How many mitigation actions are currently taking place throughout the planning area
- How many mitigation projects have been accomplished
- Are NHMP plan goals and priorities still aligning with what the public finds important
- Is there available funding for the projects the Steering Committee prioritized
- Is there public support for the completed projects and for projects the Steering Committee Prioritized
- Have mitigation projects assisted the communities they were intended to assist
- Are there additional projects that have been identified and need to be included in the plan

The simplest way to measure effectiveness is through the number of projects completed, but also assessing community attitude towards projects and if identified mitigation actions are helping the communities they were intended to assist is essential for determining the effectiveness of the plan.

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 and be involved in the plan maintenance process.

Public participation was 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:

- 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 on Social Media
- Public Meetings

After the plan is complete, the Steering Committee will continue to seek public participation with the plan's implementation, monitoring and evaluation. This will be accomplished through:

- Periodic presentations of the plan's progress to elected officials and other community groups, including attending City Council Meetings and Senior Living Facilities.
- Invite new stakeholders and members of the public 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.
- Post the final, adopted version of the county's multi-jurisdictional Natural Hazard Mitigation Plan on the Wheeler County Emergency Management website.
- Make hard-copies of the plan available for the public at Fossil City Hall, Mitchell City Hall, and Spray City Hall.
- Include information on the Natural Hazards Mitigation Plan annually at the Wheeler County Fair in an informational booth.

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 for an update in 2029. 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 records of mitigation action items completed and the notes from evaluating the plan for effectiveness from the Steering Committee Meetings that take place between 2024 and 2029 will be used to help make the 2029 plan more effective.

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

In 2019 there were sixteen multi-hazard mitigation action items. There are twenty for the 2024 Update.

- 1) Maintain an inventory of public buildings that may be particularly vulnerable to natural hazards in Wheeler County.

Status & Explanation: *This was completed after the 2019 plan update. This document is now routinely maintained and updated as buildings are constructed or taken out of service.*

Retain, Delete and/or Modify: *Modify.*

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: *In progress. Wheeler County is continuously implementing a small number of priority projects.*

Retain, Delete and/or Modify: *Retain*

Timeline: *Short Term*

Priority: *High*

- 3) Work with utilities operating in Wheeler County to establish ongoing 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) Maintain the comprehensive impact database on severe natural hazard events in Wheeler county.

Status & Explanation: *This was completed after the 2019 plan update. This document is now routinely maintained, and a layer for historic fires has been added to Wheeler County's GIS application. Work is being done on a flood overlay for the GIS application.*

Retain, Delete and/or Modify: *Retain*

Timeline: *Routine*

Priority: *Medium*

- 6) Seek funding for generators for critical facilities.
Status & Explanation: *In progress. Wheeler County is currently attempting to purchase generators for several buildings.*
Retain, Delete and/or Modify: *Modify. Removed satellite phone request.*
Timeline: *Short Term*
Priority: *Medium Priority*

- 7) Seek funding for generators for critical facilities in the County including the Jeannie Birch Building, Emergency Operations Center in Spray, and the County Road Department
Status & Explanation: *New Action for the 2024 NHMP. Modified from #6.*
Retain, Delete and/or Modify:
Timeline: *Short Term*
Priority: *Medium Priority*

- 8) Seek funding for generators for critical facilities in Fossil including City Hall, Fossil Fire Department and Water Pumping Station.
Status & Explanation: *New Action for the 2024 NHMP. Modified from #6.*
Retain, Delete and/or Modify:
Timeline: *Short Term*
Priority: *Medium Priority*

- 9) Seek Funding for generators for critical facilities in Mitchell including City Hall/EMS Building, Water Reservoir, School District and Community Hall (Cascadia staging area).
Status & Explanation: *New Action for the 2024 NHMP. Modified from #6.*
Retain, Delete and/or Modify:
Timeline: *Short Term*
Priority: *Medium Priority*

- 10) Seek Funding for generators for critical facilities in Spray including Spray EMS Complex, City Hall, Water Pumping Station, Sewer System and Asher Community Health.
Status & Explanation: *New Action for the 2024 NHMP. Modified from #6.*
Retain, Delete and/or Modify:
Timeline: *Short Term*
Priority: *Medium Priority*

- 11) Work with critical businesses, such as grocery stores and gas stations to find funding for and install backup generators and internet in Fossil, Mitchell, and Spray.
Status & Explanation: *New Action for the 2024 NHMP.*
Retain, Delete and/or Modify:
Timeline: *Medium Term*
Priority: *Moderate*

12) Identify opportunities to reduce existing barriers to interagency cooperation and work together to reduce risks 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

13) Secure funding to improve infrastructure that will increase the capacity and availability of water to protect the City of Fossil from natural hazards (i.e., drought, wildfire, etc.) that occur on an annual basis.

Status & Explanation: *Funding has been secured for this project. The City of Fossil is currently seeking contractors to complete this work.*

Retain, Delete and/or Modify: Retain

Timeline: Short Term

Priority: High

14) 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: newsletter, social media platforms, such as Facebook, radio, television, internet vlogs, videos, podcasts and presentations to local civic and business groups.

Status & Explanation: *In progress. Part of regular Emergency Management Outreach. In 2024 Wheeler County Emergency Management is working closely with OSFM and ODF on wildfire outreach.*

Retain, Delete and/or Modify: Retain

Timeline: Routine

Priority: High

15) Increase by 25% the number of people in Wheeler County signed up for the Everbridge Frontier Regional Alert System.

Status & Explanation: *In progress. Everbridge is undergoing significant updates and will require increased outreach in 2024 and beyond.*

Retain, Delete and/or Modify: Retain

Timeline: Short Term

Priority: High Priority

16) 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: *Public Health has distributed air conditioning units and air scrubbers to a limited number of individuals throughout the county.*

Retain, Delete and/or Modify: Retain

Timeline: Short Term

Priority: Low Priority

- 17) Invest in and promote community gardens and local food production.
Status & Explanation: *In progress. Gardening is being promoted throughout the county, Mitchell is starting a “take some, leave some” gardening program and produce stand.*
Retain, Delete and/or Modify: Retain
Timeline: Routine
Priority: Low Priority
- 18) Invest in and promote solar and other alternative energy in public, residential and commercial properties.
Status & Explanation: No Action
Retain, Delete and/or Modify: Retain
Timeline: Long Term
Priority: Low Priority
- 19) Develop Hazard specific evacuation plans that consider likely impacts to bridges, other key transportation infrastructure and lifelines.
Status & Explanation: *In process. A planning group has been formed to complete this task, they met several times in 2023 and are planning to meet several times in 2024.*
Retain, Delete and/or Modify: Retain
Timeline: Medium Term
Priority: Medium Priority
- 20) Develop a welcome packet for new residents (and potential new residents) on fire risk, winter storms and other hazards, EMS and volunteer fire capabilities and available services and critical facilities. Include volunteer applications for fire, ambulance, and other community services.
Status & Explanation: *New Action for the 2024 NHMP update.*
Retain, Delete and/or Modify:
Timeline: Short Term
Priority: High Priority

Invest in and promote rainwater collection systems in public, residential and commercial properties.

Status & Explanation: This action was not completed. All agencies agree time and effort can be spent on more efficient methods of drought preparation.

Retain, Delete and/or Modify: Delete

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: This action was not completed. All agencies agree time and effort can be spent on more efficient methods of drought preparation.

Retain, Delete and/or Modify: Delete

Multi-Hazard #1

Proposed Action Item: MH#1		Alignment with Plan Goals:	
Maintain 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 aid 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 Statewide Seismic Needs Assessment Using Rapid Visual Screening (RVS) Reports. 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		No.	
Benefit to Underserved/Socially Vulnerable Population		No.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
2024-Wheeler county NHMP Steering Committee, Cities of Fossil, Mitchell, and Spray		Oregon Department of Geology and Mineral Industries, Oregon Department of Emergency Management, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
County General Funds		Short Term (1-3 Years)	
Form Submitted by:	Wheeler County		
Priority:	High		
Action Item Status:	Ongoing from the 2019 NHMP, retain. This was completed and is now maintained regularly.		

Multi-Hazard #2

Proposed Action Item: MH#2	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 aid 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 Hazard Mitigation Assistance Guidance: Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, and Flood Mitigation Assistance Program. February 27, 2015. 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. 	
Does the action alleviate long-term risk from future conditions including climate change?	No.
Benefit to Underserved/Socially Vulnerable Population	Maintenance of public facilities used by underserved populations.
Coordinating Organization	Wheeler County Emergency Management
Internal Partners:	External Partners:
Wheeler County, County NHMP Steering Committee, Cities of Fossil, Mitchell, and Spray	Oregon Department of Geology and Mineral Industries, Oregon Department of Emergency Management, Federal Emergency Management Agency
Potential Funding Sources:	Timeline:
Seismic Rehabilitation Grant Program, Homeland Security Grants, Hazard Mitigation Grant Program, Building Resilient Infrastructure and Communities Grants, City and County General Funds	Short Term (1-3 years)
Priority:	High Priority
Action Item Status:	Ongoing from the 2019 NHMP, retained. Wheeler County is continuously implementing a small number of priority projects.

Multi-Hazard #3

Proposed Action Item: MH#3		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"> • Natural hazards, including windstorms and winter storms can severely affect electric utilities. • The threat of winter storms and windstorms in the County is high. Wheeler County has several trees that can damage buildings and infrastructure, block roadways and cause power outages. • 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		No. It is a recurring task that must be performed every few years.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Columbia Basin Cooperative, Columbia Power Cooperative, Wasco Electric	
Internal Partners:		External Partners:	
Wheeler County, Cities of Fossil, Mitchell, and Spray		Columbia Basin Cooperative, Columbia Power Cooperative, Wasco Electric	
Potential Funding Sources:		Timeline:	
This is a routine program that should be included in existing agency and utility cooperative budgets.		Routine	
Priority:	High Priority		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Routine Action.		

Multi-Hazard #4

Proposed 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 to 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"> 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 workflows will assist in getting systems back online and in communicating with work crews and customers when an event occurs. 			
Does the action alleviate long-term risk from future conditions including climate change?		No, this is a routine action that must be continuously performed.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Columbia Basin Cooperative, Columbia Power Cooperative, Wasco Electric	
Internal Partners:		External Partners:	
Wheeler County, Cities of Fossil, Mitchell, and Spray		Columbia Basin Cooperative, Columbia Power Cooperative, Wasco Electric	
Potential Funding Sources:		Timeline:	
This is a routine program that should be included in existing agency and utility cooperative budgets. Following a Presidentially declared disaster, the Co-Op may seek funds through FEMA's Hazard Mitigation Grant Program.		Routine	
Priority:	High Priority		
Action Item Status:	Ongoing, from the 2019 NHMP, retain. Routine Action.		

Multi-Hazard #5

Proposed Action Item: MH#5		Alignment with Plan Goals:	
Maintain the comprehensive impact database on severe natural hazard events in Wheeler County.		<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 whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.</p>	
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. 			
Does the action alleviate long-term risk from future conditions including climate change?		No. This addresses data management.	
Benefit to Underserved/Socially Vulnerable Population		Indirect.	
Coordinating Organization		Wheeler County	
Internal Partners:		External Partners:	
County Planning Department, Emergency Management GIS, Cities of Fossil, Mitchell, and Spray,		National Weather Service, National Oceanic and Atmospheric Administration, Oregon Department of Transportation, Oregon Climate Service, Overhead Utilities.	
Potential Funding Sources:		Timeline:	
Grant funding sources may be available, but it is more likely that this be included in regular County and City budgets as this should be a routine action.		Routine	
Priority:	Medium		
Action Item Status:	Ongoing from the 2019 NHMP, retain. A layer for historic fires was added to Wheeler County's GIS Application. They are currently working on finding a flood overlay.		

Multi-Hazard #6

Proposed Action Item: MH#6		Alignment with Plan Goals:	
Seek funding for generators for critical facilities.		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 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. A frequent impact from natural hazards, including winter storms, windstorms, and wildfires, is power outages resulting from damaged power lines. It is also likely that the community may lose access to fuel resources in the event of a major hazard elsewhere in the state. With the increase of extreme weather due to climate change, backup generators at critical facilities will allow for multiple warming and cooling centers, increasing the county's climate resiliency for vulnerable populations. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Identify all critical facilities without generators Prioritize need for generators at critical facilities Generators and related equipment (e.g., hook-ups) are eligible under the HMGP and Homeland Security Grants 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. It will allow for the establishment of temperature shelters to help protect residents from increasing bouts of extreme heat and cold.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Wheeler County, City of Fossil, City of Spray, City of Mitchell		Oregon Department of Emergency Management, Oregon Department of Human Services, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
FEMA Building Resilient Infrastructure and Communities Grants, Homeland Security Grants, Hazard Mitigation Grant Program		Short Term (1-3 years)	
Priority:	Medium Priority		
Action Item Status:	Ongoing from the 2019 NHMP, retain.		

Multi-Hazard #7

Proposed Action Item: MH#7	Alignment with Plan Goals:
Seek funding for generators for critical facilities in the County including Jeannie Birch Building, Emergency Operations Center in Spray, County Road Department	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 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. • A frequent impact from natural hazards, including winter storms, windstorms, and wildfires, is power outages resulting from damaged power lines. It is also likely that the community may lose access to fuel resources in the event of a major hazard elsewhere in the state. • With the increase of extreme weather due to climate change, backup generators at critical facilities will allow for multiple warming and cooling centers, increasing the county's climate resiliency for vulnerable populations. 	
Ideas for Implementation:	
<ul style="list-style-type: none"> • Identify additional critical facilities without generators • Prioritize need for generators at critical facilities • Generators and related equipment (e.g., hook-ups) are eligible under the HMGP and Homeland Security Grants 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. 	
Does the action alleviate long-term risk from future conditions including climate change?	Yes. It will allow for the establishment of temperature shelters to help protect residents from increasing bouts of extreme heat and cold.
Benefit to Underserved/Socially Vulnerable Population	Serves the entire community, including large elderly population, youth population and low income.
Coordinating Organization	Wheeler County Emergency Management
Internal Partners:	External Partners:
Wheeler County, City of Fossil, City of Spray, County Road Department	Oregon Department of Emergency Management, Oregon Department of Human Services, Federal Emergency Management Agency
Potential Funding Sources:	Timeline:
FEMA Building Resilient Infrastructure and Communities Grants, Homeland Security Grants, Hazard Mitigation Grant Program	Short Term (1-3 years)
Priority:	Medium
Action Item Status:	New Action for the 2024 NHMP. Modified from #6.

Multi-Hazard #8

Proposed Action Item: MH#8		Alignment with Plan Goals:	
Seek funding for generators for critical facilities in Fossil including City Hall, Fire Department, Water Pumping Station		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 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. A frequent impact from natural hazards, including winter storms, windstorms, and wildfires, is power outages resulting from damaged power lines. It is also likely that the community may lose access to fuel resources in the event of a major hazard elsewhere in the state. With the increase of extreme weather due to climate change, backup generators at critical facilities will allow for multiple warming and cooling centers, increasing the county's climate resiliency for vulnerable populations. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Identify additional critical facilities without generators Prioritize need for generators at critical facilities Generators and related equipment (e.g., hook-ups) are eligible under the HMGP and Homeland Security Grants 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. It will allow for the establishment of temperature shelters to help protect residents from increasing bouts of extreme heat and cold.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
City of Fossil, Fossil Fire Department, Fossil Public Works		Oregon Department of Emergency Management, Oregon Department of Human Services, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
FEMA Building Resilient Infrastructure and Communities Grants, Homeland Security Grants, Hazard Mitigation Grant Program		Short Term (1-3 years)	
Priority:	Medium		
Action Item Status:	New Action for the 2024 NHMP. Modified from #6.		

Multi-Hazard #9

Proposed Action Item: MH#9		Alignment with Plan Goals:	
Seek funding for generators for critical facilities in Mitchell including City Hall/EMS Building, Water Reservoir, School District, Community Hall (Cascadia Staging Area)		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 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. A frequent impact from natural hazards, including winter storms, windstorms, and wildfires, is power outages resulting from damaged power lines. It is also likely that the community may lose access to fuel resources in the event of a major hazard elsewhere in the state. With the increase of extreme weather due to climate change, backup generators at critical facilities will allow for multiple warming and cooling centers, increasing the county's climate resiliency for vulnerable populations. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Identify additional critical facilities without generators Prioritize need for generators at critical facilities Generators and related equipment (e.g., hook-ups) are eligible under the HMGP and Homeland Security Grants 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. It will allow for the establishment of temperature shelters to help protect residents from increasing bouts of extreme heat and cold.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
City of Mitchell, Wheeler County, Mitchell Fire/Volunteer Ambulance, Mitchell School District, Mitchell Public Works		Oregon Department of Emergency Management, Oregon Department of Human Services, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
FEMA Building Resilient Infrastructure and Communities Grants, Homeland Security Grants, Hazard Mitigation Grant Program		Short Term (1-3 years)	
Priority:	Medium		
Action Item Status:	New Action for the 2024 NHMP. Modified from #6.		

Multi-Hazard #10

Proposed Action Item: MH#10		Alignment with Plan Goals:	
Seek funding for generators for critical facilities in Spray including EMS Complex, City Hall, Water Pumping Station, Sewer, Asher Community Health		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 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. A frequent impact from natural hazards, including winter storms, windstorms, and wildfires, is power outages resulting from damaged power lines. It is also likely that the community may lose access to fuel resources in the event of a major hazard elsewhere in the state. With the increase of extreme weather due to climate change, backup generators at critical facilities will allow for multiple warming and cooling centers, increasing the county's climate resiliency for vulnerable populations. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Identify additional critical facilities without generators Prioritize need for generators at critical facilities Generators and related equipment (e.g., hook-ups) are eligible under the HMGP and Homeland Security Grants 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. It will allow for the establishment of temperature shelters to help protect residents from increasing bouts of extreme heat and cold.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
City of Spray, Wheeler County, Spray Volunteer Fire, Spray Volunteer Ambulance, Spray Public Works, Asher Health Clinic		Oregon Department of Emergency Management, Oregon Department of Human Services, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
FEMA Building Resilient Infrastructure and Communities Grants, Homeland Security Grants, Hazard Mitigation Grant Program		Short Term (1-3 years)	
Priority:	Medium		
Action Item Status:	New Action for the 2024 NHMP. Modified from #6.		

Multi-Hazard #11

Proposed Action Item: MH#11	Alignment with Plan Goals:
Work with critical businesses, such as grocery stores and gas stations on backup generators and internet in Fossil, Mitchell, and 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 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. • A frequent impact from natural hazards, including winter storms, windstorms, and wildfires, is power outages resulting from damaged power lines. It is also likely that the community may lose access to fuel resources in the event of a major hazard elsewhere in the state. • Wheeler County has limited gas stations and grocery stores, if these facilities cannot operate a majority of residents will be left without food or fuel. 	
Ideas for Implementation:	
<ul style="list-style-type: none"> • Identify additional critical facilities without generators • Prioritize need for generators at critical facilities • Generators and related equipment (e.g., hook-ups) are eligible under the HMGP and Homeland Security Grants 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. 	
Does the action alleviate long-term risk from future conditions including climate change?	No.
Benefit to Underserved/Socially Vulnerable Population	Serves the entire community, including large elderly population, youth population and low income.
Coordinating Organization	Wheeler County Emergency Management
Internal Partners:	External Partners:
City of Fossil, City of Mitchell, City of Spray, Wheeler County, Local businesses	Oregon Department of Emergency Management, Oregon Department of Human Services, Federal Emergency Management Agency
Potential Funding Sources:	Timeline:
FEMA Building Resilient Infrastructure and Communities Grants, Homeland Security Grants, Hazard Mitigation Grant Program	Short Term (1-3 years)
Priority:	Medium
Action Item Status:	New Action for the 2024 NHMP. Modified from #6.

Multi-Hazard #12

Proposed Action Item: MH#12		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, Sherman, 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 tri-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. 			
Does the action alleviate long-term risk from future conditions including climate change?			
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Cities of Fossil, Mitchell and Spray, Surrounding Counties, Fire Districts, County Road Department		Bureau of Land Management, Oregon Department of Forestry, Gilliam County, Sherman County, Jefferson County, Natural Resources Conservation Service, Columbia Basin Electric Co-Op, Wasco Rural Electric	
Potential Funding Sources:		Timeline:	
Rotating NRCS programs, USFS Community Wildfire Defense Grants, Columbia Basin Electric Co-Op, Wasco Rural Electric, Local Taxes		Routine	
Priority:	Medium		
Action Item Status:	Ongoing from the 2019 NHMP, retain.		

Multi-Hazard #13

Proposed Action Item: MH#13		Alignment with Plan Goals:	
Secure funding to improve infrastructure that will increase the capacity and availability of water 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 Aquafer Storage and Recovery project is the next plan for the City of Fossil. This plan will store excess water in a below ground aquafer during times of excess flows, October through May. Then the City will pump out the stored water in the aquifer during times of excess demand, June through 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Long term water management can help alleviate risks from climate change.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		City of Fossil	
Internal Partners:		External Partners:	
Wheeler County Emergency Management		Department of Environmental Quality, Water Master Office District 21, Engineers, Contractors, Oregon Department of Emergency Management, US Army Corps of Engineers, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
FEMA Hazard Mitigation Assistance, US Army Corps of Engineers, Rural Utilities		Short Term/In progress	
Priority:	High		
Action Item Status:	Ongoing from 2019 NHMP, retain. Funding has been secured. They are seeking contractors to complete the work.		

Multi-Hazard #14

Proposed Action Item: MH#14		Alignment with Plan Goals:	
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.		<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 whole community; the public, private sector, and government agencies to mitigate 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education early and often can create citizen buy in for projects and contribute to reducing long term risk.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Wheeler County, Cities of Fossil, Mitchell and Spray, Soil and Water Conservation District		Oregon Department of Forestry, Oregon State Fire Marshal, DOGAMI, Oregon Department of Emergency Management, Oregon Department of Health and Human Services, Oregon State University, Federal Emergency Management Agency, Natural Resources Conservation Service	
Potential Funding Sources:		Timeline:	
County and City General Funds, Oregon State Fire Marshal, and Oregon Department of Emergency Management for hazard specific outreach		Routine	
Priority:	High Priority		
Action Item Status:	Ongoing from 2019 NHMP, retain. Part of regular Emergency Management program outreach.		

Multi-Hazard #15

Proposed Action Item: MH#15		Alignment with Plan Goals:	
Increase by 25% the number of people in Wheeler County signed up for the Everbridge Frontier Regional Emergency Notification System.		Goal 1: Safety of life and property. Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate 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, Sherman, 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. • Place posters and informational brochures at major public locations. 			
Does the action alleviate long-term risk from future conditions including climate change?		No. Routine action that provides immediate benefits.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Wheeler County, Cities of Fossil, Mitchell, and Spray		Everbridge, Frontier 911, Gilliam, Sherman, and Jefferson Counties	
Potential Funding Sources:		Timeline:	
Wheeler County Emergency Management, Frontier 911, County and City General Funds		Short Term (1-3 years)	
Priority:	High		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Everbridge is undergoing significant updates and will require increased outreach.		

Multi-Hazard #16

Proposed Action Item: MH#16		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.		Goal 1: Safety of life and property. Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.	
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. • 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. • Air quality suffers during summer months with increasingly large wildfires. • 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"> • There are many funding options available through state and federal programs, some of these include the following: • 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 			
Does the action alleviate long-term risk from future conditions including climate change?		No, but it alleviates short-term risk from climate change.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Public Health	
Internal Partners:		External Partners:	
Wheeler County Emergency management, Cities of Fossil, Mitchell, and Spray.		Oregon Department of Human Services, Oregon Public Health, CAPECO, US Department of Energy, Oregon Housing and Community Services, US Department of Agriculture	
Potential Funding Sources:		Timeline:	
Oregon Housing and Community Services Weatherization Programs, USDA Very Low-Income Housing Repair Program, USDOE Weatherization Assistance Program, CAPECO Weatherization Program		Short Term (1-3 years)	
Priority:	Low		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Public Health has distributed air condition units and air scrubbers.		

Multi-Hazard #17

Proposed Action Item: MH#17		Alignment with Plan Goals:	
Invest in and promote community gardens and local food production.		Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate 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"> The Oregon Public Health Institute (OPHI) is an independent, nonprofit organization committed to improving the health of Oregonians through advocacy and support of effective public health policy and environments. They provide information on creating community gardens, including funding opportunities. The Oregon State University Extension Service provides information and classes on food preservation and canning. These classes are offered online. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Investing in local supply chains and food production can reduce the community's carbon footprint.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Extension Service	
Internal Partners:		External Partners:	
Cities of Fossil, Mitchell, and Spray		Natural Resource Conservation Service, US Department of Agriculture, Oregon Public Health Institute, Oregon State University Extension	
Potential Funding Sources:		Timeline:	
Oregon Public Health, Oregon State University, Local Community Donations		Routine	
Priority:	Low		
Action Item Status:	Ongoing from 2019 NHMP, retain. Gardening is being promoted throughout the county. A take some, leave some produce stand is being developed in Mitchell.		

Multi-Hazard #18

Proposed Action Item: MH#18		Alignment with Plan Goals:	
Invest in and promote solar and other alternative energy in public, residential, and commercial properties.		Goal 1: Safety of life and property. Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.	
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 them 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. 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 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Investing in renewable energy helps alleviate long-term risk.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Planning Department, County Emergency Management, Cities of Fossil, Mitchell, and Spray		Oregon Department of Energy, Energy Trust of Oregon	
Potential Funding Sources:		Timeline:	
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		Long Term (8-10 years)	
Priority:	Low		
Action Item Status:	No Action, retain from 2019 NHMP.		

Multi-Hazard #19

Proposed Action Item: MH#19		Alignment with Plan Goals:	
Develop hazard-specific evacuation plans that consider impacts to bridges, other key transportation infrastructure and lifelines.		<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 whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.</p>	
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. 			
Does the action alleviate long-term risk from future conditions including climate change?		No. This will have to change based on conditions.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Wheeler County Road Department, City of Fossil, Mitchell and Spray Public Works, Cities of Fossil, Mitchell, and Spray		Oregon Department of Transportation, Oregon Department of Emergency Management, Oregon Department of Forestry, US Forest Service, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
FEMA Building Resilient Infrastructure and Communities Grant, Hazard Mitigation Grants, USFS Community Wildfire Defense Grants		Medium Term (4-7 years)	
Priority:	Medium		
Action Item Status:	Ongoing from the 2019 NHMP, retain. The Planning group has had multiple meetings to discuss and plan for this.		

Multi-Hazard #20

Proposed Action Item: MH#20		Alignment with Plan Goals:	
Develop a welcome packet for new residents (and potential new residents) on fire risk, winter storms and other hazards, EMS and volunteer fire capabilities and available services and critical facilities. Include volunteer applications for fire, ambulance, and other community services.		<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 whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • Wheeler County frequently has people move in who have never lived in a rural environment, and do not understand the unique challenges that come with wildfires, winter storms and other hazards. • New residents may be unaware that they can help their community by volunteering with EMS or the fire districts. • A welcome packet can help new residents feel like part of the community faster, and also help them prepare for a new environment and be less of a burden on limited EMS, Fire Districts, and other volunteer agencies. • 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"> • Gather applications from the Fire Districts, EMS agencies and all volunteer opportunities in Wheeler County for Packet. • Gather information on hazards from OSFM, USFS, ODHS, power companies and local best practices for winterization. • Work with local real estate agents to ensure a welcome packet is provided whenever someone purchases a new home in the County. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education early and often can help create a shift in culture that can alleviate risk from long term conditions.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Cities of Fossil, Mitchell and Spray, Planning Department, Fire Districts, Health Districts		Oregon Department of Forestry, Oregon State Fire Marshal, Oregon Department of Emergency Management, US Forest Service, Utility Companies	
Potential Funding Sources:		Timeline:	
City and County General Funds, Fire District Budget, Health District Budget		Short Term (1-3 years)	
Priority:	High Priority		
Action Item Status:	New action for the 2024 NHMP.		

Drought

In 2019 there were five drought mitigation action items. There are five items again for the 2024 Update.

- 1) Make available to county residents and the public information regarding droughts.
Status & Explanation: *In progress. Part of regular Emergency Management Outreach.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Routine*
Priority: *High*

- 2) Promote the planting of native and drought-resistant plants that require less water during drier months.
Status & Explanation: *No Action.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Short Term*
Priority: *Low Priority*

- 3) Provide water conservation education to kids in schools.
Status & Explanation: *In progress. The Soil and Water Conservation District conducts outreach in schools, including field trips to see water saving strategies enacted.*
Retain, Delete and/or Modify: *Modify*
Timeline: *Routine*
Priority: *Medium*

- 4) Develop a drought emergency plan.
Status & Explanation: *No Action.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Long Term*
Priority: *Low Priority*

- 5) Consider requiring water conservation during drought conditions.
Status & Explanation: *In progress. Cities regulate water usage during drought, and irrigation is shut down by Water Resources during drought.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Routine*
Priority: *High*

Drought #1

Proposed Action Item: DR#1		Alignment with Plan Goals:	
Make available to county residents and the public information regarding droughts		<p>Goal 2: Increased cooperation and collaboration between groups and agencies.</p> <p>Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education can influence residents to take actions on their own and reduce long term risk.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court, Public Works, Cities of Fossil, Mitchell, and Spray.		Oregon Department of Agriculture, OSU Extension, Cattle Association, Soil and Water Conservation District, Oregon Department of Forestry, Watermaster, Oregon Dept of Fish and Wildfire, Natural Resource Conservation Service	
Potential Funding Sources:		Timeline:	
County and City general funds. Much of the information is free from government agencies.		Routine	
Priority:	High Priority		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Part of regular Emergency Management Program Outreach		

Drought #2

Proposed Action Item: DR#2		Alignment with Plan Goals:	
Promote the planting of native and drought-resistant plants that require less water during drier months.		<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 whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • Across the western US, mountain snowpack is projected to decline leading to reduce 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 model's projected change in precipitation, with some models projecting increases and others decreases (Gergel et al., 2017). • 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). • Drought situations increase the risk of fire hazards. They can also cause visibility hazards and critical water shortages for humans, animals, and vegetation. • 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"> • Encourage drought-tolerant landscape design through measures such as: • Incorporating drought tolerant or xeriscape 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Changing yard landscaping is a long-term strategy to reduce water usage and environmental impact.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Cities of Fossil, Mitchell and Spray, Wheeler County Planning Department		Oregon State University Extension Service, Soil and Water Conservation District, Natural Resources Conservation Service, Oregon State Fire Marshal	
Potential Funding Sources:		Timeline:	
County and City General Funds, obtain materials from OSU and OSFM.		Short Term (1-3 years)	
Priority:	Low		
Action Item Status:	Ongoing from the 2019 NHMP, retain. OSU Extension provides information to the county on this.		

Drought #3

Proposed Action Item: DR#3		Alignment with Plan Goals:	
Provide water conservation education to kids in schools.		Goal 1: Safety of life and property. Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> 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 it with their parents and siblings. Wheeler County frequently experiences drought. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> 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. Conduct a water use and savings outreach program at the schools in each city, invite parents to attend the assembly. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Early education can have a lasting impact on how residents will act for their entire lifetime.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County School District	
Internal Partners:		External Partners:	
County Schools (Fossil Charter, Mitchell Schools, and Spray Schools) Wheeler County Emergency Management, Soil and Water Conservation District		Oregon Department of Emergency Management, Natural Resources Conservation Service, US Department of Agriculture, OSU Extension Service, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
County and City General Funds, obtain materials from FEMA, ODEM, NRCS, USDA and OSU		Routine	
Priority:	Moderate		
Action Item Status:	Ongoing from the 2019 NHMP, modified. The SWCD conducts outreach in schools, including field trips to see water saving tactics.		

Drought #4

Proposed Action Item: DR#4		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 whole community; the public, private sector, and government agencies to mitigate 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. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Review current Emergency Operations Plan (EOP) to identify existing plan for drought, if any. Consider integrating drought into the future updates of the County EOP, Comprehensive Plan and other existing policies and plans. Include non-agency staff such as local utilities, farmers, and the OSU Extension Service in helping develop the plan. 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) 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Planning for long term impacts of drought can help alleviate drought symptoms.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Planning Department, Cities of Fossil, Mitchell and Spray, Soil and Water Conservation District		US Department of Agriculture, Natural Resource Conservation Service, OSU Extension Service, Oregon Department of Emergency Management, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
FEMA Building Resilient Infrastructure and Communities Grant, Hazard Mitigation Grants, Oregon Department of Emergency Management Special Funding		Long Term (8-10 years)	
Priority:	Low		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Cities regulate water during drought, and irrigation is shut down by Water Resources during drought.		

Drought #5

Proposed Action Item: DR#5		Alignment with Plan Goals:	
Consider requiring water conservation during drought conditions.		Goal 1: Safety of life and property. Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> Across the western US, mountain snowpack is projected to decline leading to reduce 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 model's projected change in precipitation, with some models projecting increases and others decreases (Gergel et al., 2017). 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). Drought situations increase the risk of fire hazards. They can also cause visibility hazards and critical water shortages for humans, animals, and vegetation. 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"> Developing an ordinance to restrict the use of public water resources for non-essential usage, such as landscaping, washing cars, filling swimming pools, etc. Adopting ordinances to prioritize or control water use, particularly for emergency situations like firefighting. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Proper use of natural resources can help manage them for long term use in the future.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Planning Department, Cities of Fossil, Mitchell, and Spray, Soil and Water Conservation District		USDA, Water Resources, Natural Resources Conservation Service	
Potential Funding Sources:		Timeline:	
Water Infrastructure Finance and Innovation Program, Water Project Grants and Loans, Soil and Water Conservation District, Natural Resource Conservation Service		Routine	
Priority:	High Priority		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Cities regulate water during drought, and irrigation is shut down by Water Resources during drought.		

Earthquake

In 2019 there were two earthquake mitigation action items. There are three for the 2024 update.

- 1) Make available to county residents and the public information regarding earthquakes.
Status & Explanation: *In progress. Part of regular Emergency Management Outreach.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Routine*
Priority: *Moderate Priority*

- 2) Seek funding through the State office of Emergency Management and/or the Federal Emergency Management Agency to seismically retrofit critical facilities with a high collapse potential rate by the Department of Geology and Mineral Industries.
Status & Explanation: *No Action*
Retain, Delete and/or Modify: *Retain*
Timeline: *Long Term*
Priority: *Moderate Priority*

- 3) Seek Funding to seismically retrofit critical infrastructure not rated by the Department of Geology and Mineral Industries including the County Emergency Operations Center in Spray.
Status & Explanation: *New Action for the 2024 NHMP update.*
Retain, Delete and/or Modify:
Timeline: *Long Term*
Priority: *Moderate Priority*

Earthquake #1

Proposed Action Item: EQ#1		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 whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • 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. • Provide an informational booth at the Wheeler County Fair on Earthquake potential. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education can influence residents to take actions on their own and reduce long term risk.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court, Fire Departments, Cities of Fossil, Mitchell, and Spray		American Red Cross, Oregon Department of Health, and Human Services	
Potential Funding Sources:		Timeline:	
County and City General Funds		Routine	
Priority:	Moderate		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Part of regular Emergency Management Program Outreach.		

Earthquake #2

Proposed Action Item: EQ#2		Alignment with Plan Goals:	
Seek funding through the State office of Emergency Management and/or the Federal Emergency Management Agency to seismically retrofit critical facilities with a high collapse potential rate by the Department of Geology and Mineral Industries.		Goal 1: Safety of life and property.	
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"> • Seek funding through various grant programs to seismically retrofit the critical facilities rated with high collapse potential rating. • Priorities the schools for the retrofit. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court, School Districts, Cities of Fossil, Mitchell, and Spray		Oregon Department of Emergency Management, Federal Emergency Management Agency, Oregon Department of Transportation	
Potential Funding Sources:		Timeline:	
ODEM Seismic Rehabilitation Program		Long Term (8-10 years)	
Priority:	Moderate Priority		
Action Item Status:	Retained from the 2019 NHMP. No Action.		

Earthquake #3

Proposed Action Item: EQ#3		Alignment with Plan Goals:	
Seek Funding to seismically retrofit critical infrastructure not rated by the Department of Geology and Mineral Industries including the County Emergency Operations Center in Spray.		Goal 1: Safety of life and property.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Emergency Operations Center in Spray is an important building for Wheeler County and for the State of Oregon in the event of a large-scale earthquake. • Priority should be given to the DOGAMI assessed buildings, these additional pieces of critical infrastructure should be seismically retrofitted when time and resources allow. • 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"> • Conduct a seismic assessment for identified facilities to determine retrofitting needs. • Seek funding through various grant programs to seismically retrofit the critical facilities with a high collapse rate potential. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court, City of Spray		Oregon Department of Emergency Management, Oregon Department of Geology and Mineral Industries, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
Seismic Rehabilitation Grant Program (ODEM)		Long Term (8-10 years)	
Priority:	Moderate		
Action Item Status:	New Action for the 2024 NHMP update.		

Flood

In 2019 there were five flood mitigation action items. There are five action items for the 2024 update.

- 1) Make available to county residents and the public information regarding floods and their potential impact on Wheeler County.
Status & Explanation: *In progress. Part of regular emergency management outreach.*
Retain, Delete and/or Modify: *Modify*
Timeline: *Short Term*
Priority: *High Priority*

- 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.
Status & Explanation: *The City of Fossil has adopted the ordinance. Spray and Mitchell are in progress.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Short Term*
Priority: *High Priority*

- 3) Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency 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: *In Progress. Mitchell is working on this on Nelson Street with FEMA.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Short Term*
Priority: *High Priority*

- 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: *In progress.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Short Term*
Priority: *High Priority*

- 5) Coordinate with the State Floodplain Coordinator and the DLCD to update the FEMA Flood Insurance Rate Maps for Wheeler County and the incorporated cities participating in the National Flood insurance Program and Risk Map.
Status & Explanation: *Wheeler County, The City of Fossil and the City of Mitchell participate in the NFIP. FIRMS for Wheeler County and incorporated Cities are current as of 1989.*
Retain, Delete and/or Modify:
Timeline: *Routine*
Priority: *High Priority*

Flood #1

Proposed Action Item: FL#1		Alignment with Plan Goals:	
Make available to county residents and the public information regarding floods and their potential impact on Wheeler County.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies.</p> <p>Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.</p>	
Rationale for Proposed Action Item:			
<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. 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. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Encourage residents to know types of flood risk in their area, visit FEMA's Flood Map Service Center. Encourage residents to sign up for community warning systems. 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. Get flood coverage under the National Flood Insurance Program (NFIP). 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education can influence residents to take actions on their own and reduce long term risk.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court; Fire Departments; Cities of Fossil, Mitchell, and Spray		American Red Cross, Oregon Department of Emergency Management, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
County and City General Funds. Much of the information on flooding preparedness is available online at little to no cost.		Short Term (1-3 years)	
Priority:	High		
Action Item Status:	Ongoing from 2019 NHMP, retain. Part of regular outreach.		

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. Update the County Flooding Ordinance by adopting DLCD's model floodplain development code when available.		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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Updated maps may prevent development in areas prone to flooding.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Planning Department	
Internal Partners:		External Partners:	
County Court, County Planning Department, Cities of Fossil, Mitchell, and Spray,		Department of Land Conservation and Development, Oregon Department of Emergency Management, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
This is a low-cost action that should be covered within the regular county and city budgets.		Short Term (1-3 years)	
Priority:	High Priority		
Action Item Status:	Ongoing from 2019 NHMP, retain. The City of Fossil has adopted the ordinance. Spray and Mitchell are in progress.		

Flood #3

Proposed Action Item: FL#3		Alignment with Plan Goals:	
Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Flood conditions may increase with more rain as climate change impacts Wheeler County.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		City of Mitchell	
Internal Partners:		External Partners:	
Wheeler County Emergency Management		CenturyTel, Oregon Department of Emergency Management, Federal Emergency Management Agency, US Postal Service	
Potential Funding Sources:		Timeline:	
FEMA, Army Corps of Engineers, Oregon Regional Solutions, Business Oregon		Short Term (1-3 years)	
Priority:	High		
Action Item Status:	Ongoing from 2019 NHMP, retain. Mitchell is working on a project on Nelson Street with FEMA.		

Flood #4

Proposed Action Item: FL#4		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: • 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		City of Spray	
Internal Partners:		External Partners:	
Wheeler County Emergency Management		Ferguson Surveying & Engineering, Oregon Department of Emergency Management, Oregon Department of Transportation, Federal Emergency Management Agency, U.S. Army Corps of Engineers	
Potential Funding Sources:		Timeline:	
Oregon Department of Transportation, Oregon Department of Emergency Management, Federal Emergency Management Agency		Short Term (1-3 years)	
Priority:	High		
Action Item Status:	Ongoing from 2019 NHMP, retain.		

Flood #5

Proposed Action Item: FL#5		Alignment with Plan Goals:	
Coordinate with the State Floodplain Coordinator and the DLCD to update the FEMA Flood Insurance Rate Maps for Wheeler County and the incorporated cities participating in the National Flood insurance Program 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Updated maps may prevent development in areas prone to flooding.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Planning Department	
Internal Partners:		External Partners:	
County Emergency Management, Cities of Fossil, Mitchell, and Spray,		Department of Land Conservation and Development, Oregon Department of Emergency Management, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
DLCD Grants, FEMA funding, State and Federal Grants		Short Term	
Priority:	High Priority		
Action Item Status:	Retained from 2019 NHMP, No Action. Wheeler County would like their floodplains updated but is low on the State Priority list.		

Landslide/Debris Flow

In 2019 there were three mitigation actions. There are three mitigation actions for the 2024 update.

- 1) Make available to county residents and the public information regarding landslides/debris flow.
Status & Explanation: *Part of regular emergency management outreach.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Short Term*
Priority: *High Priority*

- 2) Develop education and public outreach to engage adjacent landowners to improve slope management practices.
Status & Explanation: *In progress. Changed responsibility to the SWCD who regularly provides outreach to landowners on slope management and soil conservation.*
Retain, Delete and/or Modify: *Modify*
Timeline: *Short Term*
Priority: *High Priority*

- 3) Explore low-cost mitigation options, such as maintenance of slide fences, ditches, and other drainage facilities.
Status & Explanation: *No action.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Medium Term*
Priority: *Moderate Priority*

Landslide #1

Proposed Action Item: LS#1		Alignment with Plan Goals:	
Make available to county residents and the public information regarding landslides/debris flows.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies.</p> <p>Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • 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). 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Educate the public in regard 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education can influence residents to take actions on their own and reduce long term risk.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court, County Public Works, County Road Department, Cities of Fossil, Mitchell and Spray, School Districts, Medical Clinic,		Oregon Department of Geological and Mineral Industries, Oregon Department of Emergency Management, American Red Cross, Oregon Department of Transportation	
Potential Funding Sources:		Timeline:	
This is a low-cost action that should be covered within the regular county and city budgets.		Routine	
Priority:	High		
Action Item Status:	Ongoing from 2019 NHMP, retain. Part of regular emergency management outreach.		

Landslide #2

Proposed Action Item: LS#2		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 whole community; the public, private sector, and government agencies to mitigate 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education can influence residents to take actions on their own and reduce long term risk.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Soil and Water Conservation District	
Internal Partners:		External Partners:	
Wheeler County Emergency Management, County Court, County Public Works, County Road Department, Cities of Fossil, Mitchell and Spray, School Districts		Oregon Department of Geological and Mineral Industries, Oregon Department of Emergency Management, American Red Cross, Oregon Department of Transportation	
Potential Funding Sources:		Timeline:	
This is a low-cost action that should be covered within the regular county and city budgets.		Short Term (1-3 years)	
Priority:	High		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Changed responsibility to the SWCD who regularly provides outreach to landowners on slope management and soil conservation.		

Landslide #3

Proposed Action Item: LS#3		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 whole community; the public, private sector, and government agencies to mitigate 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:			
<p>There are four basic strategies to mitigate for a particular landslide:</p> <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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. This is preparing for long-term impacts of climate change including increased landslide risk days.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management, Soil and Water Conservation District	
Internal Partners:		External Partners:	
County Road Department, Cities of Fossil, Mitchell, and Spray		Oregon Department of Transportation, Oregon Department of Emergency management, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
ODOT Programs, FEMA BRIC Grants, Business Oregon Transportation/Tourism Programs		Medium Term (4-7 years)	
Priority:	Moderate		
Action Item Status:	Retain from 2019 NHMP, no action.		

Volcanic Activity

In 2019 there were two mitigation action items. There are two mitigation actions for 2024.

- 1) Make available to county residents and the public information regarding volcanic events.
Status & Explanation: *In progress. Part of regular emergency management outreach.*
Retain, Delete and/or Modify: *Modify*
Timeline: *Short Term*
Priority: *High Priority*

- 2) Evaluate the County's Emergency Operations Plan with regard to preparing for a volcanic event.
Status & Explanation: *In progress. Wheeler County Emergency is looking to update their EOP in 2024.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Short Term*
Priority: *Moderate Priority*

Volcanic Event #1

Proposed Action Item: VE#1		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 whole community; the public, private sector, and government agencies to mitigate 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 hazards risk 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education can influence residents to take action on their own.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court, Public Health, Cities of Fossil, Mitchell and Spray, Medical Clinic, Media, School Districts		Oregon Department of Emergency Management, Oregon Department of Environmental Quality, American Red Cross, US Geological Service, Oregon Department of Geological and Mineral Industries	
Potential Funding Sources:		Timeline:	
This is a low-cost action that should be covered within the regular county and city budgets.		Routine	
Priority:	High		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Part of regular emergency management outreach		

Volcanic Event #2

Proposed Action Item: VE#2		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 whole community; the public, private sector, and government agencies to mitigate 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		No.	
Benefit to Underserved/Socially Vulnerable Population		Indirect	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court, County Planning Department, Cities of Fossil, Mitchell, and Spray		Oregon Department of Emergency Management, Oregon Department of Environmental Quality, US Geological Service, Oregon Department of Geological and Mineral Industries	
Potential Funding Sources:		Timeline:	
This is an action that should be covered under the budget for updating the EOP. Oregon Department of Emergency Management, FEMA Hazard Mitigation Grants		Short Term (1-3 years)	
Priority:	Moderate		
Action Item Status:	Retain from 2019 NHMP, no action. Wheeler County is looking to update their EOP in 2024.		

Wildfire

In 2019 there were thirteen mitigation actions for wildfire. There are twelve for the 2024 NHMP update.

- 1) Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to reduce wildland fire risk in Wheeler County.
Status & Explanation: *While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy.*
Retain, Delete and/or Modify: Retain
Timeline: Routine
Priority: High Priority
- 2) Conduct risk assessment activities with the Wheeler County Community Wildfire Protection Plan local Coordinating Group to assess areas in the county at risk from wildland fires.
Status & Explanation: *While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy.*
Retain, Delete and/or Modify: Retain
Timeline: Routine
Priority: High Priority
- 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 is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy.*
Retain, Delete and/or Modify: Retain
Timeline: Routine
Priority: High Priority
- 4) Work with the CWPP Local Coordinating Group to implement fuel reduction strategies to reduce the risk to wildland fires, including conducting a full count-wide wildfire hazard risk assessment.
Status & Explanation: *While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy.*
Retain, Delete and/or Modify: Retain
Timeline: Routine
Priority: High Priority
- 5) Make available to County residents and the public information regarding wildfires.
Status & Explanation: *In progress. Part of regular emergency management outreach.*
Retain, Delete and/or Modify: Retain
Timeline: Routine
Priority: High Priority

- 6) Provide Wheeler County Road Department with firefighting training and equipment.
Status & Explanation: *In progress. A tank and pump were purchased for the Road Department. They receive annual required training.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Routine*
Priority: *High Priority*

- 7) Assist Rural Fire Protection Districts and City Fire Departments in maintaining and upgrading their firefighting equipment, facilities and trainings as needed.
Status & Explanation: *In progress.*
Retain, Delete and/or Modify: *Modify*
Timeline: *Medium Term*
Priority: *Moderate Priority*

- 8) Distribute fire prevention literature and material to homeowners and visitors.
Status & Explanation: *In progress. Part of regular emergency management outreach.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Routine*
Priority: *High Priority*

- 9) Conduct Fire prevention programs in schools.
Status & Explanation: *In progress. Fossil Fire consistently goes to the schools, OSFM is assisting with outreach to other schools.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Routine*
Priority: *High Priority*

- 10) Provide information about what type of fire resistive plants to use for landscaping.
Status & Explanation: *In progress. OSFM regularly distributes materials at community events, including Fair.*
Retain, Delete and/or Modify: *Modify*
Timeline: *Short Term*
Priority: *Medium Priority*

- 11) Look into large scale fire mitigation methods, including prescribed burns, vegetative fuel breaks, habitat/native vegetation restoration and juniper mitigation near critical facilities, towns, and highly trafficked tourist areas, including Cougar Mountain and Twickenham.
Status & Explanation: *New Action for the 2024 NHMP.*
Retain, Delete and/or Modify:
Timeline: *Short Term*
Priority: *High Priority*

12) Promote wildfire mitigation funding opportunities available through BLM, ODF and other grants.

Status & Explanation: *New Action for the 2024 NHMP.*

Retain, Delete and/or Modify:

Timeline: *Short Term*

Priority: *High Priority*

Wildfire #1

Proposed Action Item: WF#1		Alignment with Plan Goals:	
Coordinate mitigation activities and emergency management planning efforts with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to reduce wildland fire risk in Wheeler County.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies.</p> <p>Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate 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 group is responsible for: <ul style="list-style-type: none"> Providing oversight of 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. 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"> Coordinate wildland fire risk reduction activities with the Local Coordinating Group to assist them in accomplishing the following activities: <ul style="list-style-type: none"> 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. Outline strategies and activities for public outreach in emergency management 			
Does the action alleviate long-term risk from future conditions including climate change?		No.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court, County Road Department, Wheeler County Defense Board, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens		Oregon State Fire Marshal, Oregon Department of Forestry, US Forest Service Umatilla and Ochoco, National Park Service	
Potential Funding Sources:		Timeline:	
Oregon Department of Forestry Wildland-Urban Interface Grants, Oregon Forest Land Protection Fund, and other funding, FEMA grants		Routine	
Priority:	High		
Action Item Status:	Ongoing from the 2019 NHMP, retain. While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy.		

Wildfire #2

Proposed Action Item: WF#2		Alignment with Plan Goals:	
Conduct risk assessment activities with the Wheeler County Community Wildfire Protection Plan local Coordinating Group to assess areas in the county at risk to wildland fires.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies.</p> <p>Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate 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 of 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		No.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		CWPP Local Coordinating Group	
Internal Partners:		External Partners:	
County Court, County Road Department, Wheeler County Defense Board, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens		Oregon State Fire Marshal, Oregon Department of Forestry, US Forest Service Umatilla and Ochoco, National Park Service	
Potential Funding Sources:		Timeline:	
Oregon Department of Forestry Wildland-Urban Interface Grants, US Forest Service Community Wildfire Defense Grants, Oregon Forest Land Protection Fund, and other funding		Routine	
Priority:	High		
Action Item Status:	Ongoing from the 2019 NHMP, retained. While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy.		

Wildfire #3

Proposed Action Item: WF#3		Alignment with Plan Goals:	
Coordinate information and outreach activities with the Wheeler County Community Wildfire Protection Plan Local Coordinating Group to promote fire prevention and risk reduction.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies.</p> <p>Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate 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 meet as one body to create synergies between the groups. As a practical matter, given the 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Some projects from the CWPP will have long lasting impacts.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		CWPP Local Coordinating Group	
Internal Partners:		External Partners:	
County Court, County Road Department, Wheeler County Defense Board, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens		Oregon State Fire Marshal, Oregon Department of Forestry, US Forest Service Umatilla and Ochoco, National Park Service	
Potential Funding Sources:		Timeline:	
Oregon Department of Forestry Wildland-Urban Interface Grants, US Forest Service Community Wildfire Defense Grants, Oregon Forest Land Protection Fund, and other funding		Routine	
Priority:	High		
Action Item Status:	Ongoing from the 2019 NHMP, retained. While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy.		

Wildfire #4

Proposed Action Item: WF#4		Alignment with Plan Goals:	
Work with the CWPP Local Coordinating Group to implement fuel reduction strategies to reduce the risk to wildland fires, including conducting a full county-wide wildfire hazard risk assessment.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies.</p> <p>Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate 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. • 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 reduce their property's risk of fire damage. • 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"> • 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." 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Some projects from the CWPP will have long lasting impacts.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		CWPP Local Coordinating Group	
Internal Partners:		External Partners:	
County Court, County Road Department, Wheeler County Defense Board, Community and County Leaders, Cities of Fossil, Mitchell and Spray and Citizens		Oregon State Fire Marshal, Oregon Department of Forestry, US Forest Service Umatilla and Ochoco, National Park Service	
Potential Funding Sources:		Timeline:	
Oregon Department of Forestry Wildland-Urban Interface Grants, Oregon Forest Land Protection Fund, and other funding, FEMA grants		Routine	
Priority:	Moderate		
Action Item Status:	Ongoing from the 2019 NHMP, retained. While this is a routine mitigation action, it is a crucial part of the County's Wildfire Resilience strategy.		

Wildfire #5

Proposed Action Item: WF#5		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 whole community; the public, private sector, and government agencies to mitigate 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education can influence residents to take action on their own.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Sheriff, Cities of Fossil, Mitchell and Spray, Fire Districts, County Road Department		Oregon State Fire Marshal, Oregon Department of Forestry, US Forest Service Umatilla and Ochoco, National Park Service, American Red Cross, Humane Society, Utilities, Bureau of Land Management, Oregon Department of Fish and Wildlife, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
County and City general funds. This is a collaborative effort that includes local, state, and federal partners. Seek funding through partner agencies as well as grants from FEMA and OSFM; many materials are available for free through OSFM.		Routine	
Priority:	High		
Action Item Status:	Ongoing from the 2019 NHMP, retained. Part of regular emergency management outreach.		

Wildfire #6

Proposed Action Item: WF#6		Alignment with Plan Goals:	
Provide Wheeler County Road Department with firefighting training and equipment		<p>Goal 2: Increased cooperation and collaboration between groups and agencies.</p> <p>Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		No. Short term response impact.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Road Department	
Internal Partners:		External Partners:	
Wheeler County Emergency Management, CWPP Local Coordinating Group, Fire Districts		Oregon State Fire Marshal, Oregon Department of Forestry, US Forest Service Umatilla and Ochoco, Bureau of Land Management, Federal Emergency Management Agency	
Potential Funding Sources:		Timeline:	
DHS Assistance to Firefighter Grant, FEMA grants. USDA Website "rural fire department resources for local officials: https://www.nal.usda.gov/ric/rural-fire-department-resources-local-officials#FPA		Short Term (1-3 years)	
Priority:	High		
Action Item Status:	Ongoing from the 2019 NHMP, retained. A tank and pump were purchased for the Road Department. They receive annual required training.		

Wildfire #7

Proposed Action Item: WF#7	Alignment with Plan Goals:
Assist Rural Fire Protection Districts and City Fire Departments in maintaining and upgrading their firefighting equipment, facilities and trainings 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. 	
Does the action alleviate long-term risk from future conditions including climate change?	No. Short term response mitigations
Benefit to Underserved/Socially Vulnerable Population	Serves the entire community, including large elderly population, youth population and low income.
Coordinating Organization	Wheeler County Emergency Management
Internal Partners:	External Partners:
Rural Fire Districts, City Fire Departments, CWPP local Coordinating Group	Oregon State Fire Marshal, Oregon Department of Forestry, US Forest Service Umatilla and Ochoco, Federal Emergency Management Agency
Potential Funding Sources:	Timeline:
DHS Assistance to Firefighter Grant, FEMA grants. USDA Website "rural fire department resources for local officials: https://www.nal.usda.gov/ric/rural-fire-department-resources-local-officials#FPA	Medium Term (4-7 years)
Priority:	Moderate
Action Item Status:	Ongoing from the 2019 NHMP, retain.

Wildfire #8

Proposed Action Item: WF#8		Alignment with Plan Goals:	
Distribute fire prevention literature and material to homeowners and visitors.		Goal 1: Safety of life and property. Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate 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. Oregon State Fire Marshal regularly provides outreach material to local Fire Districts and will provide educational materials upon request. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education can influence residents to take action on their own.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Rural Fire Districts, City Fire Departments, CWPP local Coordinating Group		Oregon Department of Forestry, US Forestry Service, Bureau of Land Management, Oregon State Fire Marshal	
Potential Funding Sources:		Timeline:	
County and City General Funds, Fire District General Funds, Oregon State Fire Marshal Funding		Routine	
Priority:	High Priority		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Part of regular Emergency Management outreach.		

Wildfire #9

Proposed Action Item: WF#9		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 whole community; the public, private sector, and government agencies to mitigate 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 the Northeast Oregon Fire Prevention Co-Ops 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Early education can have a lasting impact on how residents will act for their entire lifetime.	
Benefit to Underserved/Socially Vulnerable Population		Focuses on the socially vulnerable youth community.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Schools, Fire Districts, City Fire Departments, Soil and Water Conservation District		Mid-Columbia Fire Prevention Co-Op, Northeast Oregon Fire Prevention Co-Op, Oregon State Fire Marshal	
Potential Funding Sources:		Timeline:	
County, City and Fire Department General Funds. Much of the literature identified above is available at no charge, contact the Oregon Department of Education and ODF to discuss potential funding sources. OSFM regularly provides outreach materials at no charge.		Routine	
Priority:	High Priority		
Action Item Status:	Ongoing from the 2019 NHMP, retain. Fossil Fire consistently goes to the schools, OSFM is assisting with outreach to other schools.		

Wildfire #10

Proposed Action Item: WF#10		Alignment with Plan Goals:	
Provide information about what type of fire resistive plants to use for landscaping.		Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate 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 Fire-Resistant Plants for Home Landscapes 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 An Introduction to Xeriscaping in the High Desert and Pictorial Plant Guide for Central and Eastern Oregon. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Fire resistant plants are a good long-term strategy that can contribute to reducing runoff and increasing soil health more than hardscaping.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Cities of Fossil, Mitchell and Spray, Fire Districts, City Fire Departments, Soil and Water Conservation District		OSU Extension Service, Oregon State Fire Marshal, Natural Resource Conservation Service	
Potential Funding Sources:		Timeline:	
OSFM, OSU, County and City General Funds, Soil and Water Conservation District		Short Term (1-3 years)	
Priority:	Medium Priority		
Action Item Status:	Ongoing from 2019 NHMP, retain. OSFM regularly distributes materials at community events, including Fair.		

Wildfire #11

Proposed Action Item: WF#11		Alignment with Plan Goals:	
Look into large scale fire mitigation methods, including prescribed burns, vegetative fuel breaks, habitat/native vegetation restoration and juniper mitigation near critical facilities, towns, and highly trafficked tourist areas, including Cougar Mountain and Twickenham.		<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 whole community; the public, private sector, and government agencies to mitigate 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, Wheeler County reported itself as being highly vulnerable to wildfire as well as having a high probability of future wildfire events. • Local vegetation increases fire risk; fuel or fire breaks reduce that risk. • Establishing fuel/fire breaks prior to a wildfire will enhance community safety and security and reduce the impact of wildland fires on the built and natural environment. • 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"> • Determine locations for fire breaks, fuel breaks and prescribed burns; coordinate closely with ODF and USFS. • Enhance collaboration between internal and external partner agencies and private landowners. • Engage with landowners in high-risk locations for prescribed burns and fuel breaks. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Rural Fire Districts, City Fire Departments, CWPP local Coordinating Group, Soil and Water Conservation District		Oregon Department of Forestry, Bureau of Land Management, US Forest Service, Oregon State Fire Marshal, Natural Resource Conservation Service, OSU Extension Service	
Potential Funding Sources:		Timeline:	
USFS Community Wildfire Defense Grants, OSFM Grants		Short Term (1-3 years)	
Priority:	High		
Action Item Status:	New action for the 2024 NHMP.		

Wildfire #12

Proposed Action Item: WF#12		Alignment with Plan Goals:	
Promote wildfire mitigation funding opportunities available through BLM, ODF, OSFM and other grants.		<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 whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • ODF is developing programs to assist local landowners with forest health and fuels reduction. • BLM is working on partnerships for widespread fuels reduction projects. • Performing • 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"> • Engage with landowners in high-risk locations to determine their needs and assist with finding funding. • Coordinate closely with ODF, BLM and other agencies offering funding to individuals so there is knowledge of what funding is available, and how to apply for it. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Certain wildfire mitigation strategies, such as restoring native habitats can have a positive long-term impact on climate change conditions.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Cities of Fossil, Spray and Mitchell, Fire Districts, Fire Departments, Soil and Water Conservation District		Oregon Department of Forestry, Bureau of Land Management, US Forest Service, Oregon State Fire Marshal, Natural Resource Conservation Service, OSU Extension Service	
Potential Funding Sources:		Timeline:	
ODF, BLM, and OSFM funding (programs change annually, coordinate with agency reps to determine what is available)		Short Term	
Priority:	Moderate Priority		
Action Item Status:	New Action for the 2024 NHMP.		

Windstorm

In 2019 there was one windstorm mitigation action item. There is one for the 2024 Update.

- 1) Make available to county residents and the public information regarding windstorms.
Status & Explanation: *In progress. Part of regular emergency management outreach.*
Retain, Delete and/or Modify: *Retain*
Timeline: *Routine*
Priority: *High Priority*

Windstorm #1

Proposed Action Item: WDS#1		Alignment with Plan Goals:	
Make available to county residents and the public information regarding windstorms.		<p>Goal 2: Increased cooperation and collaboration between groups and agencies.</p> <p>Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.</p>	
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 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education can influence residents to take action on their own.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court, Cities of Fossil, Mitchell, and Spray		Oregon Department of Emergency Management, Utility Companies, Local Media, Oregon Department of Transportation and American Red Cross	
Potential Funding Sources:		Timeline:	
County and City General Funds		Routine	
Priority:	High Priority		
Action Item Status:	Ongoing from 2019 NHMP, retain. Part of regular emergency management outreach.		

Winter Storm

In 2019 there were three winter storm mitigation action items. There is one for the 2024 Update.

- 1) Make available to county residents and the public information regarding winter storms.

Status & Explanation: *In progress. Part of regular emergency management outreach.*

Retain, Delete and/or Modify: *Retain*

Timeline: *Routine*

Priority: *High Priority*

Winter Storm #1

Proposed Action Item: WTS#1		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 whole community; the public, private sector, and government agencies to mitigate 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. 			
Does the action alleviate long-term risk from future conditions including climate change?		Yes. Education can influence residents to take action on their own.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
County Court, County Road Department, Cities of Fossil, Mitchell and Spray and citizens		Oregon Department of Emergency Management, Oregon Department of Transportation, American Red Cross, Federal Emergency Management Agency, National Weather Service	
Potential Funding Sources:		Timeline:	
County and City General Funds		Routine	
Priority:	High		
Action Item Status:	Ongoing from 2019 NHMP, retain. Part of regular emergency management outreach.		

Severe Weather

In 2019 there were no severe weather mitigation action items. There are two for the 2024 update.

- 1) Identify county resident and families with home weatherization needs (LMI) and seek funding assistance for repairs.

Status & Explanation: *In progress.*

Retain, Delete and/or Modify: *Modify. Shifted to severe weather since this action helps combat extreme heat and extreme cold.*

Timeline: *Short Term*

Priority: *Moderate Priority*

- 2) Work with CAPECO to assist low-income residents with energy needs during severe weather events.

Status & Explanation: *New Action for the 2024 NHMP.*

Retain, Delete and/or Modify:

Timeline: *Medium Term*

Priority: *Moderate Priority*

Severe Weather #1

Proposed Action Item: SW#1		Alignment with Plan Goals:	
Identify county resident and families with home weatherization needs (LMI) and seek funding assistance for repairs.		<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 whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.</p>	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> Wheeler County has a large number of vulnerable residents (elderly, low income, youth) who are particularly susceptible to extreme temperatures. The State of Oregon and Servicing Utility companies have several programs available to assist residents with improving the energy efficiency of their homes to combat extreme temperatures. 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"> Obtain outreach materials from Energy Trust of Oregon Determine what programs are available to County residents through local utility companies. Work with Wheeler County Family and Senior services to help get information to residents in need. Make materials available in high traffic areas, including Senior Meal Sites, Childcare Centers, and City Hall. 			
Does the action alleviate long-term risk from future conditions including climate change?		No. This is a short-term safety of life action.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Emergency Management	
Internal Partners:		External Partners:	
Cities of Fossil, Mitchell and Spray, Wheeler County Family and Senior Services		Energy Trust of Oregon, Utility Companies, Oregon Department of Emergency Management, Oregon Department of Human Services	
Potential Funding Sources:		Timeline:	
Energy Trust of Oregon, Utility Companies.		Short Term (1-3 years)	
Priority:	Moderate		
Action Item Status:	Ongoing from 2019 NHMP, modified. Shifted to severe weather since this action helps combat extreme heat and extreme cold.		

Severe Weather #2

Proposed Action Item: SW#2		Alignment with Plan Goals:	
Work with CAPECO to assist low-income residents with energy needs during severe weather events.		Goal 1: Safety of life and property. Goal 2: Increased cooperation and collaboration between groups and agencies. Goal 3: Motivate the whole community; the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> Wheeler County has a large number of vulnerable residents (elderly, low income, youth) who are particularly susceptible to extreme temperatures. Frequently vulnerable populations will not weatherize their homes because they cannot afford the upfront cost, or do not know all of the benefits it provides. 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"> CAPECO provides free weatherization services for income eligible households. Weatherization includes insulation installation and air services. 			
Does the action alleviate long-term risk from future conditions including climate change?		No. Short term safety of life action.	
Benefit to Underserved/Socially Vulnerable Population		Serves the entire community, including large elderly population, youth population and low income.	
Coordinating Organization		Wheeler County Public Health	
Internal Partners:		External Partners:	
Wheeler County Emergency management, Cities of Fossil, Mitchell and Spray, Wheeler County Family and Senior Services		CAPECO, Energy Trust of Oregon, State of Oregon	
Potential Funding Sources:		Timeline:	
CAPECO Weatherization Assistance, Energy Trust of Oregon, State Energy Loan Program, Oregon Tax Credits		Medium Term (4-7 years)	
Priority:	Moderate		
Action Item Status:	New Action for the 2024 NHMP.		

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) Hazard Mitigation Grant Program, to the state of Oregon. Wheeler County received a sub-grant through the state of Oregon, HMP -PF-5 94-09-P-OR.

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 retain eligibility for FEMA Hazard Mitigation, Building Resilient Infrastructure and Communities BRIC , 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 Month Day, 2024 and the Fossil addendum was adopted via resolution on Month Day, 2024. This NHMP is effective through Month Day, 2029.

Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3(iv), *Mitigation Strategy*.

During the 2024 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.

Table FS-1 Fossil Priority Action Items

Action Item #	Description	Managing Department/Agency	Timeline	Potential Funding Sources
MH #8	Seek funding for generators for critical facilities in Fossil including City Hall, Fire Department, Water Pumping Station	Wheeler County Emergency Management	Short Term (1-3 Years)	FEMA BRIC Grants, Homeland Security Grants, Hazard Mitigation Grant Program
MH#13	Secure funding to improve infrastructure that will increase the capacity and availability of water to protect the City of Fossil from the natural Hazards (i.e., drought, wildfire, etc.) that occur annually.	City of Fossil	In Progress	FEMA Hazard Mitigation Grant Program, USACE, Rural Utilities
FL#5	Coordinate with the State Floodplain Coordinator and the DLCD to update the FEMA Flood Insurance Rate Maps for Wheeler County and the incorporated cities participating in the National Flood insurance Program 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 Local Coordinating Group to reduce wildland fire risk in Wheeler County.	Wheeler County, County Wildfire Protection Plan Local Coordinating Group	Routine	Oregon Department of Forestry Wildland-Urban Interface Grants, Oregon Forest Land Protection Fund, and other funding, FEMA grants
WF#5	Make available to County residents and the public information regarding wildfires.	Wheeler county Emergency Management	Routine	County and City general funds. This is a collaborative effort that includes local, state, and federal partners. Seek funding through partner agencies as well as grants from FEMA and OSFM; materials are available for free through OSFM.
WF#8	Distribute fire prevention literature and material to homeowners and visitors.	Wheeler County Emergency management	Routine	County and City general funds. This is a collaborative effort that includes local, state, and federal partners. Seek funding through partner agencies as well as grants from FEMA and OSFM; many materials are available for free through OSFM.

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 has the authority to expand and improve City plans to achieve mitigation goals, as well as to levy taxes, use general funds and apply for grants to support mitigation. They also can participate in County plans and policy updates.

When updating plans and policies, the NHMP shall be reviewed and a member of the NHMP Steering Committee should be included in each project. By reviewing the NHMP prior to and during other plan updates and developments, the overall mitigation strategy for the City is strengthened. It is essential that mitigation be involved in every step of City Planning.

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 (2014)	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 (2019)	<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 (2024)	<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
 ·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 (2012)

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
Public Works Assistant	Full time City employee
City Recorder	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, 2023.

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 46-85 degrees in July, and 24-41 degrees in January. The city receives approximately 14.02 inches of rain and 14.2 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 next nearest gas station is in Biggs Junction, 18 miles to the north.

Economy

The median household income in Fossil is \$50,908 which is higher than that of Wheeler County as a whole (\$46,648) and significantly lower than the state average of \$75,657. The unemployment rate in the city is 6.5%.⁵ There are 184 people over the age of 16 employed in the city (41. %). Of these, 112 are in the private sector, while 47 are government workers and 1 are self-employed. Educational services, healthcare and social assistance employs the most people (22%), followed by public administration (16.9%), and arts, entertainment, recreation, accommodation and food services (12.9%).

Population Characteristics

The total population of Fossil is 447 people.⁶ The median age is 62.1 and 39.4% of the Fossil population is over 65 years old, while just 9. % is under 18 years old. Less than 10% of the population (7.8%) lives below the federal poverty level.⁷ It should be noted that Census data can be inaccurate at the small city level.

There are 268 housing units in the city of which 242 are occupied. Of the 242, 192 are owner occupied, while 50 are rentals. 90.4% 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 (50.4%) and 2.8% were built before 1939. Only 5 new housing units have been built in Fossil since the year 2000. The average household size in Fossil is under 2 people.⁸ 70.6% of housing units are heated by two sources: electricity (40.1%) and wood (30.5%).

A few conclusions that can be drawn from this data include:

- Fossil's median income is significantly lower than the state of Oregon's. 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/ek/fossil.aspx>

⁴ Western Regional Climate Center, NCDC Monthly Tabular Data, 1923-2021.

⁵ American Community Survey 2022 5-Year Estimates, DP0, U.S. Census Bureau

⁶ American Community Survey 2022 (5-Year Estimates), P1, U.S. Census Bureau

⁷ American Community Survey 2022 (5-Year Estimates), S101, U.S. Census Bureau

⁸ American Community Survey 2022 (5-Year Estimates), DP04, 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.
- Fossil's population continues to show 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
Fossil City Parks	Community Services
Fossil Water Supply	Community Services
Main Street in Fossil	Community Services

Source: Wheeler County NHMP Steering Committee, August 202

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 Department of Emergency Management (ODEM) 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 : 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	Vulnerability	Probability	Maximum Threat	Total	Rank	Risk Level
Wildfire (WUI)	20	50	70	100	240	1	High
Drought	20	50	70	100	240	1	High
Severe Weather	20	50	70	100	240	1	High
Winter Storms	18	50	70	100	238	2	High
Floods	18	50	70	100	238	2	High
Landslide/ Debris Flow	14	50	70	100	234	3	High
Windstorms	6	25	56	80	167	4	Medium
Volcanic Events	0	50	7	100	157	5	Medium
Earthquakes	0	40	7	90	137	6	Medium

Source: Wheeler County NHMP Steering Committee, 202 .

Please review Chapter : Risk Assessment and Appendix : 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) Hazard Mitigation Grant Program, to the State of Oregon. Wheeler County received a sub-grant through the State of Oregon, HMP -PF-5 94-09-P-OR.

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 retain eligibility for FEMA Hazard Mitigation, Building Resilient Infrastructure and Communities BRIC , 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 Month Day, 2024 and the Mitchell addendum was adopted via resolution on Month, Day, 2024. This NHMP is effective through Month Day, 2029.

Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3(iv), *Mitigation Strategy*.

During the 2024 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.

Table MI-1 Mitchell Priority Action Items

Action Item #	Description	Coordinating Organization	Timeline	Potential Funding Sources
MH #9	Seek funding for generators for critical facilities in Mitchell including City Hall/EMS Building, Water Reservoir, School District, Community Hall (Cascadia Staging Area)	Wheeler County Emergency Management	Short Term (1-3 Years)	FEMA BRIC Grants, Homeland Security Grants, Hazard Mitigation Grant Program
FL#3	Seek funding through the State Office of Emergency Management (OEM) and/or the Federal Emergency Management Agency 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	In Progress	FEMA, US Army Corps of Engineers, Oregon Regional Solutions, Business Oregon
FL#5	Coordinate with the State Floodplain Coordinator and the DLCDD to update the FEMA Flood Insurance Rate Maps for Wheeler County and the incorporated cities participating in the National Flood Insurance Program 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 Local Coordinating Group to reduce wildland fire risk in Wheeler County.	Wheeler County, County Wildfire Protection Plan Local Coordinating Group	Routine	Oregon Department of Forestry Wildland-Urban Interface Grants, Oregon Forest Land Protection Fund, and other funding, FEMA grants
WF#5	Make available to County residents and the public information regarding wildfires.	Wheeler county Emergency Management	Routine	County and City general funds. This is a collaborative effort that includes local, state, and federal partners. Seek funding through partner agencies as well as grants from FEMA and OSFM; materials are available for free through OSFM.
WF#8	Distribute fire prevention literature and material to homeowners and visitors.	Wheeler County Emergency management	Routine	County and City general funds. This is a collaborative effort that includes local, state, and federal partners. Seek funding through partner agencies as well as grants from FEMA and OSFM; many materials are available for free through OSFM.

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 has the authority to expand and improve City plans to achieve mitigation goals, as well as to levy taxes, use general funds and apply for grants to support mitigation. They also can participate in County plans and policy updates.

When updating plans and policies, the NHMP shall be reviewed and a member of the NHMP Steering Committee should be included in each project. By reviewing the NHMP prior to and during other plan updates and developments, the overall mitigation strategy for the City is strengthened. It is essential that mitigation be involved in every step of City Planning.

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 (2014)	<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 (2019)	<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 (2024)	<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 (2012)	<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
Four City Council members and Mayor	Elected Office
City Clerk	Part-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 MI-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, 2023.

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. 202) 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 \$41,800 which is lower than that of Wheeler County as a whole (\$46,648) and significantly lower than the state average of \$75,657². There are 17 people 16 and over in the city of which 82 are in the labor force. Of these, 6 are in the private sector, 25 are government workers and 6 are self-employed. The three largest employers by industry are: Educational services, and health care and social assistance (6.6%); professional, scientific, and management, and administrative and waste management services (20.6%); and arts, entertainment and recreation, and accommodation and food services (10.9%).³

Population Characteristics

The total population of Mitchell is 202 people⁴. 14.4% of the Mitchell population is over 62 years old, and 4.7% is under 18 years old. The median age in Mitchell is 24.5 years old.⁵

There are 74 housing units in the city of which 58 are occupied. Of the 58, 32 are owner occupied, and 26 are rentals. There are 16 vacant housing units in the city. Over 95% of the population has lived in the same house for the past 4 years or more, indicating high stability. The majority of houses in Mitchell were built before 1969 (70.%) while no units have been built since 1990. 29 of the 58 occupied housing units are heated by wood and 15 are heated by fuel oil.

A few conclusions that can be drawn from this data include:

- The population in Mitchell has increased in size and age since 2019, with the median age of 25 being well below the state median age of 40.
- 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 2022 (5-Year Estimates), S1901, US Census Bureau.

³ American Community Survey 2022 (5-Year Estimates), DP0, US Census Bureau.

⁴ American Community Survey 2022 (5-Year Estimates), S0101, US Census Bureau.

⁵ American Community Survey 2022 (5-Year Estimates), S0101, 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 Department of Emergency Management (ODEM) 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 : 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	Vulnerability	Probability	Maximum Threat	Total	Rank	Risk Level
Wildfire (WUI)	20	50	70	100	240	1	High
Drought	20	50	70	100	240	1	High
Severe Weather	20	50	70	100	240	1	High
Winter Storms	18	50	70	100	238	2	High
Floods	18	50	70	100	238	2	High
Landslide/ Debris Flow	14	50	70	100	234	3	High
Windstorms	6	25	56	80	167	4	Medium
Volcanic Events	0	50	7	100	157	5	Medium
Earthquakes	0	40	7	90	137	6	Medium

Source: Wheeler County NHMP Steering Committee, 202 .

Please review Chapter : Risk Assessment and Appendix : 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) Hazard Mitigation Grant Program to the State of Oregon. Wheeler County received a sub-grant through the state of Oregon, HMP -PF-5 94-09-P-OR.

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, Building Resilient Infrastructure and Communities BRIC , 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 Month Day, 2024 and the Spray addendum was adopted via resolution on Month Day, 2024. This NHMP is effective through Month Day, 2029.

Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3(iv), *Mitigation Strategy*.

During the 2024 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.

Table SP-1 Spray Priority Action Items

Action Item #	Description	Coordinating Organization	Timeline	Potential Funding Sources
MH #10	Seek funding for generators for critical facilities in Spray including EMS Complex, City Hall, Water Pumping Station, Sewer, Asher Community Health	Wheeler County Emergency Management	Short Term (1-3 Years)	FEMA BRIC Grants, Homeland Security Grants, Hazard Mitigation Grant Program
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	In Progress	Oregon Department of Transportation, Oregon Department of Emergency Management, Federal Emergency Management Agency
FL#5	Coordinate with the State Floodplain Coordinator and the DLCDC to update the FEMA Flood Insurance Rate Maps for Wheeler County and the incorporated cities participating in the National Flood insurance Program 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 Local Coordinating Group to reduce wildland fire risk in Wheeler County.	Wheeler County, County Wildfire Protection Plan Local Coordinating Group	Routine	Oregon Department of Forestry Wildland-Urban Interface Grants, Oregon Forest Land Protection Fund, and other funding, FEMA grants
WF#5	Make available to County residents and the public information regarding wildfires.	Wheeler county Emergency Management	Routine	County and City general funds. This is a collaborative effort that includes local, state, and federal partners. Seek funding through partner agencies as well as grants from FEMA and OSFM; materials are available for free through OSFM.
WF#8	Distribute fire prevention literature and material to homeowners and visitors.	Wheeler County Emergency management	Routine	County and City general funds. This is a collaborative effort that includes local, state, and federal partners. Seek funding through partner agencies as well as grants from FEMA and OSFM; many materials are available for free through OSFM.

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 has the authority to expand and improve City plans to achieve mitigation goals, as well as to levy taxes, use general funds and apply for grants to support mitigation. They also can participate in County plans and policy updates.

When updating plans and policies, the NHMP shall be reviewed and a member of the NHMP Steering Committee should be included in each project. By reviewing the NHMP prior to and during other plan updates and developments, the overall mitigation strategy for the City is strengthened. It is essential that mitigation be involved in every step of City Planning.

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 (2014)	<p>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..</p>
	Wheeler County Community Wildfire Protection Plan (2019)	<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 (2024)	<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 (2012)	<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
Four 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 SP-1 below. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

Figure SP-1 Understanding Risk



Source: FEMA Local Mitigation planning Handbook, 2023.

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. 199)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 \$ 0,469 which is lower than that of Wheeler County as a whole (\$46,648) and significantly lower than the state average of \$75,657³. There are 165 people 16 and over in the city of which 59 are in the labor force. Of these, 5 are employed. The three largest employers by industry are: Educational services, and health care and social assistance (64), construction 1 and manufacturing (7.5).⁴

Population Characteristics

9.2% of the Spray population is over 62 years old, and 2 .1% is under 18 years old. The median age in Spray is 45.9 years old.⁵

There are 97 housing units in the city of which 81 are occupied. Of the 81, 51 are owner occupied, and 0 are rentals. There are 16 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 (77. %) while only 10 total units were built after the year 2000. 28 of the 81 occupied housing units are heated by wood, 1 by electricity, and the rest by gas or oil⁶.

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, making them more vulnerable to hazards.
- Homes tend to be older and most were built before current seismic building codes.

¹ American Community Survey 2022 (5-Year Estimates), P1, 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 2022 (5-Year Estimates), S1901, US Census Bureau.

⁴ American Community Survey 2022 (5-Year Estimates), DP0 , US Census Bureau.

⁵ American Community Survey 2022 (5-Year Estimates), S0101, US Census Bureau.

⁶ American Community Survey 2022 5-Year Estimates , DP04, 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 Department of Emergency Management (ODEM) 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 : 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	Vulnerability	Probability	Maximum Threat	Total	Rank	Risk Level
Wildfire (WUI)	20	50	70	100	240	1	High
Drought	20	50	70	100	240	1	High
Severe Weather	20	50	70	100	240	1	High
Winter Storms	18	50	70	100	238	2	High
Floods	18	50	70	100	238	2	High
Landslide/ Debris Flow	14	50	70	100	234	3	High
Windstorms	6	25	56	80	167	4	Medium
Volcanic Events	0	50	7	100	157	5	Medium
Earthquakes	0	40	7	90	137	6	Medium

Source: Wheeler County NHMP Steering Committee, 202 .

Please review Chapter : Risk Assessment and Appendix : 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 2019 Wheeler County Natural Hazards Mitigation Plan (NHMP) during the 202 -2024 update process.

Project Background

Wheeler County collaborated with Fair Winds Consulting, LLC to update the 2019 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 Building Resilient Infrastructure and Communities BRIC 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. 447), Mitchell (pop. 202), and Spray (pop. 199). Major changes to the 2019 NHMP are documented and summarized in this appendix.

2024 Plan Update Changes

The sections below only discuss *major* changes and additions made to the 2019 Wheeler County NHMP during the 202 -2024 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 were maintained from the 2019 update.

Front Pages

The plan's cover has been updated.

Acknowledgements have been updated to include the 202 -24 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 2024 NHMP update, no changes were made.

Executive Summary

The 2024 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. Except for the City of Mitchell, which had a population explosion and now has a median age of 20. 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.
- Impact of Climate Change on Future Hazards.
- Impact of recent development on vulnerability.

Chapter 4: Mitigation Strategy

The 2024 Wheeler County Natural Hazard Mitigation Plan (NHMP) contains a number of action items that have been continued from the 2019 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 and 2020 were bad wildfire years for the State of Oregon and Wheeler County. Additionally, between 2019 and 2022 Wheeler County suffered a significant amount of small landslides, that while easily managed, brought landslide risk to the forefront of natural hazard concerns. The Flash Flood in Mitchell was still fresh in everyone’s minds, so wildfire, landslides and floods were of top concern, as well as severe weather and how extreme heat impacts elderly and youth populations.

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 Severe Weather
- WTS = inter 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

This plan removed one section that had been in the previous NHMP, the Appendix that contained Mid-Columbia Region Natural Hazard Mitigation Public Opinion Survey. It was a survey for 8 counties in the region from 2014 and not used in the development of this plan.

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.

Appendix B: City Addenda

This includes city addenda for each of the three incorporated cities in Wheeler County: Fossil, Mitchell and Spray. City demographic, hazard, government and priority mitigation actions were updated.

Appendix C: Planning & Public Process

This planning and public process appendix reflects changes made to the Wheeler County NHMP and documents the 202 -2024 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

Updates were made to the available grant programs and resources, including several more wildfire mitigation funding sources.

Appendix F: Wheeler County 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 and in person from March, 202 through February, 2024. A flyer promoting the survey and a link to it were placed on the Wheeler County website, the Wheeler County Facebook page and at the Wheeler County Fair. Eight 8 unique surveys were completed and received. The results of the survey are detailed in the appendix.

Appendix : 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 H was removed.

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. In the summer of 2024, 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 2020 of 1,466 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 posted the Wheeler County Natural Hazards Mitigation Plan Update information on their webpage. The screen shot below is from the Wheeler County Emergency Management Website. It is letting residents know about the NHMP, and advertising the survey. Project staff were on hand at the Fair and Rodeo to provide information to attendees about the plan and answer questions.

Wheeler County Natural Hazard Mitigation Public Opinion Survey

The survey was done on line from March 2022 through February 2024. A flyer promoting the survey and a link to it were placed on the Wheeler County website, and was emailed out to Wheeler County Citizens. Eight (8) unique surveys were completed and received. The results of the survey are detailed in Appendix F.



Screen shot of NHMP Survey on the Wheeler County Website.



WHEELER COUNTY NATURAL HAZARDS MITIGATION PLAN SURVEY

PLEASE SCAN THE QR CODE TO PROVIDE US WITH
INFORMATION ON HOW NATURAL HAZARDS IMPACT YOU
AND YOUR FAMILY



Wheeler County Natural Hazards Mitigation Plan Update

Wheeler County Emergency Management is updating their NHMP. The NHMP identifies types of natural hazards that impact a jurisdiction (Fossil, Mitchell, Spray), assesses each jurisdiction's vulnerability to those hazards and formulates mitigation strategies that will lessen the severity of natural disasters by protecting human life and property. Please take the survey to help us know what hazards affect you and help us improve county-wide mitigation efforts!

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 2024, the 2024 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 Third Place Ribbon

Wheeler County Draft Final NHMP Review June- July, 2019

A final draft of the NHMP was made available to the general public and the Steering Committee throughout the month of June. Copies were made available on the County and City websites, and Facebook pages.

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 Fair Winds Consulting, LLC.

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.

- August 7, 2022 : The Wheeler County Steering Committee met for the first of two meetings. The meeting took place at the Wheeler County Sheriff's Office in Fossil, OR.
- February 12, 2024: The Wheeler County Steering Committee met for the second of two meetings. The meeting took place at the Eennie Birch Building in Fossil, OR.

Wheeler County Plan Update Introductory and Risk Assessment Meeting August 7th, 2022

On August 7, 2022, the Natural Hazards Mitigation Plan Steering Committee (NHMSC) met for a work session to go over and update the County's hazard analysis and risk assessment. The purpose of the meeting was to 1 review and update the mitigation plan's mission statement and goals, 2 gather and update hazard history and probability and vulnerability estimates for each of the hazards identified in the county, 3 update the hazard analysis matrix for each of the hazards, 4 identify community vulnerabilities for each hazard, 5 update critical facilities and infrastructure and 6 identify the relative risk from each hazard likely to affect the County. Using information gathered from this meeting, the Consultant updated the hazard analysis to include total threat scores and used these scores to identify hazards that pose the biggest threats to the County. All of the information gathered at this meeting was used to update the Risk Assessment and Hazard Analysis portion of the plan.

Wheeler County Plan Update Mitigation Strategy February 12, 2024

On February 12, 2024 the NHMSC met once again to review and update the mitigation strategy and plan implementation, and the maintenance schedule. The purpose of the first half of this work session was to 1 determine the status and progress of action items in the 2019 mitigation plan, and 2 discuss new action items for the 2024 plan. The purpose of the second half of the work session was to, 1 identify a convener and coordinating body for continued plan implementation, 2 review and update the method and schedule for monitoring and evaluation the plan, discuss the process for prioritizing mitigation action items, 4 review and edit the finalized sections of the NHMP.



Wheeler County NHMP Update Steering Committee Meeting One

Monday, August 7, 2023

AGENDA

- I. Welcome and Introductions
- II. NHMP Overview
 - a. What, Why and How
 - b. Project Timeline
 - c. Steering Committee Expectations
 - d. Time Tracking Requirements
- III. Community Profile
 - a. Critical Infrastructure and Facilities Review
 - b. County and City Asset Review
 - c. Demographic Information
 - d. Vulnerable Populations
- IV. Goals Update
- V. Hazard Vulnerability Analysis
 - a. Work Session
- VI. Next Steps
 - a. Public Outreach
 - b. Next Meeting
- VII. Adjourn



Wheeler County Natural Hazard Mitigation Plan Steering Committee Meeting #1 Minutes Monday, August 7, 2023

Welcome and Introductions began at 10:00AM on Monday, August 7, 2023.

In Attendance:

Mitch Elliott, NHMP Coordinator, Wheeler County Emergency Management
Glenn Raber, Fire Chief, City of Mitchell Volunteer Fire Department
Matt Davis, Planner, Wheeler County Planning Department
Jeremiah Holmes, Fire Chief, City of Spray
Bill Potter, Public Works, City of Fossil, Fire Chief, City of Fossil Fire Department
Rick Shaffer, Wheeler County Fire Defense Board
Heather Miller, Fire Risk Reduction Specialist, Oregon State Fire Marshal
Tyler Wright, Wildland Protection Supervisor, Oregon Department of Forestry
David Helmricks, Community Wildfire Forrester, Oregon Department of Forestry
Marc DesJardin, Landscape Resiliency Operations Coordinator, Oregon Department of Forestry

Absent:

Mike Smith, Sheriff, Wheeler County
Brianna Koon, City Clerk, City of Mitchell
Lynn Morley, Wheeler County Judge

As part of the introductions, each person noted their familiarity with Natural Hazards Mitigation Plans (NHMPs) and any previous participation in a NHMP update. Several Steering Committee Members have participated in previous plan updates.

NHMP Overview

Cori Mikkalo led the meeting, Cori is a consultant with Fair Winds Consulting, LLC who is updating Wheeler County's NHMP.

After introductions, Cori explained what a Natural Mitigation Plan was, why Wheeler County has one and how the update process will work. She explained that the purpose of an NHMP is to prepare for the long-term effects resulting from natural hazards, and that natural hazard mitigation is a method of reducing or alleviating the losses of life, property and injuries resulting from natural hazards through long and short-term strategies.

She explained the essential pieces of an NHMP:

Hazards profile: Description of Local Hazards to help the steering committee make decisions about hazard priority.



Community Profile: Overview of physical, natural, demographic, and social community characteristics, intended to highlight vulnerabilities.

Risk Assessment: Identification of priority risks based on hazard and community information.

Mitigation Strategy: Set of actions the community prioritizes to respond to risks.

City Addendums: Specific information and mitigation actions for the incorporated cities.

She then explained why Wheeler County was updating their NHMP, because mitigation is important because it is a proactive way to eliminate long-term risk to life and property, and it focuses on preventing emergencies or reducing their effects, increasing a community's ability to adapt to, withstand and recover from hazards. NHMPs are required by 44 CFR 201 for jurisdictions to be eligible for certain funding for mitigation projects, and they must be updated every 5 years.

Funding that NHMPs make counties eligible include:

Building Resilient Infrastructure and Communities Grants (BRIC): Provides funding to states, local communities, tribes, and territories as they undertake hazard mitigation projects reducing the risks they face from disasters and natural hazards.

Hazard Mitigation Grant Program (HMGP): provides funding to implement long-term hazard mitigation measures after a major disaster declaration.

Flood Mitigation Assistance Program: Property owners who participated in the FMA program must have 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): ODEM requires current NHMP as part of performance measures to receive funds.

Cori then provided an overview of the timeline. The period of performance for this project is March 2023-December 2024. The first steering committee meeting was today, August 7, and the second one will be in the winter, most likely December, or January. The current goal is to have the first draft of the Wheeler County NHMP submitted to OEM by May 2024.

Cori then let the Steering Committee know what their expectations were, which included providing technical advice and policy direction, review drafts, provide information and make high-level decisions regarding NHMP content, identify hazards that affect the community and identify mitigation activities to reduce the impacts of those hazards and that they should attend Steering Committee Meetings.



Mitch then stepped in and explained time tracking requirements, and that all Steering Committee Members needed to track the time that they have already spent, and time that they spend on the NHMP to help with in-kind hours for meeting grant requirements.

Community Profile Update

The Steering Committee then reviewed critical infrastructure, critical facilities, vulnerable populations, and new developments in the county. One update was made to the County's Critical infrastructure and assets, the Painted Hills and John Day Fossil Beds National Monument was added. The City of Fossil added their four City Parks as assets, Mitchell added the Mitchell City Park and Spray added the Spray Riverfront Park.

Wheeler County also reviewed and updated their vulnerable populations and neighborhoods. They confirmed that the Haven House Retirement Center, The Mitchell School Dormitory, and the Spray School dormitory still hold a large number of vulnerable residents (elderly and youth).

Basic Wheeler County demographic information was reviewed, including that 32.4% of the population that is 65 years or older and that the median income is \$46,648 (65% of Oregon Median income). Wheeler County's relative social vulnerability according to the CDC was also covered. As of May 2023, the relative social vulnerability index score was 46%.

Goals update:

Cori provided the 2019 NHMP goals, as well as the 2020 State of Oregon NHMP Goals for comparison. The Steering Committee unanimously agreed to keep the original three goals, but to update wording on the third goal "Motivate the public, private sector and government agencies to mitigate against the effects of natural hazards through information and education" to include "Motivate the whole community, including the public, private sector and government agencies to mitigate against the effect of natural hazards through information and education."

Hazard Vulnerability Analysis

Cori then led the steering committee through a Hazard Vulnerability Analysis work session. It began with a review of the 2019 identified hazards, and then a comparison to the 2020 State of Oregon NHMP identified hazards. In 2020 the State of Oregon Identified extreme heat as a new hazard for Region 6 (which includes Wheeler County) and the State as a whole. The Steering Committee determined that Extreme Heat would fall under the umbrella of the "Severe Weather" category that they created to address weather extremes in the 2019 NHMP update.

The Steering Committee then reviewed the 2018 Oregon Climate Change Research Institute's report on projected changes to Wheeler County weather for the 2020s (2010-2039) and 2050s (2040-2069). Overall climate change models project warmer, drier summers for the region. It is highly likely that Wheeler County will experience increasing wildfire frequency and intensity,



increasing extreme heat frequency and severity, as well as an increase in extreme precipitation and mid- to low-elevation areas are expected to see an increase in winter flood risk. This information was used to help inform the hazard analysis.

Federal and state disaster declaration history was also reviewed, and it was noted that since 2019, FEMA has declared two disasters in Wheeler County. Disaster 4452 Oregon Severe Storms, Flooding, Landslides and Mudslides in 2019 and Disaster 4499 Covid-19 Pandemic in 2020.

The Steering Committee worked through a hazard analysis for winter storms, landslides, wildfire, drought, windstorm, severe weather, volcanic event, flood, and earthquake. While working through the hazard analysis they also reviewed climate change predictions to help aid with future probability. Additionally, during this time hazard history tables were reviewed and added on to. Several historical events were added, including winter storms, summer flash flooding, landslides/debris flows and extreme heat events.

The results were compared to the 2019 Hazard analysis. Wildfires and droughts stayed at the highest risk with a score of 240 in 2019 and 2023. Additionally, while severe weather was high risk in 2019, its score increased to 240 (from 238) in 2023. Winter storms and floods were also high in 2019, but both of their risk scores increased to 238, barely below maximum risk in 2023. Landslides went from a low score in 2019 to a high-risk score in 2023, due to several recent landslides increasing their likelihood. Windstorms stayed moderate, but the score in 2023 was higher than in 2019. Earthquakes and volcanic events maintained their exact same scores between 2019 and 2023, remaining at a moderate risk level. Overall, priorities have stayed mainly the same for the County since 2019, except for landslides/debris flows, which have become significantly more important to the County to mitigate.



Wheeler County 2023 Hazard History Table

Hazard	History			Vulnerability			Probability			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	5	50	10	7	70	10	10	100	240	1
Drought	10	2	20	10	5	50	10	7	70	10	10	100	240	1
Severe Weather	10	2	20	10	5	50	10	7	70	10	10	100	240	1
Winter Storms	9	2	18	10	5	50	10	7	70	10	10	100	238	2
Floods	9	2	18	10	5	50	10	7	70	10	10	100	238	2
Landslide/ Debris Flow	7	2	14	10	5	50	10	7	70	10	10	100	234	3
Windstorms	3	2	6	5	5	25	8	7	56	8	10	80	167	4
Volcanic Events	0	2	0	10	5	50	1	7	7	10	10	100	157	5
Earthquakes	0	2	0	8	5	40	1	7	7	9	10	90	137	6

Cori closed the meeting with a review of the next steps that need to be taken. Continuing the planning process with a focus on public outreach is important, and she will be attending the County Fair with a booth on the Natural Hazard Mitigation Plan update.

The next meeting is scheduled for December or January. At the next meeting, the Committee will be discussing mitigation strategies. This will be done through determining the status and progress of 2019 action items, discussing new action items and how to prioritize mitigation action items.

The meeting adjourned at 12:00 PM.

Wheeler County Natural Hazards Mitigation Plan Steering Committee Meeting

Monday, August 07, 2023

Please sign in

Full Signature	Name	Title	Representing	Email
	Mitch Elliott	Coordinator	Wheeler County Emergency Management	melliott@co.wheeler.or.us
	Cori Mikkalo	NHMP Coordinator	Fair Winds Consulting, LLC	Cori.mikkalo@fairwindsemergencymanagement.com
	Lynn Morley	Wheeler County Judge	Wheeler County	lmorley@co.wheeler.or.us
	Mike Smith	Sheriff	Wheeler County Sheriff's Office	msmith@co.wheeler.or.us
	Rick Shaffer	Fire Defense Board Chief	Wheeler County Fire Defense Board	rshaffer@co.wheeler.or.us
	Scott Field		Wheeler County Fire and Rescue	lazywolfbranch@gmail.com
			City of Fossil	City_recorder@cityoffossil.com
	Matt Davis	Planner	Wheeler County Planning Department	planning@co.wheeler.or.us
	Bill Potter	Fire Chief	Fossil Fire and Public Works	Wf-potter@hotmail.com
			City of Spray	cityofspray@sprayoregon.us
	Jeremiah Holmes	Fire Chief	Spray Fire	jholmes@co.wheeler.or.us holmes.jeremiah77@yahoo.com
	Krista Miller	CITY ADMINISTRATOR	City of Mitchell	cityofmitchell@gmail.com
	Steve Tripp	Mayor	City of Mitchell	s.tripp@cityofmitchelloregon.com
	Glenn Raber	Fire Chief	Mitchell Fire Chief	Pendleton66@yahoo.com

Heather Miller	Heather Miller	Fire Risk Reduction Specialist	Oregon State Fire Marshal	heather.miller@osfm.oregon.gov
Alex Wright	Alex Wright	Wildland Protection Supervisor	Oregon Dept. of Forestry	alex.wright@odf.oregon.gov
David Helmerich	David Helmerich	Community Wildfire Forester	Oregon Dept. of Forestry	david.a.helmerich@odf.oregon.gov
Marc Desjardin	Marc Desjardin	Landscape Resiliency Operations Coordinator	ODF	Marc.Desjardin@odf.oregon.gov



Wheeler County Natural Hazard Mitigation Plan Steering Committee Meeting 2
February 12, 2024

1. Purpose of Meeting
2. Review of Identified Hazards
3. Mitigation Plan Goals
4. Community Survey Results
5. Mitigation Action Item Work Session
6. Prioritization Process
7. Plan Implementation and Maintenance
8. Next Steps

The Survey was done online from March 2023 through February 2024. A flyer promoting the survey and a link to it were placed on the Wheeler County website and the Wheeler County Facebook Page. Eight (8) unique surveys were completed and received. The results of the survey are detailed in Appendix F.



Wheeler County Natural Hazard Mitigation Plan Steering Committee Meeting #2 Minutes
Monday, February 12, 2024

Welcome and Introductions began at 1:00 PM on Monday, February 12, 2024.

In Attendance:

In Attendance:

Mitch Elliott, NHMP Coordinator, Wheeler County Emergency Management
Glenn Raber, Fire Chief, City of Mitchell Volunteer Fire Department
Matt Davis, Planner, Wheeler County Planning Department
Jeremiah Holmes, Fire Chief, City of Spray
Bill Potter, Public Works, City of Fossil, Fire Chief, City of Fossil Fire Department
Rick Shaffer, Wheeler County Fire Defense Board
Brianna Koon, City Clerk, City of Mitchell
Heather Miller, Fire Risk Reduction Specialist, Oregon State Fire Marshal
Marc DesJardin, Landscape Resiliency Operations Coordinator, Oregon Department of Forestry

Absent:

Mike Smith, Sheriff, Wheeler County
Lynn Morley, Wheeler County Judge
Tyler Wright, Wildland Protection Supervisor, Oregon Department of Forestry
David Helmricks, Community Wildfire Forrester, Oregon Department of Forestry

Cori started the meeting by reviewing the agenda and purpose of the meeting. The main purpose of today's meeting was to conduct a mitigation action item work session; review the status of 2019 mitigation actions and develop new mitigation actions for the 2024 plan. Additionally, the Steering Committee will review the prioritization process and plan implementation and maintenance process.

Cori reviewed Wheeler County's identified natural hazards and the hazard analysis matrix that the Steering Committee had completed at the previous meeting.

Then they reviewed the results from the Wheeler County Community Survey. 5 people responded to the survey, and 4 out of 5 had not experienced a natural disaster in the past 5 years. 100% of respondents were very concerned about wildfire, 40% were very concerned about drought, windstorms and winter storms and 40% were somewhat concerned with drought and windstorms. Residents are most worried about protecting humans and preventing loss of life and identified elder-care facilities, schools, major bridges, and fire/police stations as very important community facilities. 60% of respondents support a mix of regulatory and non-



regulatory approaches to reducing risk, agree with using local tax dollars to reduce risk, and support steps to safeguard the local economy following a disaster event.

Finally, Wheeler County Demographic Data and vulnerable populations determined during the previous steering committee were reviewed so these important factors could be taken into account when developing Mitigation Action Items.

The Steering Committee then reviewed the 2019 actions and shared updates or progress that had occurred.

In progress: MH2, MH6, MH8, MH10, MH11, MH16, DR2, FL2, FL3, FL4, LS2, VE1, WF6, WF9, WF10,

Routine: MH1, MH3, MH4, MH5, MH7, MH9, MH13, DR1, DR3, DR5, EQ1, FL1, FL5, LS1, WF1, WF2, WF3, WF4, WF5, WF10, WF11, WDS1, WTS2

Of the 49 mitigation actions from 2019, 15 are in some sort of progress and 23 are now routine actions, meaning only 11 action items had no progress made whatsoever.

For 2024, 5 of the existing mitigation action items were deleted, as they are completed with no further action necessary, or time/energy would be better spent elsewhere.

In this session the steering committee updated and developed a total of twenty multi-hazard mitigation action items, five drought mitigation action items, three earthquake mitigation action items, five flood mitigation action items, three landslide mitigation action items, two volcanic event mitigation action items, twelve wildfire mitigation action items, one windstorm mitigation action item one winter storm mitigation action item and two severe weather mitigation action items.

The Steering Committee reviewed the 2019 implementation and maintenance process, as well as the prioritization process contained in the 2019 plan. They agreed that these were the processes they wanted to continue to use for the 2024 plan.


The Steering Committee then prioritized action items using a modified STAPLEE process. STAPLEE evaluates social, technical, administrative, political, legal, economic, and environmental capabilities and impacts. For Wheeler County's initial project prioritization, qualitative methods were used to determine priority, including quality of life, natural and beneficial values, including actions that could benefit long term risk including climate change, and which actions would provide the benefit to the largest number of people, specifically focusing on socially vulnerable communities. They plan to use STAPLEE and FEMA Cost Benefit analysis to prioritize mitigation actions annually at Steering Committee Meetings, recognizing that initial priorities may change based on recent hazard events, staffing and funding availability.

The meeting ended with a review of the plan approval process and adjourned at 3:00 PM.

Wheeler County Natural Hazards Mitigation Plan Steering Committee Meeting

Monday, February 12, 2024
Please sign in

Full Signature	Name	Title	Representing	Email
	Mitch Elliot	Coordinator	Wheeler County Emergency Management	melliott@co.wheeler.or.us
	Cori Mikkalo	NHMP Coordinator	Fair Winds Consulting, LLC	Cori.mikkalo@fairwindsemergencymanagement.com
	Lynn Morley	Wheeler County Judge	Wheeler County	lmorley@co.wheeler.or.us
	Mike Smith	Sheriff	Wheeler County Sheriff's Office	msmith@co.wheeler.or.us
	Rick Shaffer	Fire Defense Board Chief	Wheeler County Fire Defense Board	rshaffer@co.wheeler.or.us
	Scott Field		Wheeler County Fire and Rescue	lazywolfranch@gmail.com
			City of Fossil	City_recorder@cityoffossil.com
	Matt Davis	Planner	Wheeler County Planning Department	planning@co.wheeler.or.us
	Bill Potter	Fire Chief	Fossil Fire and Public Works	Wf-potter@hotmail.com
			City of Spray	cityofspray@sprayoregon.us
	Jeremiah Holmes	Fire Chief	Spray Fire	jholmes@co.wheeler.or.us

	Glenn Raber	Fire Chief	City of Mitchell	cityofmitchell@gmail.com
Heather Miller	Heather Miller	Fire Risk Reduction Specialist	Oregon State Fire Marshal	heather.miller@osfm.oregon.gov
Brianna Hara	Brianna Koon	City Clerk	City of Mitchell	See above
	Glenn Raber	fire chief	City of Mitchell	See above
William Florin		FIRE CHIEF FIRO	Fossil	William.Florin@cityofmitchell.com wflorin@cityofmitchell.com
Rick Shafer		Fire Coordinator	Wheeler Co	rshafer@co.wheeler.or.us
Jeremiah Holmes		Spring Fire Chief	Spring	holmes.jerem@springohio.com

2019 Update

Project Background

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.

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 Oregon Department of Emergency Management (ODEM), 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?

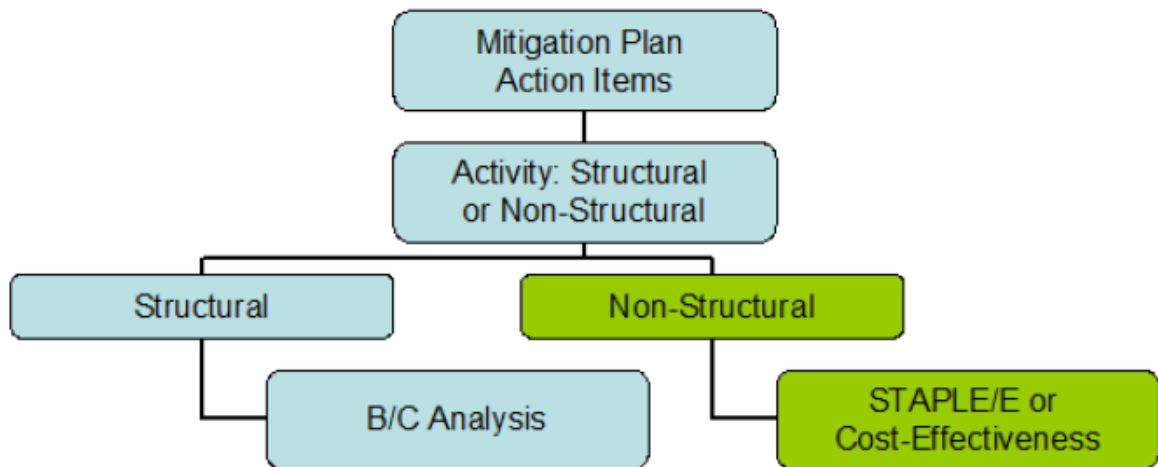
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

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 HMGP is to help communities implement hazard mitigation measures following a Presidential Major Disaster Declaration in the areas of the state, tribe, or territory requested by the Governor or Tribal Executive. The key purpose of this grant program is to enact mitigation measures that reduce the risk of loss of life and property from future disasters. The webpage link below includes extensive resources and job aids to streamline project implementation. The primary guidance document for this program is the HMA Guidance. HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. <https://www.fema.gov/grants/mitigation/hazard-mitigation>
- Hazard Mitigation Grant Program Post Fire
 - The HMPG Post Fire program provides funding to help communities implement hazard mitigation measures focused on reducing the risk of harm from wildfire. HMPG Post Fire funding is authorized under Sections 404 and 420 of the Stafford Act and provides hazard mitigation grant funding to SLTT governments in areas receiving a Fire Management Assistance Grant (FMAG) declaration. <https://www.fema.gov/grants/mitigation/post-fire>
- Flood Mitigation Assistance Swift Current
 - The Swift Current effort provides funding to mitigate repetitively, and substantially flood-damaged buildings insured through the NFIP after a presidentially declared flood-related disaster to reduce risk against future flood damage. Funds will be made available to states, territories and federally recognized tribal government that receive a major disaster declaration following a flood-related disaster event and meet all other eligibility criteria. Examples of projects eligible for funding include property acquisition and demolition, elevation, and relocation. <https://www.fema.gov/grants/mitigation/flood-mitigation-assistance/swift-current>

- Physical Disaster Loan Program
 - During a disaster declaration, SBA coordinates with FEMA, State and Local partners to deliver affordable disaster loan assistance to those affected, quickly and efficiently. SBA disaster loans are an important part of the recovery process because they provide eligible homeowners, renters, and businesses with access to the funds they need to rebuild, particularly when damages are not covered by insurance or other forms of assistance. <https://www.sba.gov/funding-programs/disaster-assistance>

Non-Disaster Federal Programs

- Building Resilient Infrastructure and Communities (BRIC)
 - The FEMA's Building Resilient Infrastructure and Communities (BRIC) annual grant program supports SLTTs as they implement hazard mitigation projects to reduce the risks from disasters and natural hazards. The program is authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The BRIC program aims to categorically shift the federal focus away from reactive disaster spending and toward proactive investment in community resilience. It is a competitive grant program, and applicants can apply on an annual basis. The BRIC program also encourages communities to participate in the BRIC Direct Technical Assistance (BRIC DTA) initiative. BRIC DTA provides tailored support to communities that may not have the resources to begin climate resilience planning and project solution design on their own. BRIC has primarily replaced the PDM program as a funding mechanism for governments. <https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities>
- 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. <https://www.fema.gov/flood-mitigation-assistance-grant-program>

Non-FEMA Federal Mitigation Funding

- **United States Forest Service Community Wildfire Defense Grants**
 - The CWDG is intended to help at-risk local communities and tribes plan for and reduce the risk to wildfire, including mitigation activities. The program prioritizes at-risk communities in an area identified as having high or very high wildfire hazard potential, are low-income, or have been impacted by a severe disaster that affects the risk of wildfire. <https://www.fs.usda.gov/managing-land/fire/grants>
- **US Fish and Wildlife Service Wildland Urban Interface Community Assistance Grants**
 - This grant is to implement the National Cohesive Wildland Fire Management Strategy and assist communities at risk from catastrophic wildland fires by providing assistance in the following areas: implementation of community programs that develop and enhance local capability in the areas of risk assessment and planning, training, mitigation activities and community and homeowner education and action, planning and implementation of fuels management reduction activities aimed at mitigation the threat of catastrophic wildfire to communities and natural resources in high risk areas. www.grants.gov

For Oregon Department of Emergency Management (ODEM) grant guidance on Federal Hazard Mitigation Assistance, visit:

<https://www.oregon.gov/OEM/emresources/Grants/Pages/HMA.aspx> For information on Hazard Mitigation Grant Program, Building Resilient Infrastructure and Communities Grant Program, and Flood Mitigation Assistance Program, contact the Oregon State Hazard Mitigation Officer at Office of Emergency Management at 503-798-7240.

State Programs

- **Community Development Block Grant Program**
 - The CDBG program works to ensure decent affordable housing, to provide services to the most vulnerable in our communities, and to create jobs through the expansion and retention of businesses. CDBG is an important tool for helping local governments tackle serious challenges facing their communities. The CDBG program has made a difference in the lives of millions of people and their communities across the Nation.
 - The annual CDBG appropriation is allocated between States and local jurisdictions called "non-entitlement" and "entitlement" communities, respectively. Entitlement communities are comprised of central cities of Metropolitan Statistical Areas (MSAs); metropolitan cities with populations of at least 50,000; and qualified urban counties with a population of 200,000 or more (excluding the populations of entitlement cities). States distribute CDBG funds to non-entitlement localities not qualified as entitlement communities.

- HUD determines the amount of each grant by using a formula comprised of several measures of community need, including the extent of poverty, population, housing overcrowding, age of housing, and population growth lag in relationship to other metropolitan areas.
https://www.hud.gov/program_offices/comm_planning/communitydevelopment
- 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.
<https://www.oregon.gov/oweb/Pages/index.aspx>
- State Preparedness and Incident Response Equipment (SPIRE) Grant Program
 - The State Preparedness and Incident Response Equipment (SPIRE) grant program provides equipment to local governments and other recipients for emergency preparedness. The program funds the purchasing and distribution of equipment, including vehicles and other property, to be used during an emergency to decrease the risk for loss of life and property damage. Oregon House Bill 2687 funds the program and became effective in August 2017. <https://spire-geo.hub.arcgis.com/> Contact the SPIRE Program at oem.spire@oem.oregon.gov
- Seismic Rehabilitation Grant Program
 - The Seismic Rehabilitation Grant Program (SRGP) provides state funds to strengthen public schools and emergency services buildings so they will be less damaged during an earthquake. Reducing property damage, injuries, and casualties caused by earthquakes is the goal of the SRGP. <https://www.oregon.gov/biz/programs/srgp/pages/default.aspx>

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. <https://new.nsf.gov/funding/opportunities/decision-risk-management-sciences-drms>

Hazard ID and Mapping

- National Flood Insurance Program: Flood Mapping; FEMA. Flood insurance rate maps and flood plain management maps for all NFIP communities. <https://www.fema.gov/flood-maps>
- State of Oregon Department of Geology and Mineral Industries (DOGAMI). The DOGAMI Geological Survey & Services program develops maps, reports, and data to help Oregon manage natural resources and prepare for natural hazards. GS&S core program areas include:
 - Studying hazards such as earthquakes, tsunamis, landslides, floods and coastal erosion, community vulnerability to those hazards, and ways to reduce risk.
 - Geologic mapping to support healthy ecosystems and guide rural and urban development.
 - Collection of lidar, which provides accurate high-resolution images of the earth's surface, for use in new-generation mapping, natural resource management, planning, and many other applications. <https://www.oregongeology.org/default.htm>
- National Map: Orthoimagery, DOI – USGS. Develops topographic quadrangles for use in mapping of flood and other hazards. <https://nationalmap.gov/ortho.html>
- National Cooperative Geologic Mapping Program, DOI-USGS. The NCGMP is the primary source of funds for the production of geologic maps in the United States and provides accurate geologic maps and three-dimensional framework models that improve life, the economy and mitigate natural hazards. <http://ncgmp.usgs.gov/standards.html>

- 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/printed_surveys/

Project Support

- 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. <https://www.hudexchange.info/programs/cdbg-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. <https://www.forestsandrangelands.gov/resources/overview/>
- 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). <https://www.fema.gov/assistance-firefighters-grant>
- National Cohesive Wildland Fire Management Strategy (DOI-USDA). The Nation Cohesive Strategy is a collaborative process to seek national, all-lands, solutions to wildland fire management issues focusing on three goals: restore and maintain resilient landscapes, create fire adapted communities, and safe and effective wildfire response
<http://www.forestsandrangelands.gov/>
- 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.
<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/>
- Rural Development Assistance, USDA. Provides loans, grants, and loan guarantees to help create jobs and support economic development and essential services such as housing, health care, first responder services and equipment, and water, electric and communications infrastructure. Promotes economic development by supporting loans to businesses through banks, credit unions and community-managed lending pools. Offers technical assistance and information to help agricultural producers and cooperatives get started and improve the effectiveness of their operations. Provides technical assistance to

help communities undertake community empowerment programs. Helps rural residents buy or rent safe, affordable housing and make health and safety repairs to their homes.

<https://www.rd.usda.gov/>

- 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. <https://www.fema.gov/public-assistance-local-state-tribal-and-non-profit>
- HOME Investments Partnerships Program, HUD. The HOME Investment Partnerships Program (HOME) provides formula grants to States and localities that communities use - often in partnership with local nonprofit groups - to fund a wide range of activities including building, buying, and/or rehabilitating affordable housing for rent or homeownership or providing direct rental assistance to low-income people. HOME is the largest Federal block grant to state and local governments designed exclusively to create affordable housing for low-income households. https://www.hud.gov/program_offices/comm_planning/home
- Disaster Recovery Initiative, HUD. Grants to fund gaps in available recovery assistance after disasters (including mitigation). <https://www.hudexchange.info/programs/cdbg-dr/>
- Food and Nutrition Service (FNS) Disaster Assistance. FNS coordinates with state, territory, tribal and voluntary organizations to provide nutrition assistance to families and individuals affected by a disaster or emergency. <https://www.fns.usda.gov/da/disaster-assistance>
- Emergency Management Performance Grants, FEMA. Helps state and local governments to sustain and enhance their all-hazards emergency management programs. <https://www.fema.gov/emergency-management-performance-grant-program>
- 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. <https://www.fws.gov/service/north-american-wetlands-conservation-act-nawca-grants-us-standard>

- Wetlands Reserve Easement (WRE) program, USDA-NCRS. The WRE program provides financial and technical assistance to protect and restore wetlands through easements and restoration agreements. <https://www.nrcs.usda.gov/programs-initiatives/wre-wetland-reserve-easements>
- 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. <https://www.nps.gov/orgs/1508/index.htm>
- Agricultural Conservation Easement Program, USDA-NCRS. Provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits. Under the Agricultural Land Easements component, NRCS helps American Indian tribes, state and local governments and non-governmental organizations protect working agricultural lands and limit non-agricultural uses of the land. Under the Wetlands Reserve Easements component, NRCS helps to restore, protect, and enhance enrolled wetlands. <https://www.nrcs.usda.gov/programs-initiatives/acep-agricultural-conservation-easement-program>
- Secure Rural Schools and Community Self-Determination Act of 2000, US Forest Service. Reauthorized for FY2018, 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. <https://www.fs.usda.gov/working-with-us/secure-rural-schools>

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 March 2021 through February 2024. A flyer promoting the survey and a link to it were placed on the Wheeler County website, the Wheeler County Facebook page. Eight (08) unique surveys were completed and received. The results of the survey are detailed below.

Survey Results Displayed Graphically

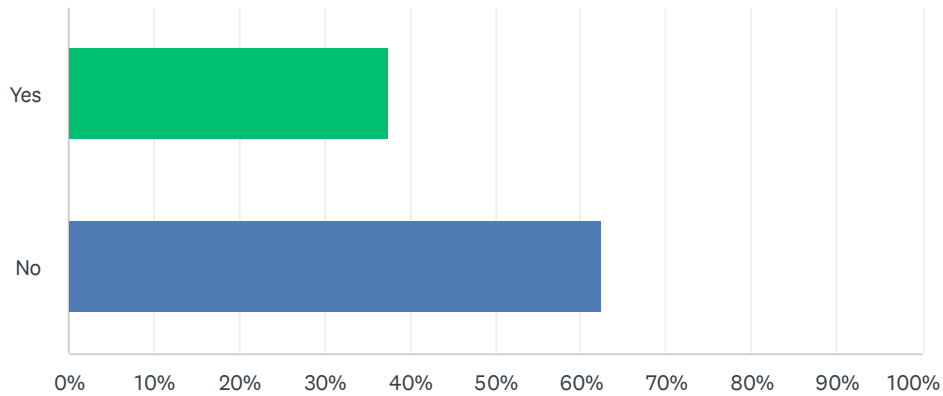
The survey consisted of 28 questions and was created by FEMA as part of their hazard mitigation planning. Overall results of the 8 responses are shown in the following 47 pages. The survey questions are shown in full below along with all responses and are referred to as the resident survey.

The resident survey respondents reported highest concern about wildfire, followed by drought, windstorm and winter storm.

Residents reported concerns that human life/injury and governance ability to maintain order and/or provide public amenities and services were most vulnerable to hazards, followed closely by infrastructure. The Steering Committee confirmed that the hazards the residents identified as concern are also of high concern to the county, wildfire and winter storms are very high. Survey respondents reported their mitigation priorities as protecting schools, elder-care facilities, fire/police stations and major bridges. These were prioritized by the Steering Committee in several mitigation actions. See Chapter 4 Mitigation Strategy for a list of Wheeler County's mitigation actions.

Q1 During the past five years in Wheeler County, 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?

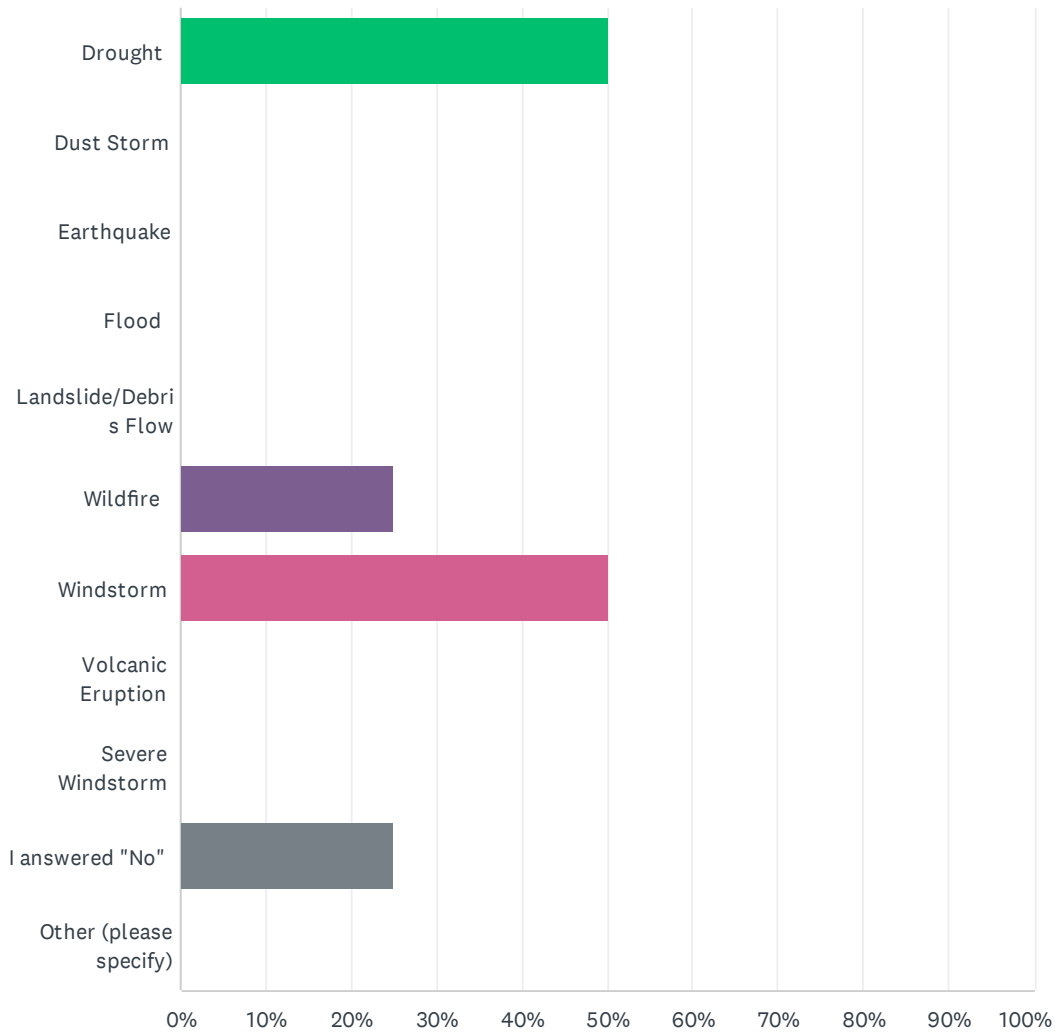
Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	37.50%	3
No	62.50%	5
TOTAL		8

Q2 If you answered YES to the previous question, which of these natural disasters have you or someone in your household experienced in the past five years?

Answered: 4 Skipped: 4



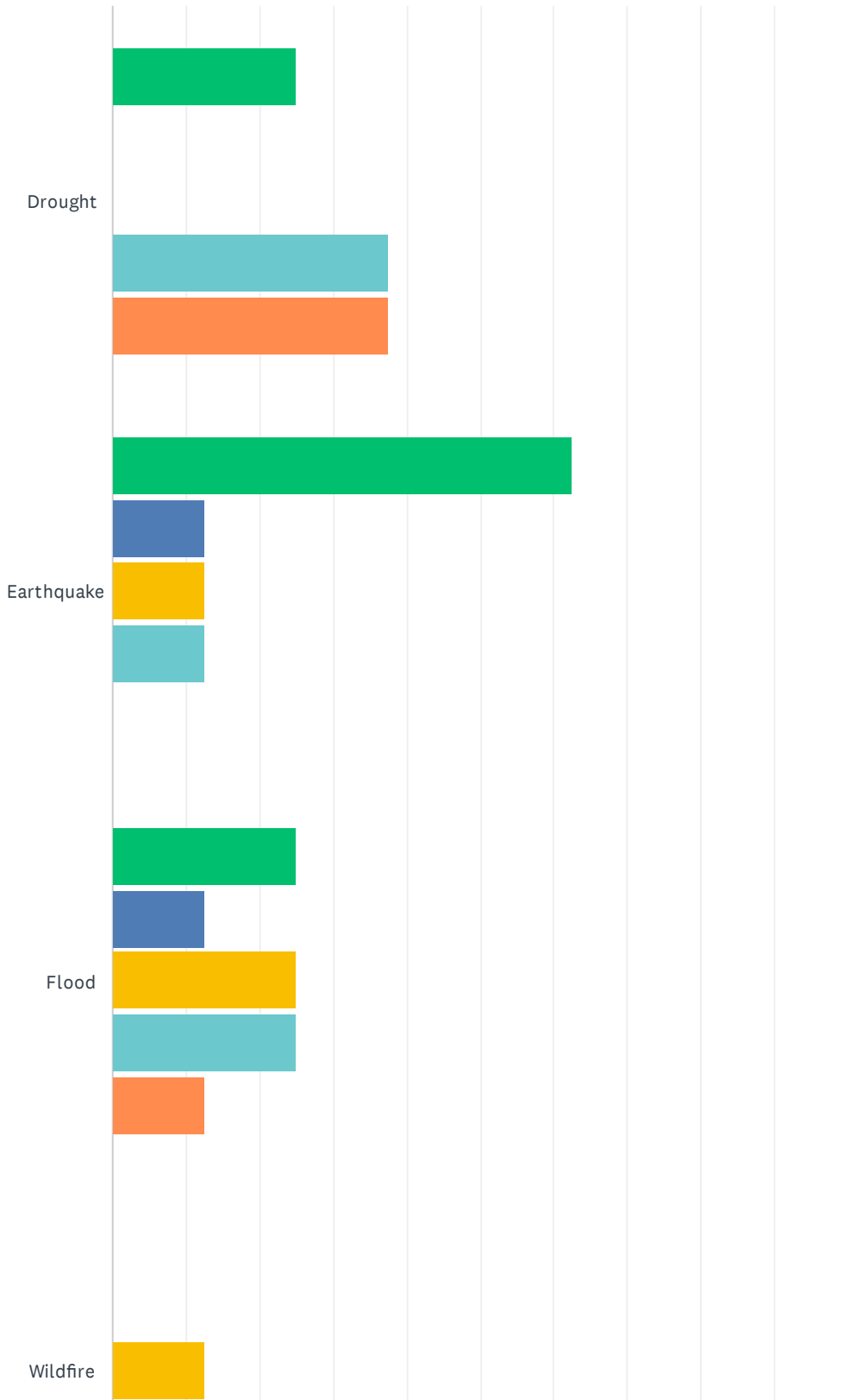
Wheeler County Natural Hazard Survey

ANSWER CHOICES	RESPONSES	
Drought	50.00%	2
Dust Storm	0.00%	0
Earthquake	0.00%	0
Flood	0.00%	0
Landslide/Debris Flow	0.00%	0
Wildfire	25.00%	1
Windstorm	50.00%	2
Volcanic Eruption	0.00%	0
Severe Windstorm	0.00%	0
I answered "No"	25.00%	1
Other (please specify)	0.00%	0
Total Respondents: 4		

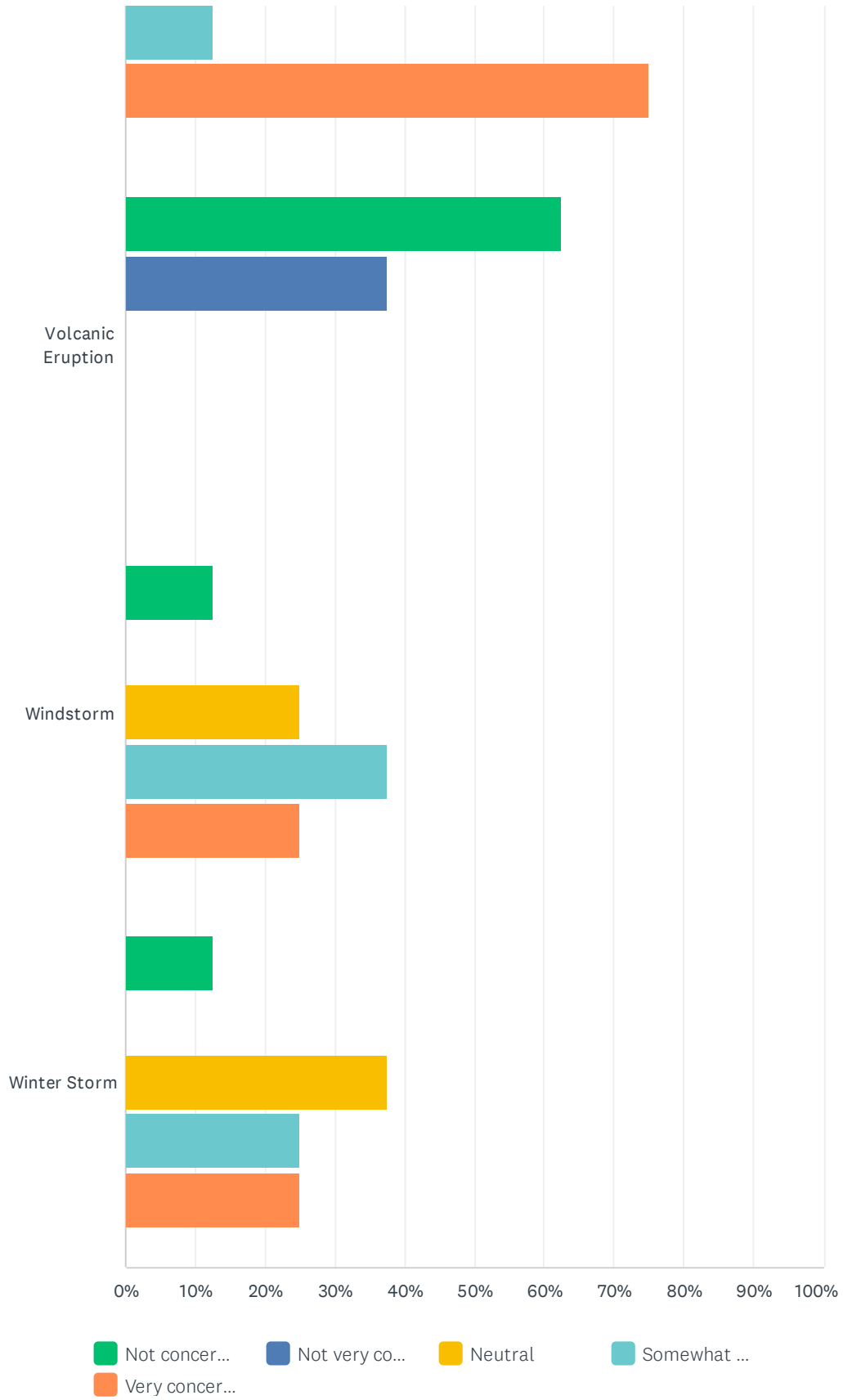
#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Q3 How concerned are you about the following natural disasters affecting Wheeler County?

Answered: 8 Skipped: 0



Wheeler County Natural Hazard Survey

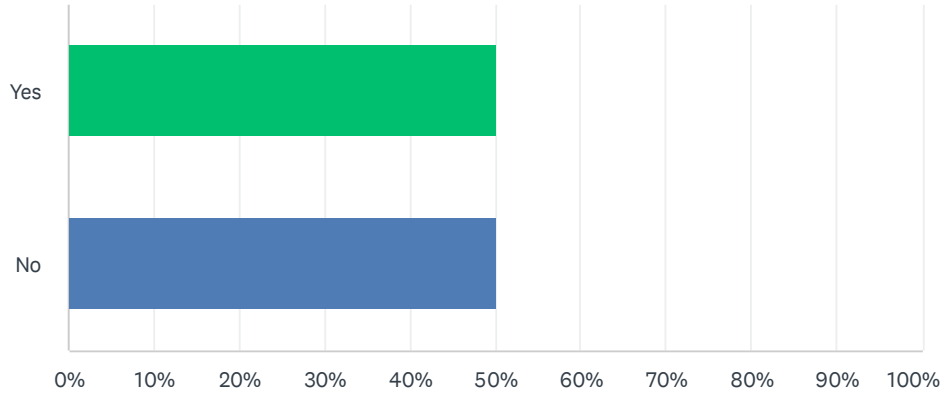


Wheeler County Natural Hazard Survey

	NOT CONCERNED	NOT VERY CONCERNED	NEUTRAL	SOMEWHAT CONCERNED	VERY CONCERNED	TOTAL	WEIGHTED AVERAGE
Drought	25.00% 2	0.00% 0	0.00% 0	37.50% 3	37.50% 3	8	3.63
Earthquake	62.50% 5	12.50% 1	12.50% 1	12.50% 1	0.00% 0	8	1.75
Flood	25.00% 2	12.50% 1	25.00% 2	25.00% 2	12.50% 1	8	2.88
Wildfire	0.00% 0	0.00% 0	12.50% 1	12.50% 1	75.00% 6	8	4.63
Volcanic Eruption	62.50% 5	37.50% 3	0.00% 0	0.00% 0	0.00% 0	8	1.38
Windstorm	12.50% 1	0.00% 0	25.00% 2	37.50% 3	25.00% 2	8	3.63
Winter Storm	12.50% 1	0.00% 0	37.50% 3	25.00% 2	25.00% 2	8	3.50

Q4 Have you ever received information about how to make members of your household and your home safer from natural disasters?

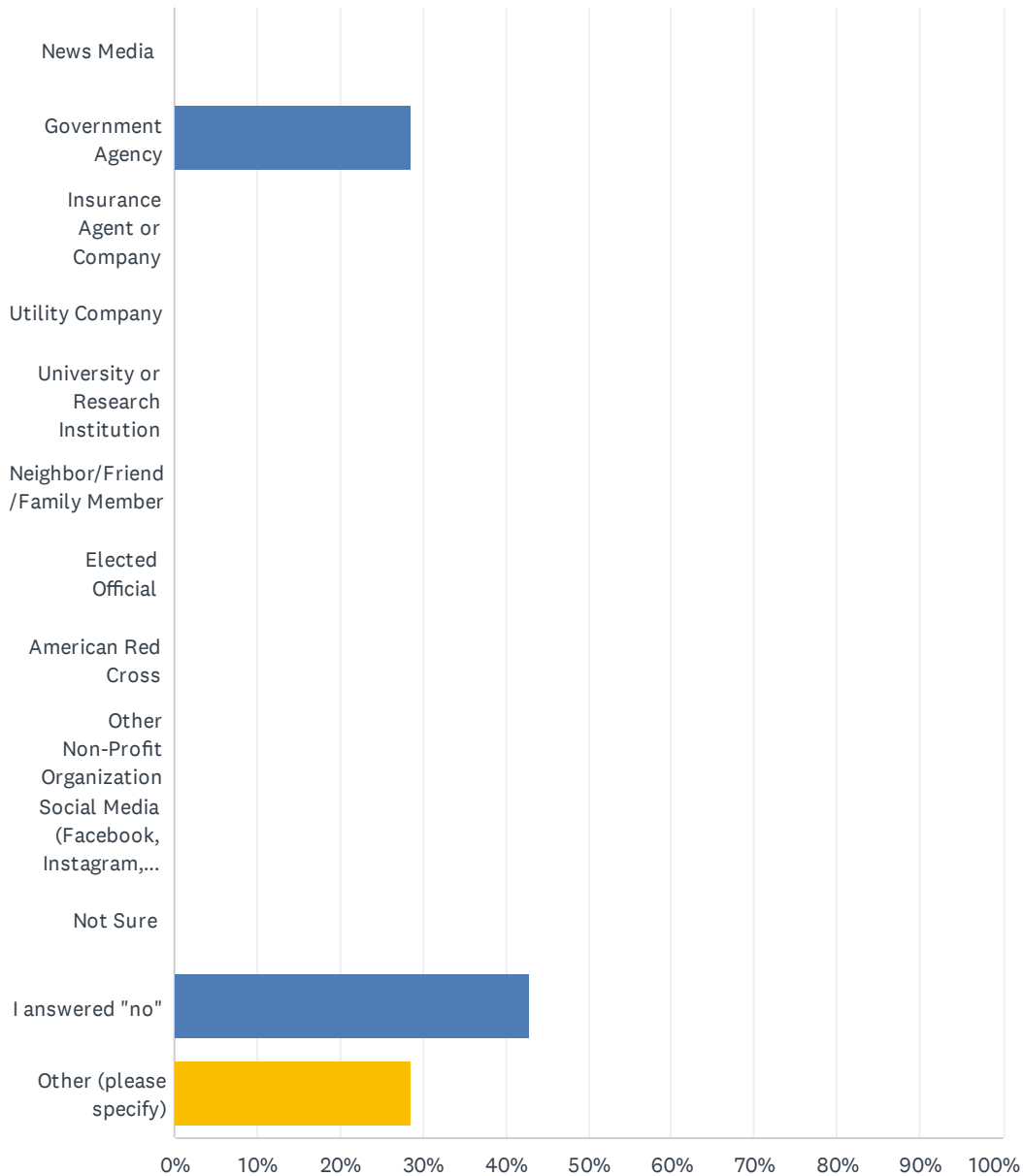
Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	50.00%	4
No	50.00%	4
TOTAL		8

Q5 If you answered "yes" from whom did you last receive information about how to make members of your household and your home safer from natural disasters?

Answered: 7 Skipped: 1



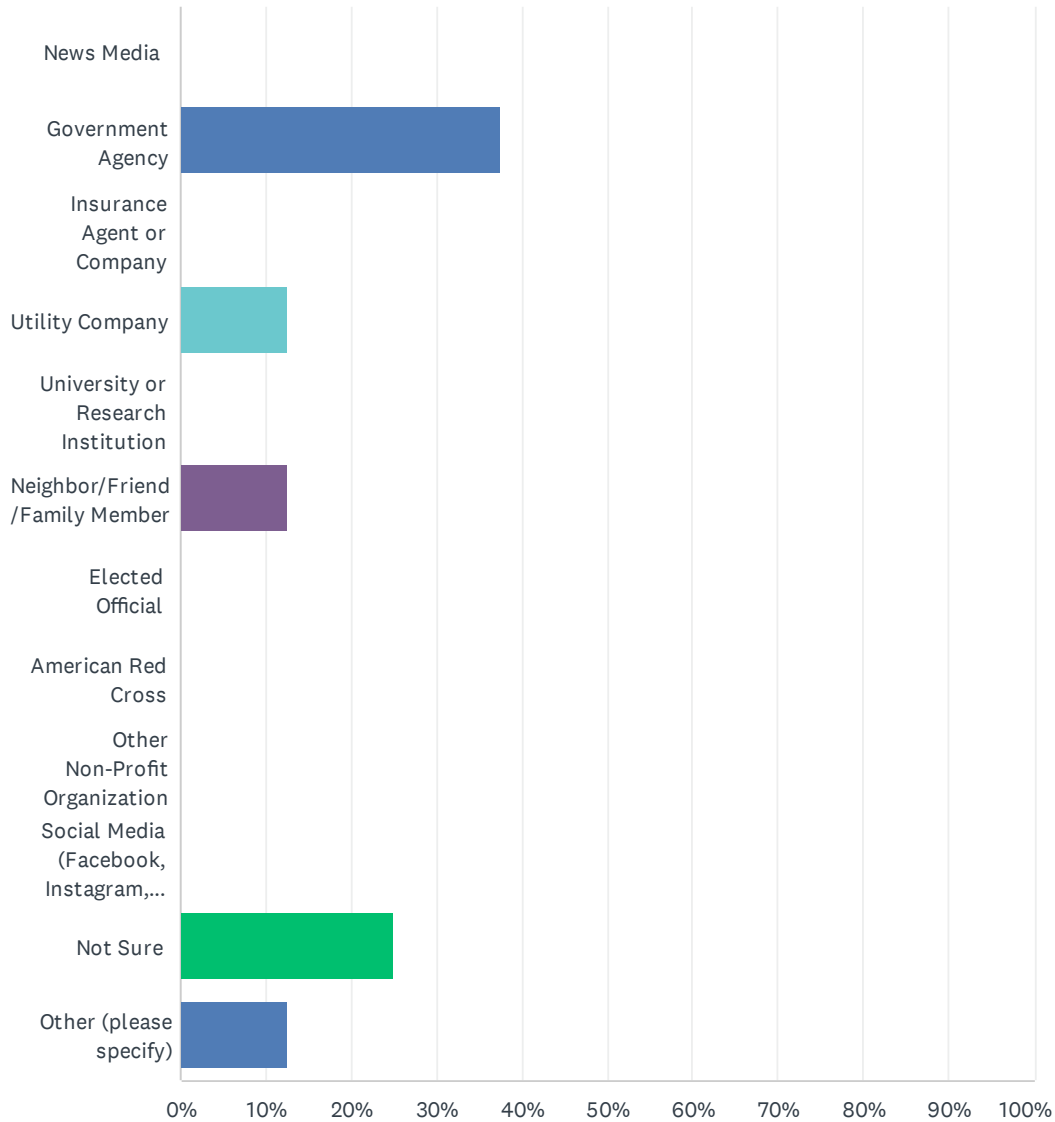
Wheeler County Natural Hazard Survey

ANSWER CHOICES	RESPONSES	
News Media	0.00%	0
Government Agency	28.57%	2
Insurance Agent or Company	0.00%	0
Utility Company	0.00%	0
University or Research Institution	0.00%	0
Neighbor/Friend/Family Member	0.00%	0
Elected Official	0.00%	0
American Red Cross	0.00%	0
Other Non-Profit Organization	0.00%	0
Social Media (Facebook, Instagram, etc.)	0.00%	0
Not Sure	0.00%	0
I answered "no"	42.86%	3
Other (please specify)	28.57%	2
TOTAL		7

#	OTHER (PLEASE SPECIFY)	DATE
1	Health Department	2/10/2024 9:53 AM
2	Government Agency: Public Health	2/10/2024 9:46 AM

Q6 Whom would you most trust to provide you with information about how to make your household and home safer from natural disasters?

Answered: 8 Skipped: 0



Wheeler County Natural Hazard Survey

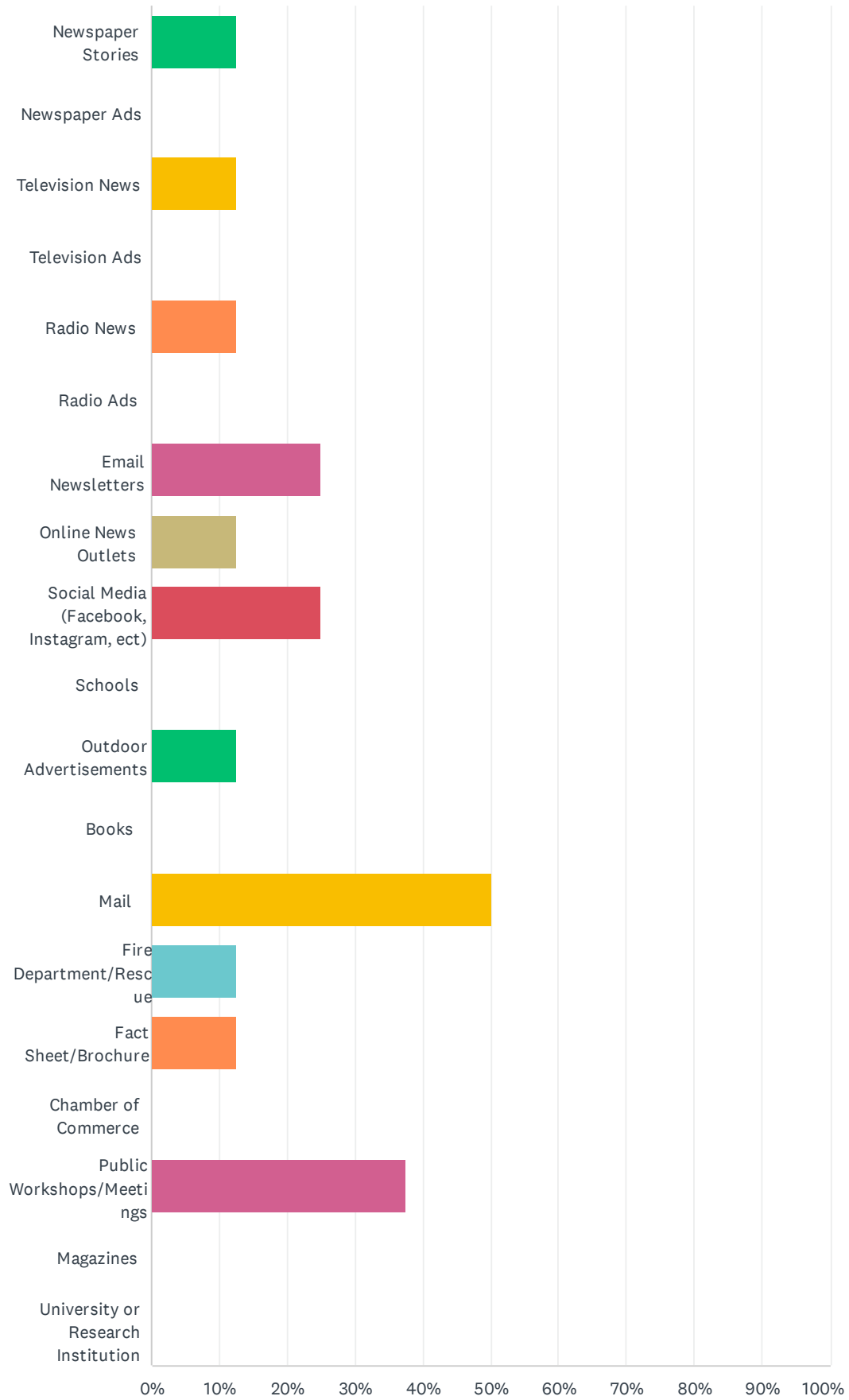
ANSWER CHOICES	RESPONSES	
News Media	0.00%	0
Government Agency	37.50%	3
Insurance Agent or Company	0.00%	0
Utility Company	12.50%	1
University or Research Institution	0.00%	0
Neighbor/Friend/Family Member	12.50%	1
Elected Official	0.00%	0
American Red Cross	0.00%	0
Other Non-Profit Organization	0.00%	0
Social Media (Facebook, Instagram, etc.)	0.00%	0
Not Sure	25.00%	2
Other (please specify)	12.50%	1
TOTAL		8

#	OTHER (PLEASE SPECIFY)	DATE
1	Sheriff's Office	2/10/2024 9:25 AM

Q7 What is the most effective way for you to receive information about how to make your household and home safer from natural disasters?
(Please select up to three)

Answered: 8 Skipped: 0

Wheeler County Natural Hazard Survey

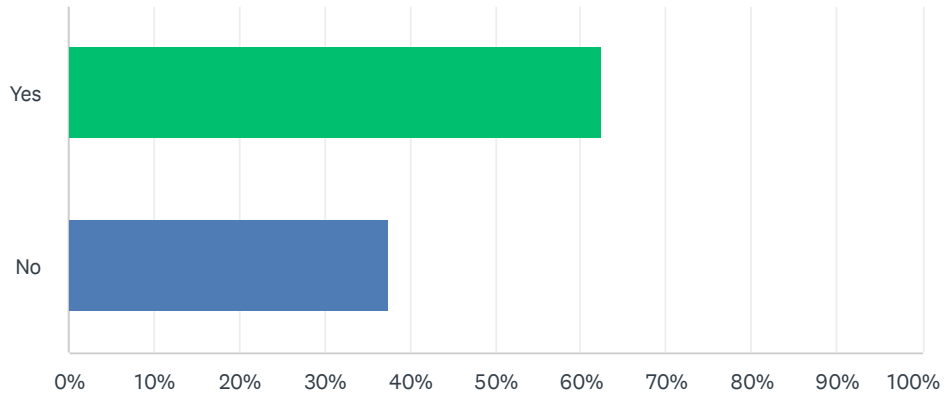


Wheeler County Natural Hazard Survey

ANSWER CHOICES	RESPONSES	
Newspaper Stories	12.50%	1
Newspaper Ads	0.00%	0
Television News	12.50%	1
Television Ads	0.00%	0
Radio News	12.50%	1
Radio Ads	0.00%	0
Email Newsletters	25.00%	2
Online News Outlets	12.50%	1
Social Media (Facebook, Instagram, ect)	25.00%	2
Schools	0.00%	0
Outdoor Advertisements	12.50%	1
Books	0.00%	0
Mail	50.00%	4
Fire Department/Rescue	12.50%	1
Fact Sheet/Brochure	12.50%	1
Chamber of Commerce	0.00%	0
Public Workshops/Meetings	37.50%	3
Magazines	0.00%	0
University or Research Institution	0.00%	0
Total Respondents: 8		

Q8 Prior to receiving this survey, were you aware of your county's Natural Hazard Mitigation Plan (NHMP)?

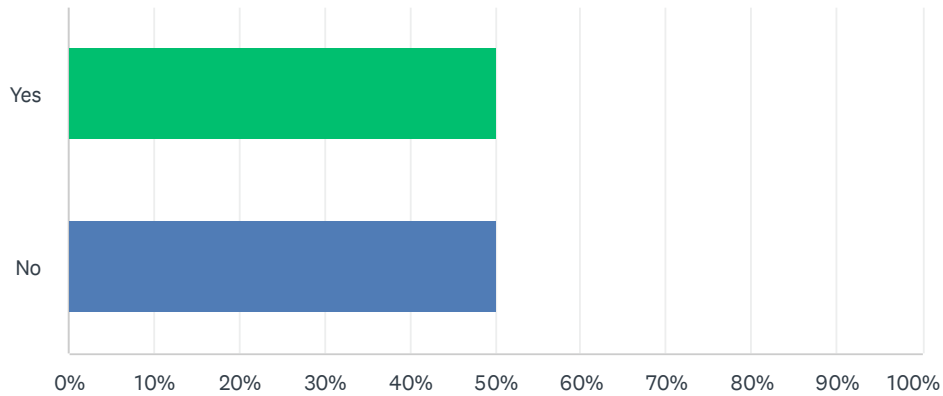
Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	62.50%	5
No	37.50%	3
TOTAL		8

Q9 Prior to receiving this survey, were you aware that the Federal Emergency Management Agency (FEMA) requires your county to update the NHMP every five years in order for your county to be eligible for federal pre-and post-disaster hazard mitigation funds?

Answered: 8 Skipped: 0



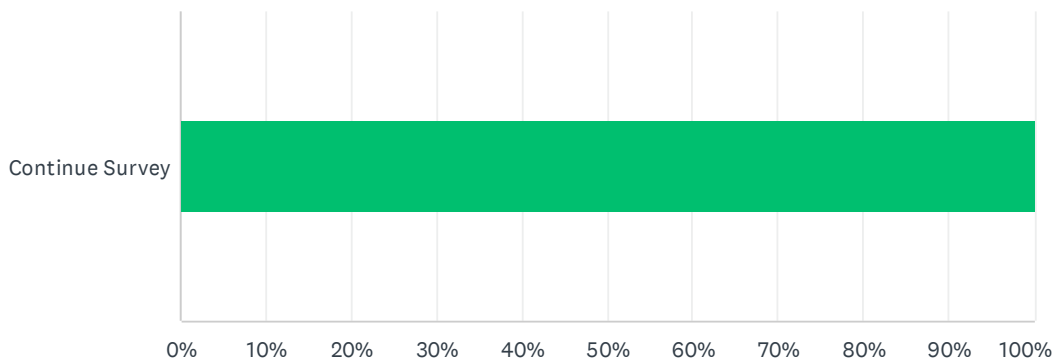
ANSWER CHOICES	RESPONSES
Yes	50.00% 4
No	50.00% 4
TOTAL	8

Q10 COMMUNITY VULNERABILITIES AND HAZARD MITIGATION STRATEGIES

In order to assess community risk, we need to understand which community assets may be vulnerable to natural hazards in the region. Vulnerable assets are those community features, characteristics, or resources that may be impacted by natural hazards (e.g., populations with functional needs, economic components, environmental resources, etc.).

The next set of questions will focus on vulnerable assets in your community and your preferred strategies to mitigate risk to those assets.

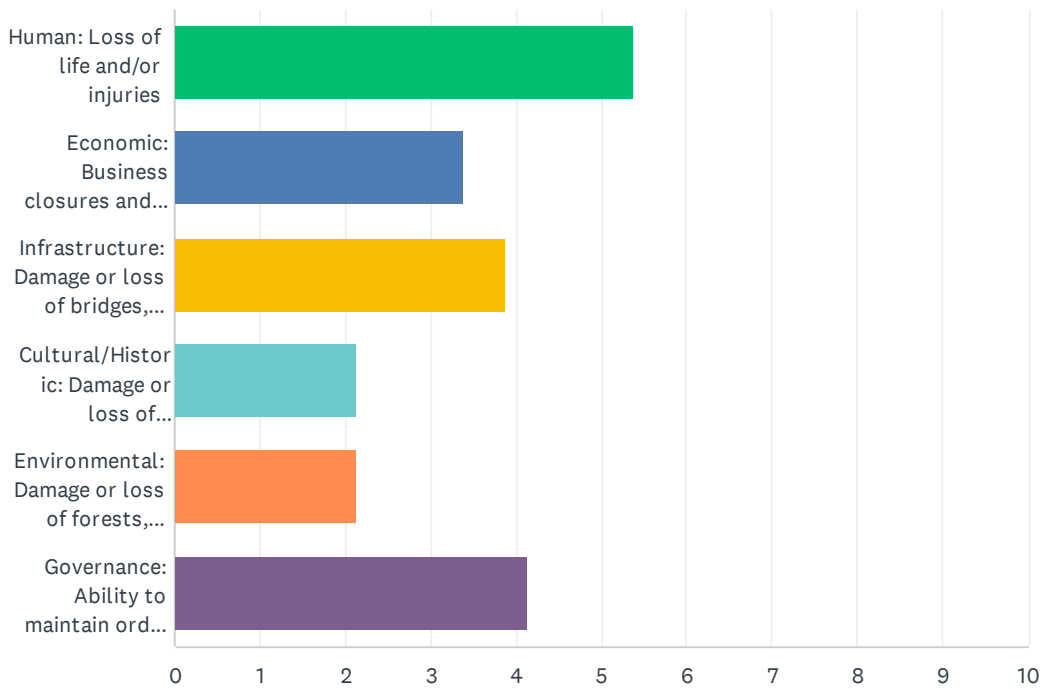
Answered: 7 Skipped: 1



ANSWER CHOICES	RESPONSES
Continue Survey	100.00% 7
TOTAL	7

Q11 Community assets are features, characteristics, or resources that either make a community unique or allow the community to function. In your opinion, which of the following categories are most susceptible to the impacts caused by natural hazards in your county? (please rank the community assets in order of vulnerability, 1 being most vulnerable and 6 being least vulnerable)

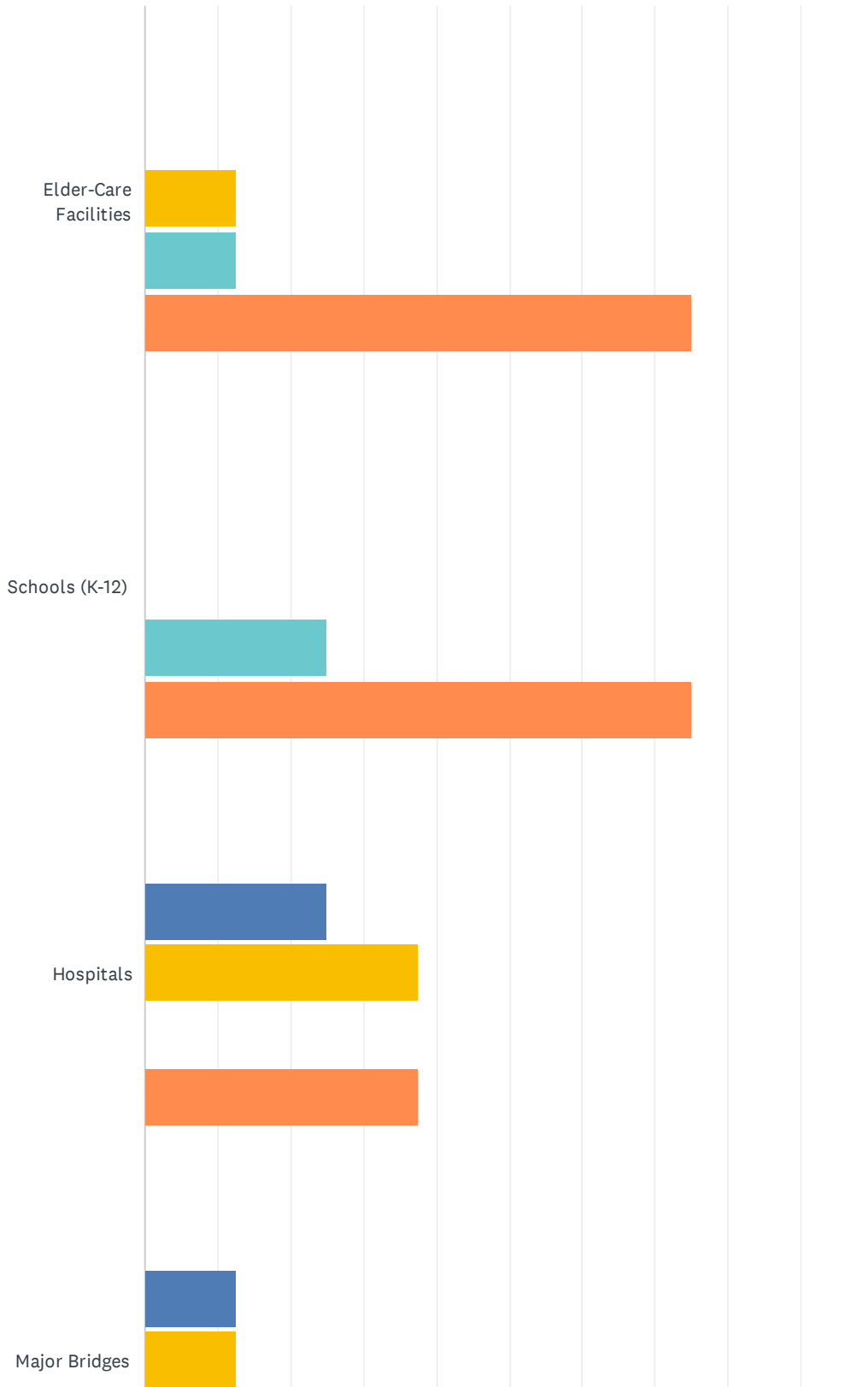
Answered: 8 Skipped: 0



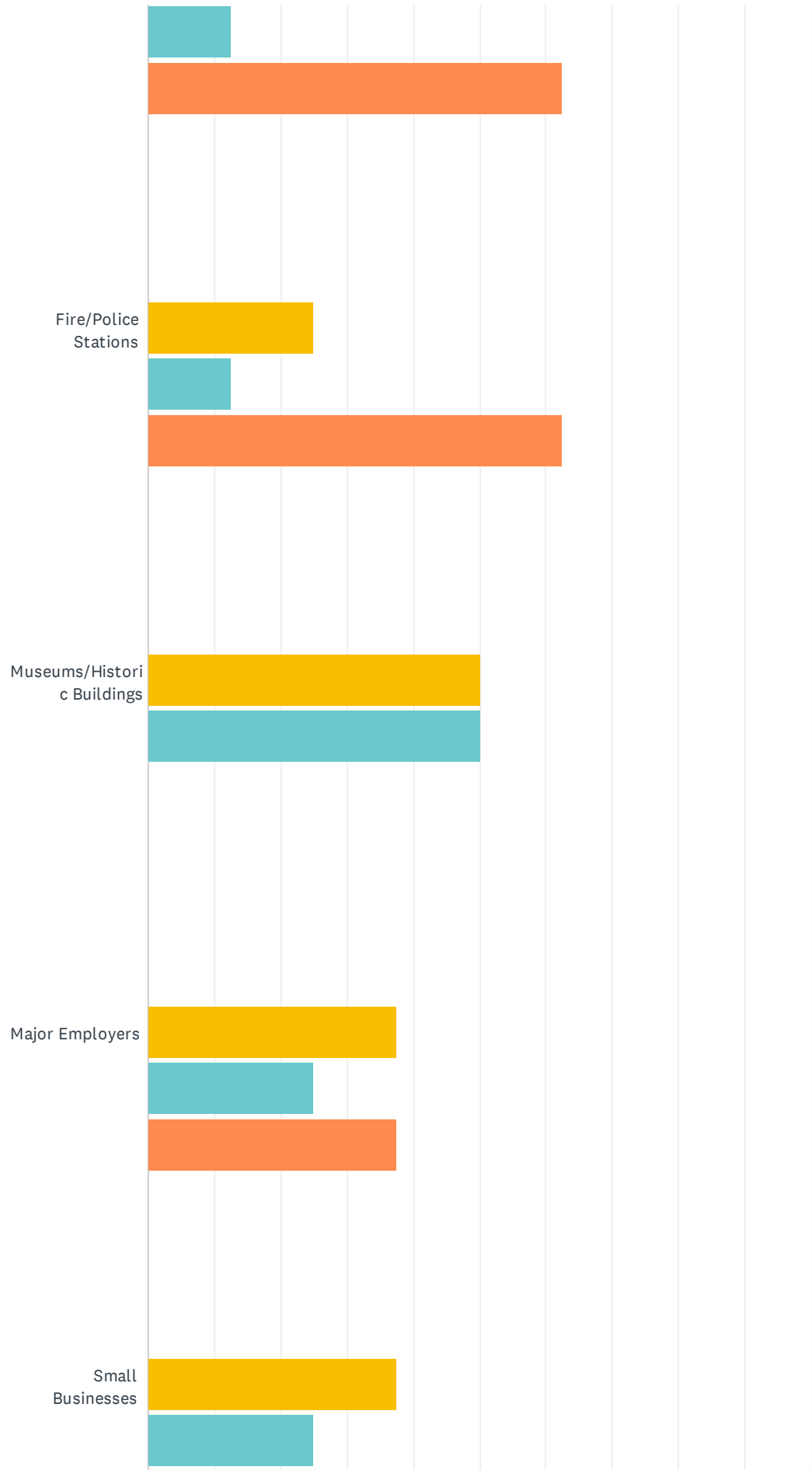
	1	2	3	4	5	6	TOTAL	SCORE
Human: Loss of life and/or injuries	62.50% 5	12.50% 1	25.00% 2	0.00% 0	0.00% 0	0.00% 0	8	5.38
Economic: Business closures and/or job loss	12.50% 1	12.50% 1	0.00% 0	50.00% 4	25.00% 2	0.00% 0	8	3.38
Infrastructure: Damage or loss of bridges, utilities, schools, etc.	12.50% 1	37.50% 3	12.50% 1	12.50% 1	12.50% 1	12.50% 1	8	3.88
Cultural/Historic: Damage or loss of libraries, museums, fairgrounds, etc.	0.00% 0	0.00% 0	12.50% 1	25.00% 2	25.00% 2	37.50% 3	8	2.13
Environmental: Damage or loss of forests, rangeland, waterways, etc.	0.00% 0	0.00% 0	25.00% 2	0.00% 0	37.50% 3	37.50% 3	8	2.13
Governance: Ability to maintain order and/or provide public amenities and services.	12.50% 1	37.50% 3	25.00% 2	12.50% 1	0.00% 0	12.50% 1	8	4.13

Q12 Next we would like to know what specific types of community assets are most important to you.

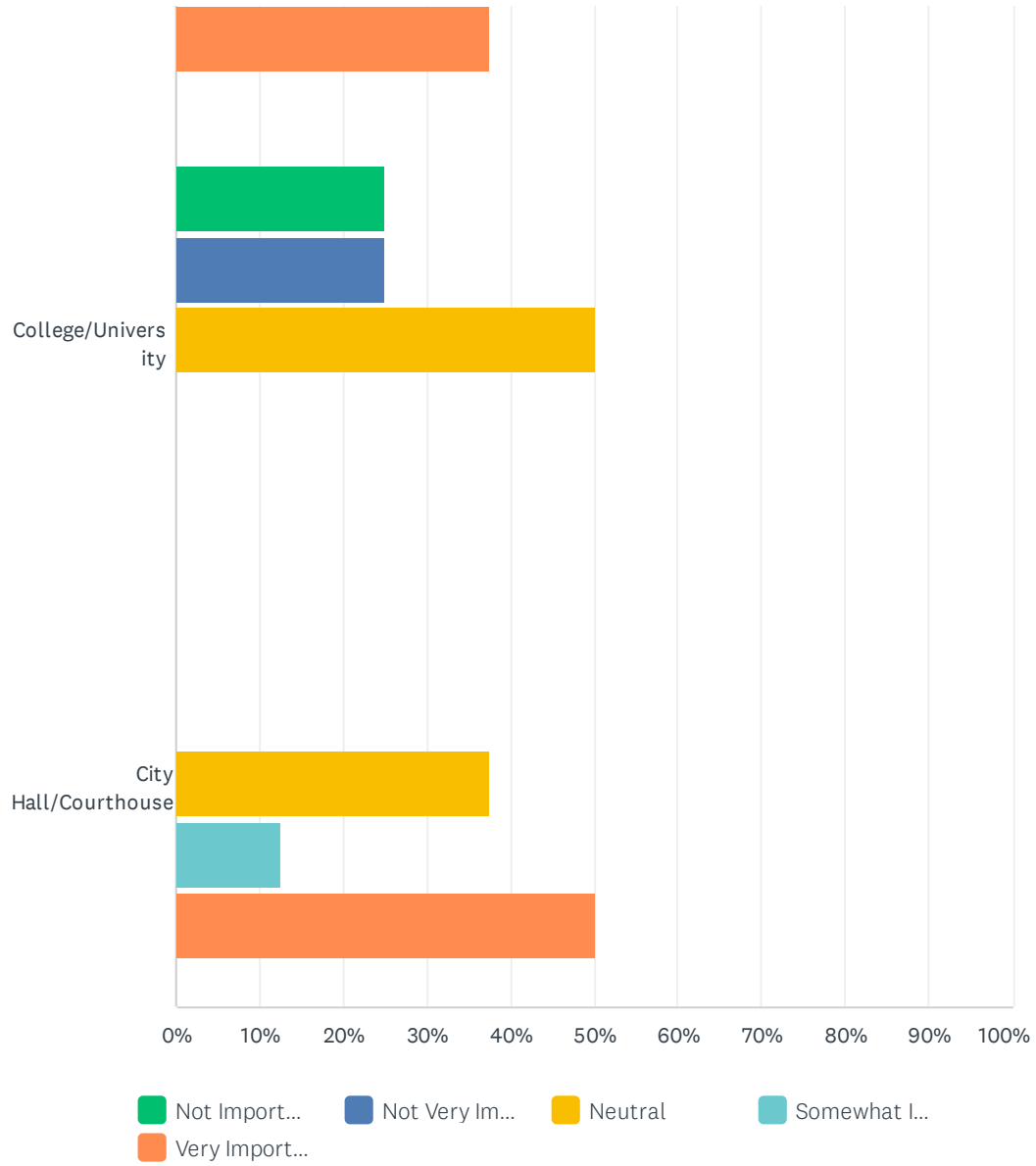
Answered: 8 Skipped: 0



Wheeler County Natural Hazard Survey



Wheeler County Natural Hazard Survey

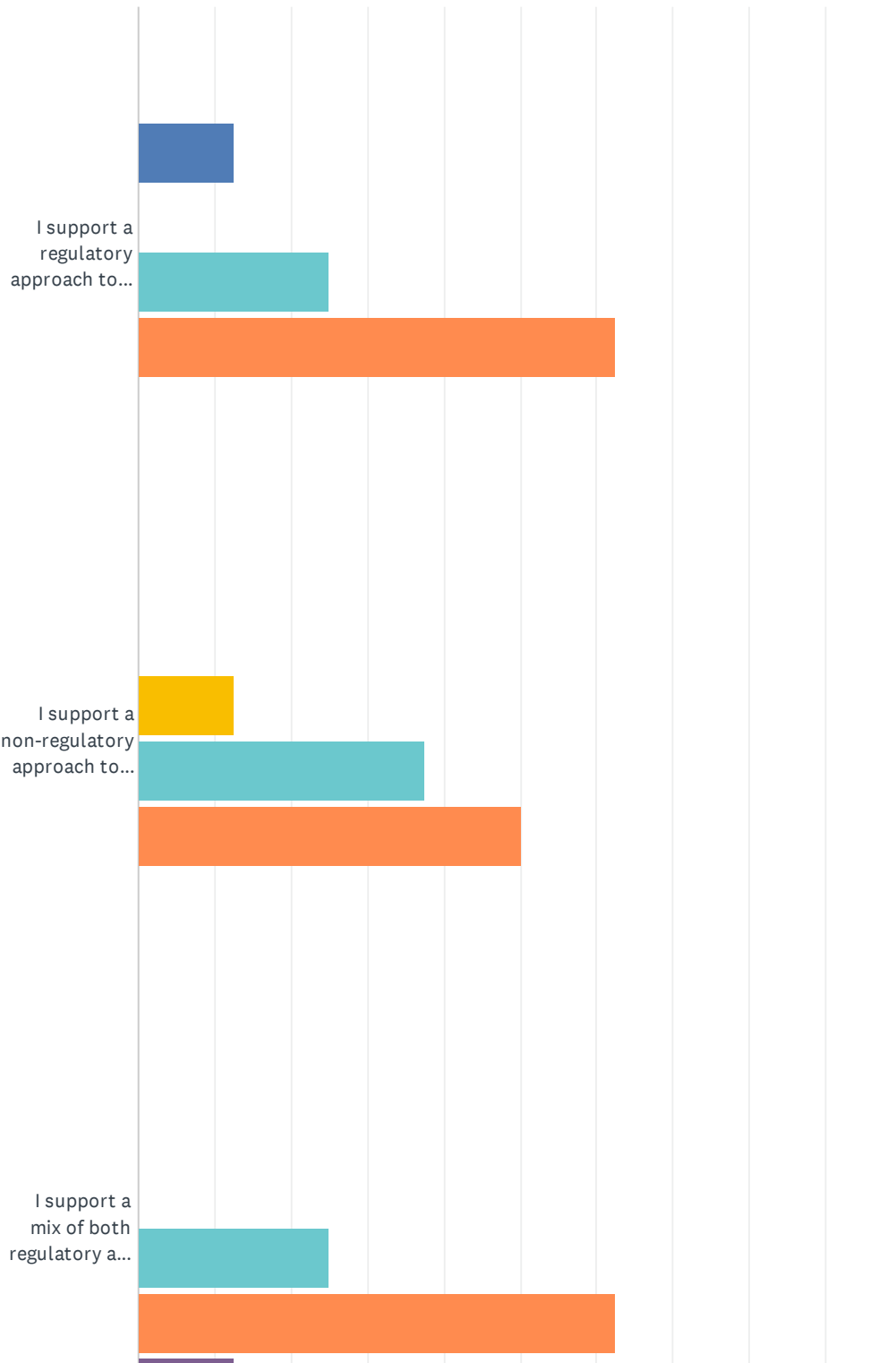


Wheeler County Natural Hazard Survey

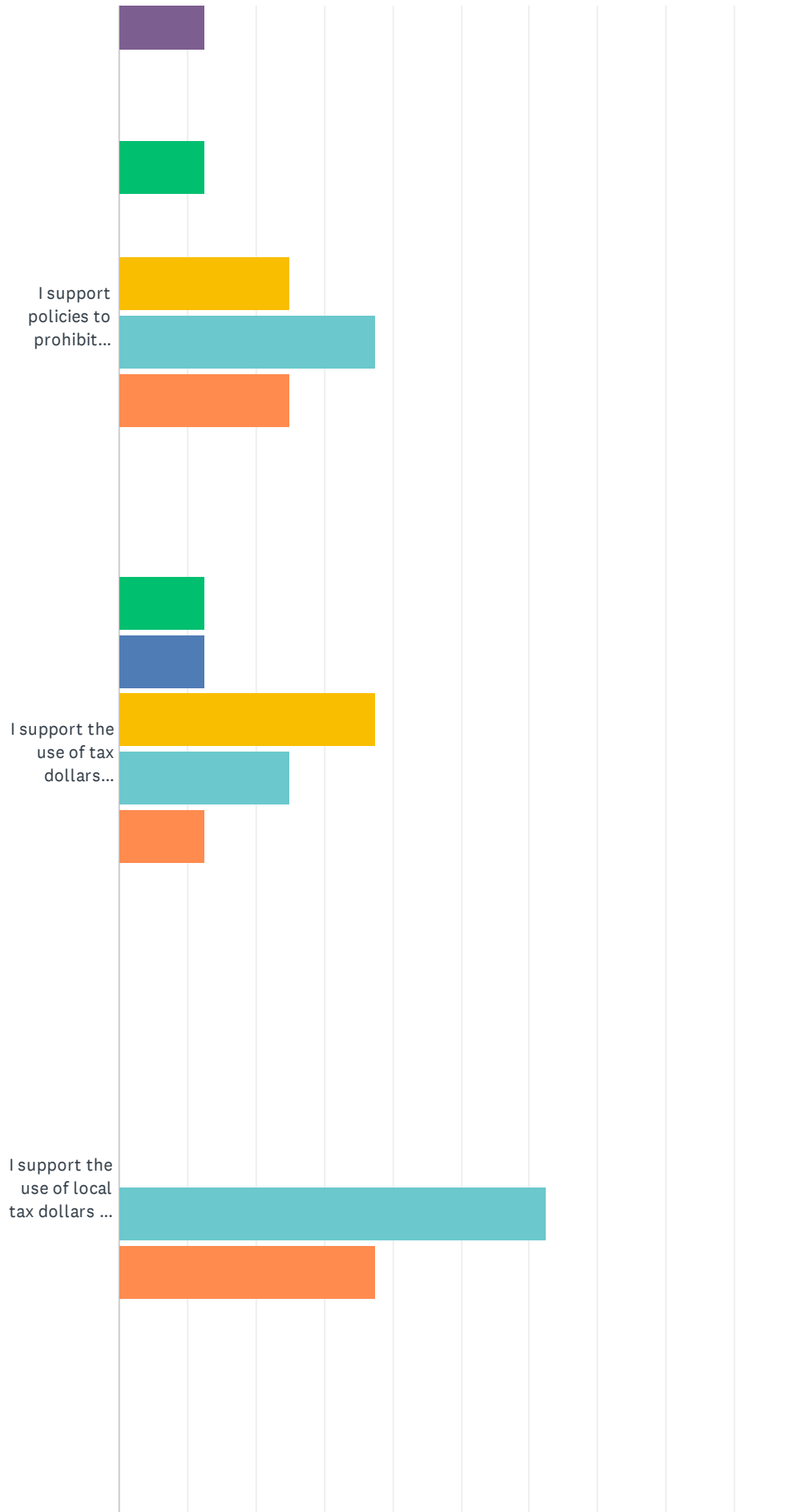
	NOT IMPORTANT	NOT VERY IMPORTANT	NEUTRAL	SOMEWHAT IMPORTANT	VERY IMPORTANT	TOTAL	WEIGHTED AVERAGE
Elder-Care Facilities	0.00% 0	0.00% 0	12.50% 1	12.50% 1	75.00% 6	8	4.63
Schools (K-12)	0.00% 0	0.00% 0	0.00% 0	25.00% 2	75.00% 6	8	4.75
Hospitals	0.00% 0	25.00% 2	37.50% 3	0.00% 0	37.50% 3	8	3.50
Major Bridges	0.00% 0	12.50% 1	12.50% 1	12.50% 1	62.50% 5	8	4.25
Fire/Police Stations	0.00% 0	0.00% 0	25.00% 2	12.50% 1	62.50% 5	8	4.38
Museums/Historic Buildings	0.00% 0	0.00% 0	50.00% 4	50.00% 4	0.00% 0	8	3.50
Major Employers	0.00% 0	0.00% 0	37.50% 3	25.00% 2	37.50% 3	8	4.00
Small Businesses	0.00% 0	0.00% 0	37.50% 3	25.00% 2	37.50% 3	8	4.00
College/University	25.00% 2	25.00% 2	50.00% 4	0.00% 0	0.00% 0	8	2.25
City Hall/Courthouse	0.00% 0	0.00% 0	37.50% 3	12.50% 1	50.00% 4	8	4.13

Q13 A number of activities can reduce your community's risk from natural hazards. These activities can be both regulatory and non-regulatory. Please select the option that best represents your opinion of the following strategies to reduce the risk and loss associated with natural disasters.

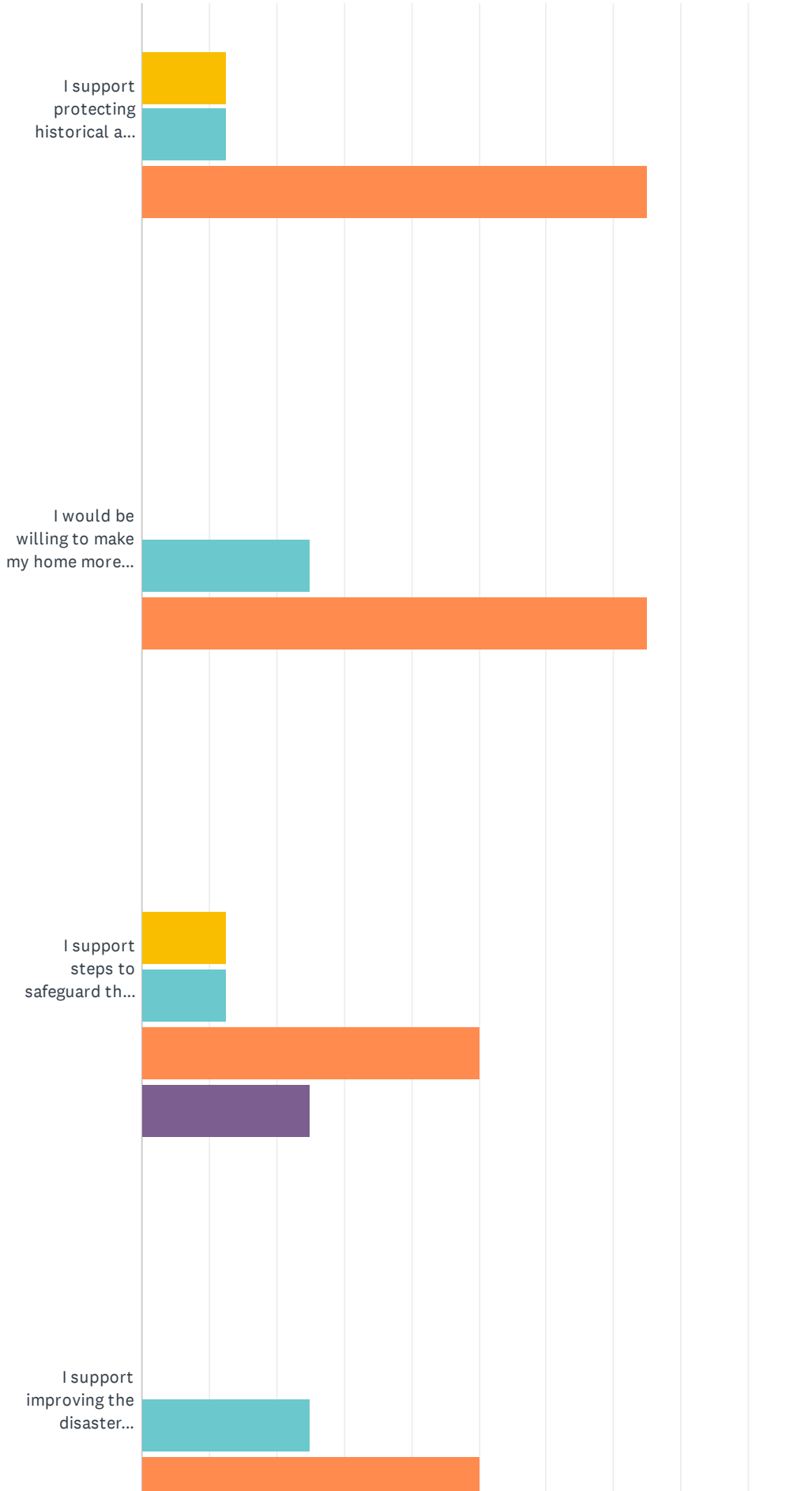
Answered: 8 Skipped: 0



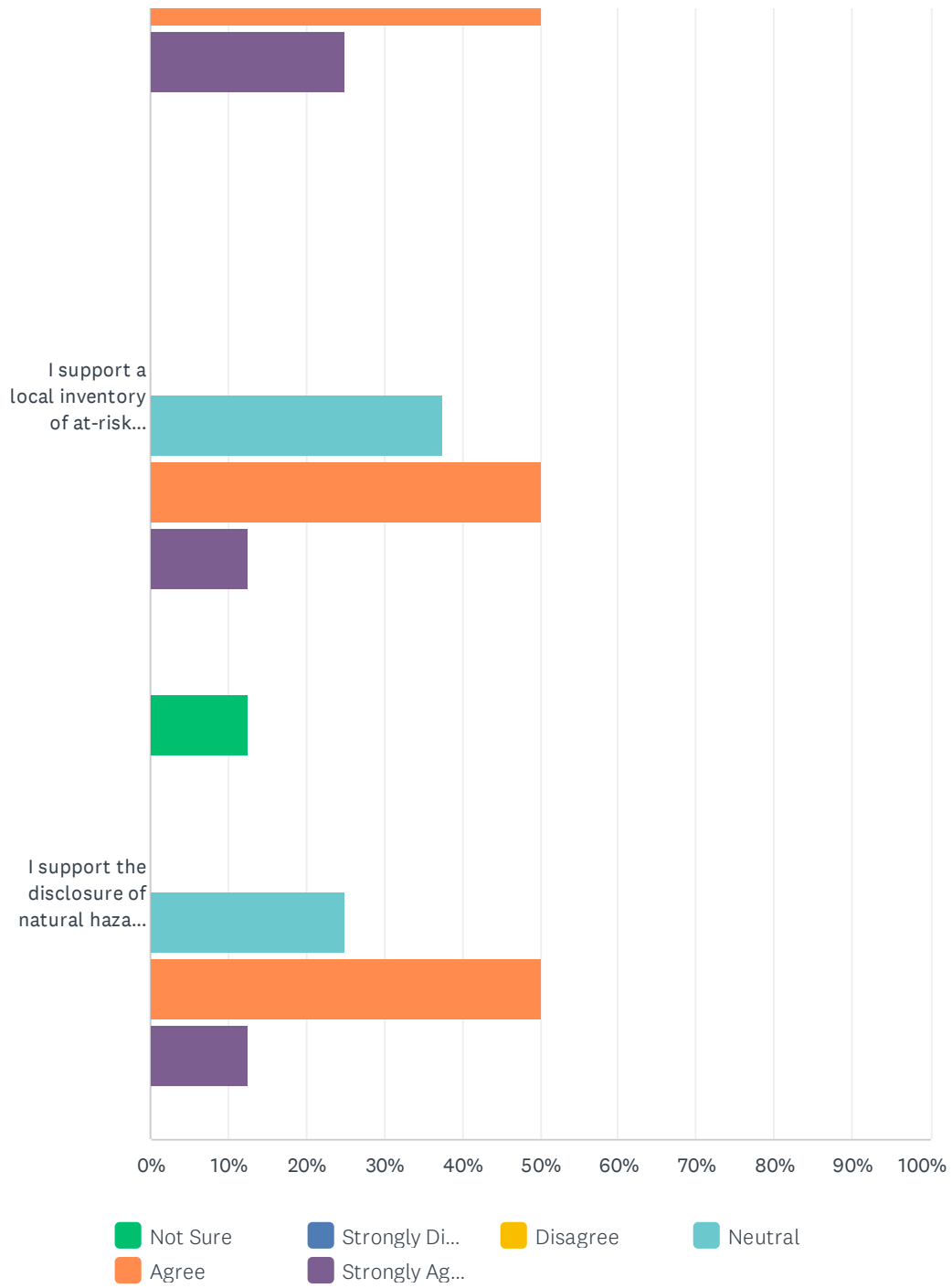
Wheeler County Natural Hazard Survey



Wheeler County Natural Hazard Survey



Wheeler County Natural Hazard Survey

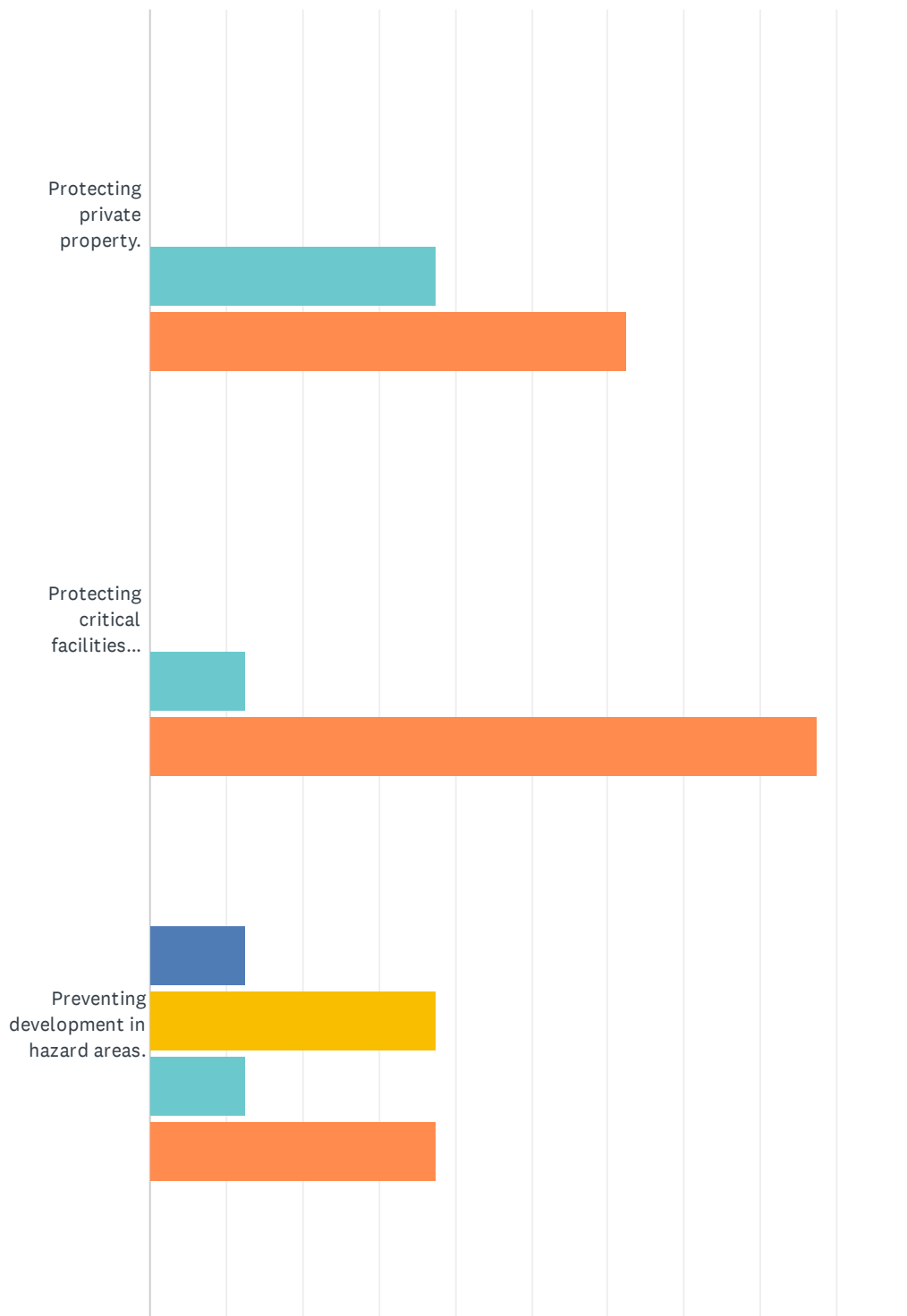


Wheeler County Natural Hazard Survey

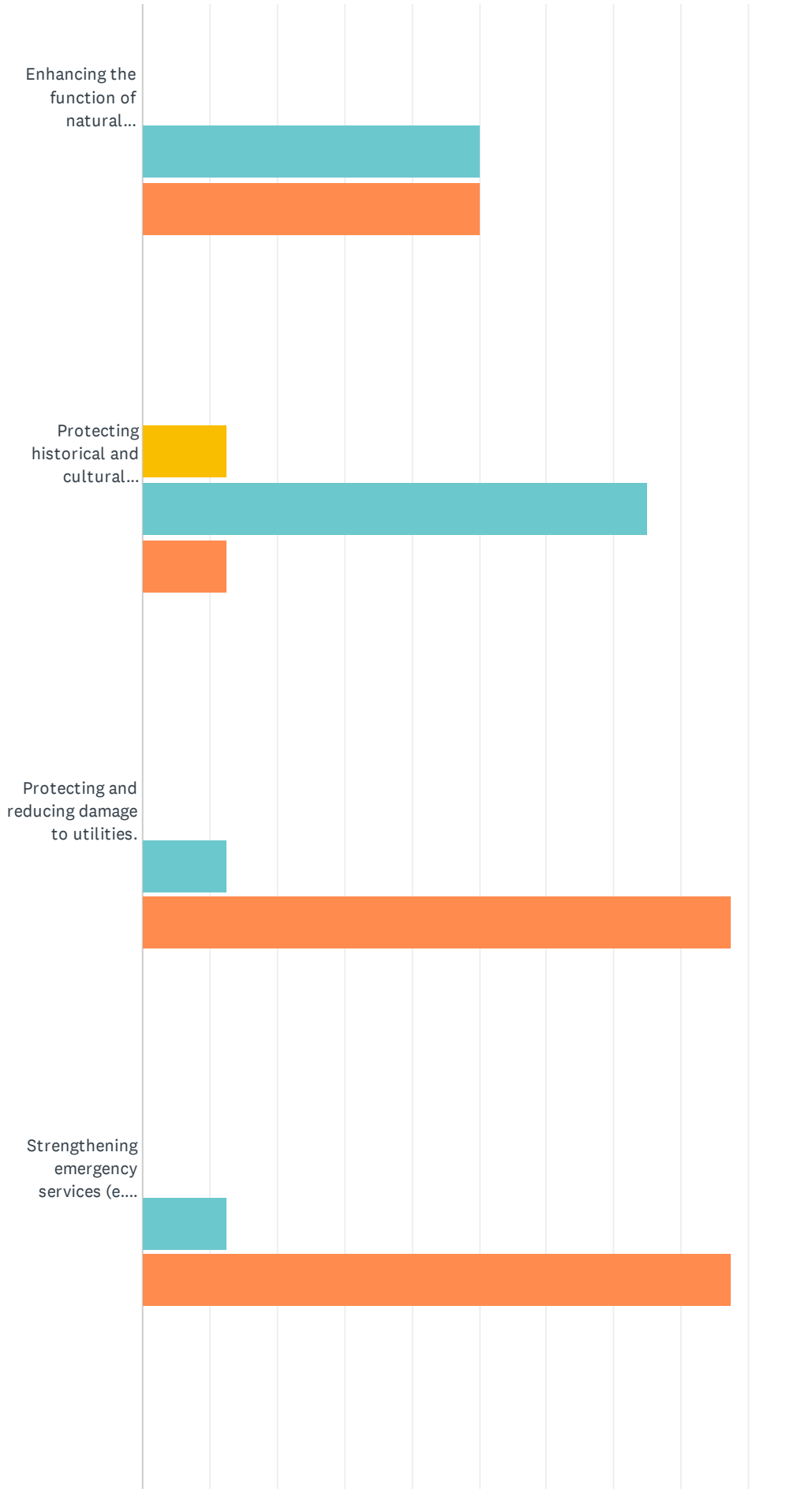
	NOT SURE	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL
I support a regulatory approach to reducing risk.	0.00% 0	12.50% 1	0.00% 0	25.00% 2	62.50% 5	0.00% 0	8
I support a non-regulatory approach to reducing risk.	0.00% 0	0.00% 0	12.50% 1	37.50% 3	50.00% 4	0.00% 0	8
I support a mix of both regulatory and non-regulatory approaches to reducing risk.	0.00% 0	0.00% 0	0.00% 0	25.00% 2	62.50% 5	12.50% 1	8
I support policies to prohibit development in areas subject to natural hazards.	12.50% 1	0.00% 0	25.00% 2	37.50% 3	25.00% 2	0.00% 0	8
I support the use of tax dollars (federal and/or local) to compensate landowners for not developing in areas subject to natural hazards.	12.50% 1	12.50% 1	37.50% 3	25.00% 2	12.50% 1	0.00% 0	8
I support the use of local tax dollars to reduce risks and losses from natural disasters.	0.00% 0	0.00% 0	0.00% 0	62.50% 5	37.50% 3	0.00% 0	8
I support protecting historical and cultural structures.	0.00% 0	0.00% 0	12.50% 1	12.50% 1	75.00% 6	0.00% 0	8
I would be willing to make my home more disaster-resilient.	0.00% 0	0.00% 0	0.00% 0	25.00% 2	75.00% 6	0.00% 0	8
I support steps to safeguard the local economy following a disaster event.	0.00% 0	0.00% 0	12.50% 1	12.50% 1	50.00% 4	25.00% 2	8
I support improving the disaster preparedness of local schools.	0.00% 0	0.00% 0	0.00% 0	25.00% 2	50.00% 4	25.00% 2	8
I support a local inventory of at-risk buildings and infrastructure.	0.00% 0	0.00% 0	0.00% 0	37.50% 3	50.00% 4	12.50% 1	8
I support the disclosure of natural hazard risks during real estate transactions.	12.50% 1	0.00% 0	0.00% 0	25.00% 2	50.00% 4	12.50% 1	8

Q14 Natural hazards can have a significant impact on a community but planning for these events can help lessen the impacts. The following statements will help determine citizen priorities regarding planning for natural hazards in your county. Please tell us how important each one is to you.

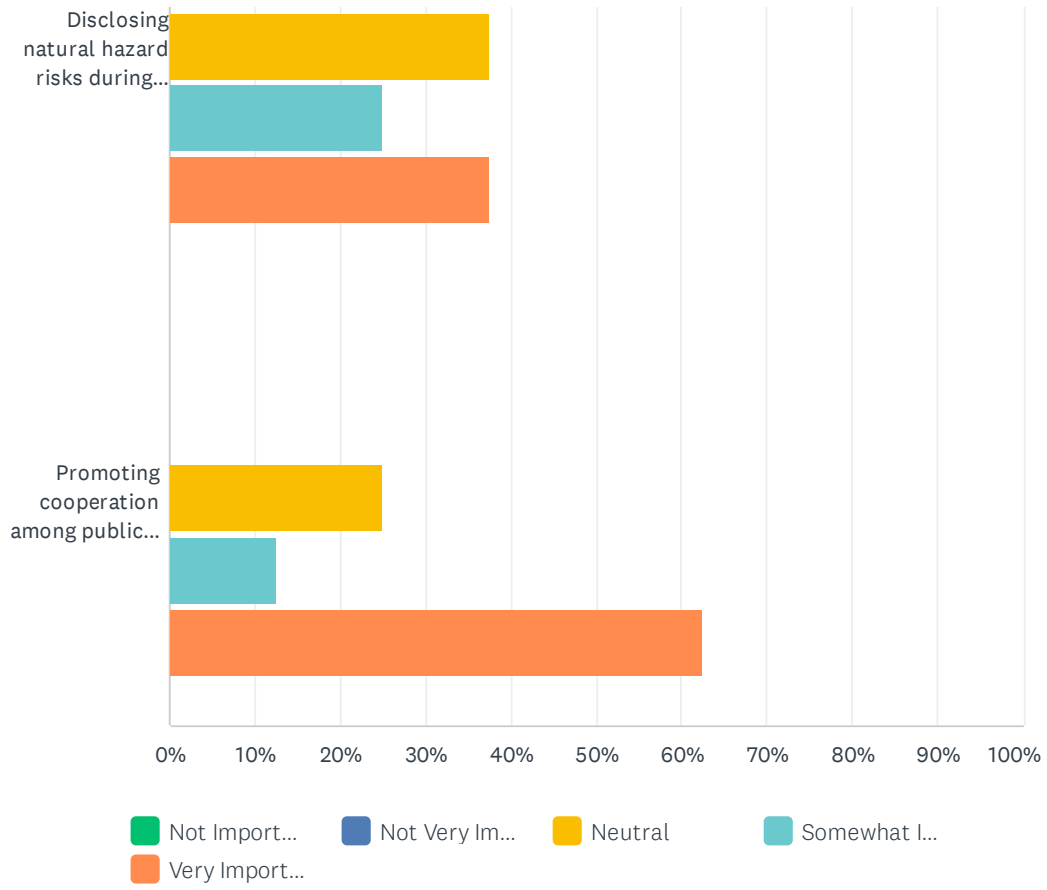
Answered: 8 Skipped: 0



Wheeler County Natural Hazard Survey



Wheeler County Natural Hazard Survey

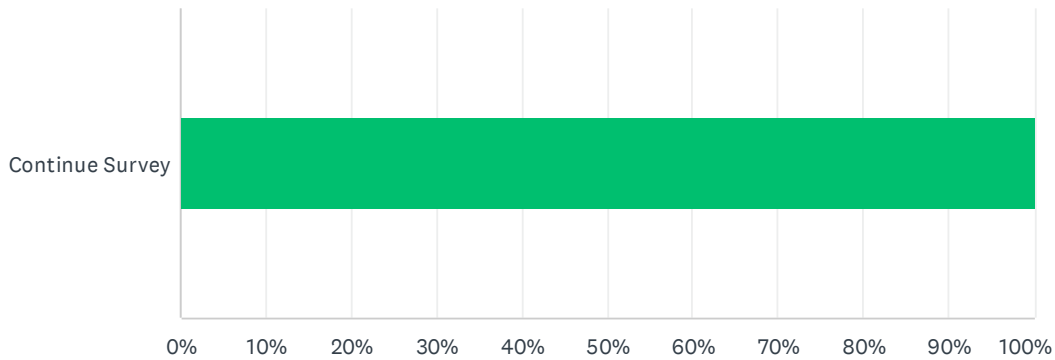


Wheeler County Natural Hazard Survey

	NOT IMPORTANT	NOT VERY IMPORTANT	NEUTRAL	SOMEWHAT IMPORTANT	VERY IMPORTANT	TOTAL	WEIGHTED AVERAGE
Protecting private property.	0.00% 0	0.00% 0	0.00% 0	37.50% 3	62.50% 5	8	4.63
Protecting critical facilities (e.g., transportation networks, hospitals, fire stations).	0.00% 0	0.00% 0	0.00% 0	12.50% 1	87.50% 7	8	4.88
Preventing development in hazard areas.	0.00% 0	12.50% 1	37.50% 3	12.50% 1	37.50% 3	8	3.75
Enhancing the function of natural features (e.g., streams, wetlands).	0.00% 0	0.00% 0	0.00% 0	50.00% 4	50.00% 4	8	4.50
Protecting historical and cultural landmarks.	0.00% 0	0.00% 0	12.50% 1	75.00% 6	12.50% 1	8	4.00
Protecting and reducing damage to utilities.	0.00% 0	0.00% 0	0.00% 0	12.50% 1	87.50% 7	8	4.88
Strengthening emergency services (e.g. police, fire and ambulance).	0.00% 0	0.00% 0	0.00% 0	12.50% 1	87.50% 7	8	4.88
Disclosing natural hazard risks during real estate transactions.	0.00% 0	0.00% 0	37.50% 3	25.00% 2	37.50% 3	8	4.00
Promoting cooperation among public agencies, citizens, non-profits and businesses.	0.00% 0	0.00% 0	25.00% 2	12.50% 1	62.50% 5	8	4.38

Q15 MITIGATION AND PREPAREDNESS ACTIVITIES IN YOUR HOUSEHOLD Households can mitigate and prepare for natural hazards in order to prevent damage to property, injuries, and loss of life. The precautions you take and training you receive can make a big difference in your ability to recover from a natural disaster or emergency. Access to basic services, such as electricity, gas, water, telephones and emergency care may be cut off temporarily or you may have to evacuate at a moment's notice. The following questions focus on your household's preparedness for disaster events.

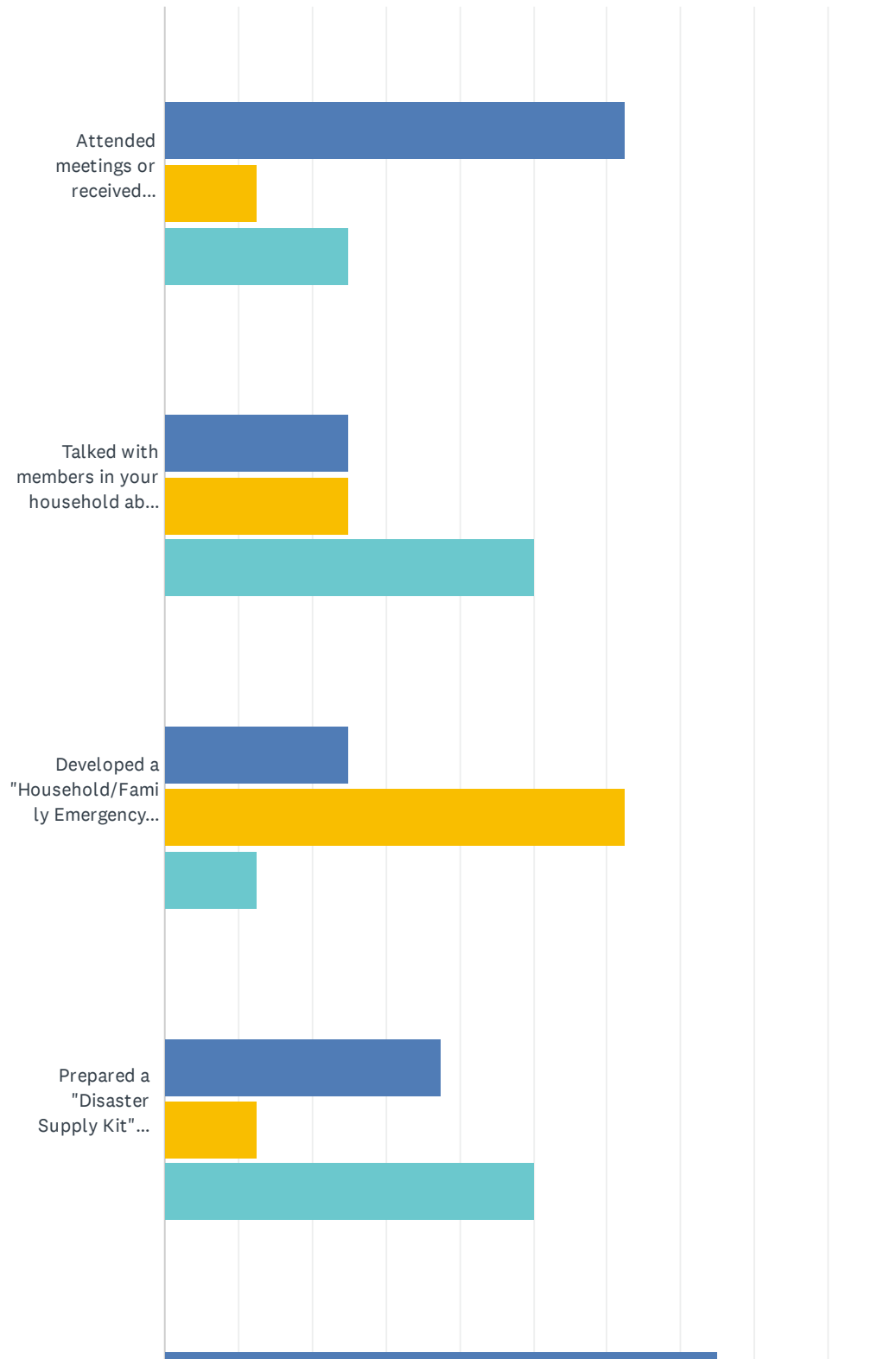
Answered: 8 Skipped: 0



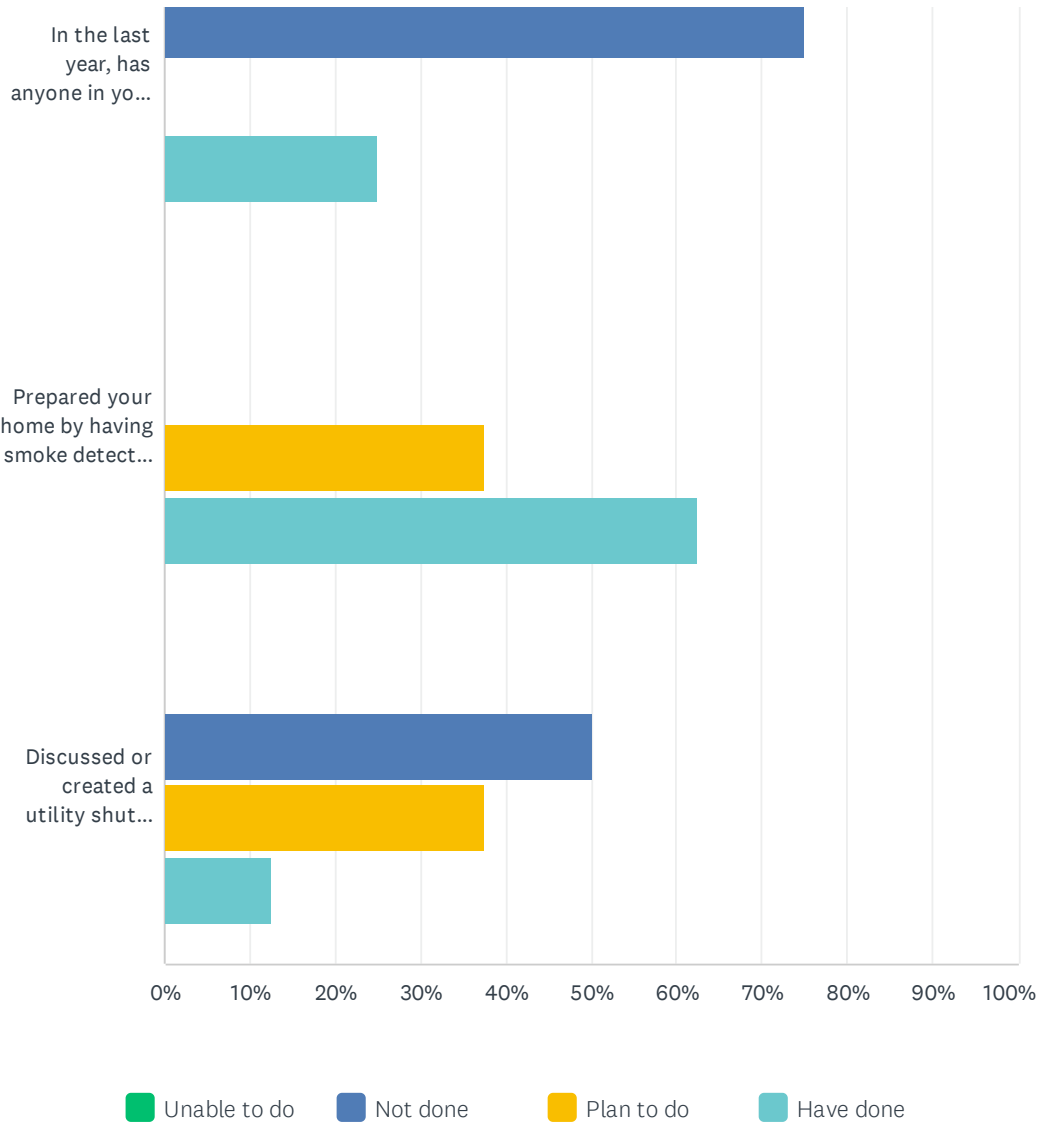
ANSWER CHOICES	RESPONSES
Continue Survey	100.00% 8
TOTAL	8

Q16 In the following list, please check those activities that you have done in your household, plan to do in the near future, have not done or are unable to do.

Answered: 8 Skipped: 0



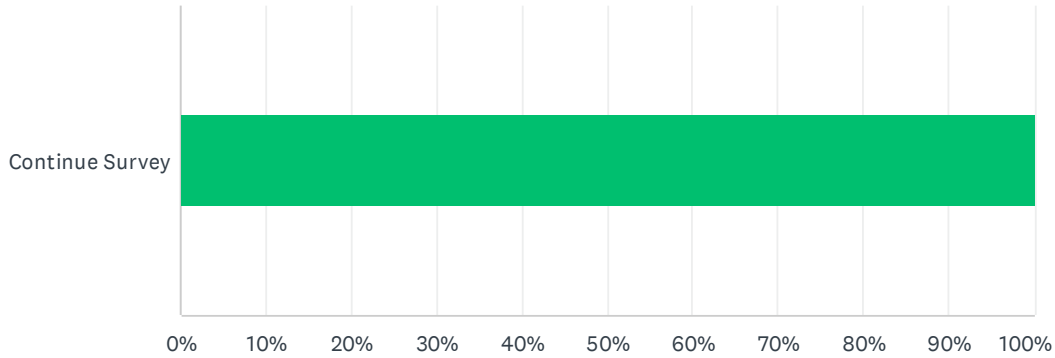
Wheeler County Natural Hazard Survey



	UNABLE TO DO	NOT DONE	PLAN TO DO	HAVE DONE	TOTAL
Attended meetings or received written information on natural disasters or emergency preparedness?	0.00% 0	62.50% 5	12.50% 1	25.00% 2	8
Talked with members in your household about what to do in case of a natural disaster or emergency?	0.00% 0	25.00% 2	25.00% 2	50.00% 4	8
Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a disaster?	0.00% 0	25.00% 2	62.50% 5	12.50% 1	8
Prepared a "Disaster Supply Kit" (stored extra food, water, batteries or other emergency supplies?)	0.00% 0	37.50% 3	12.50% 1	50.00% 4	8
In the last year, has anyone in your household been trained in First Aid or Cardio-Pulmonary Resuscitation (CPR)?	0.00% 0	75.00% 6	0.00% 0	25.00% 2	8
Prepared your home by having smoke detectors on each level of the house?	0.00% 0	0.00% 0	37.50% 3	62.50% 5	8
Discussed or created a utility shutoff procedure in the event of a natural disaster?	0.00% 0	50.00% 4	37.50% 3	12.50% 1	8

Q17 GENERAL HOUSEHOLD INFORMATION Finally, we would appreciate any information you are willing to share with us about you and your household. This information will remain confidential and is for survey comparison purposes only.

Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES
Continue Survey	100.00% 8
TOTAL	8

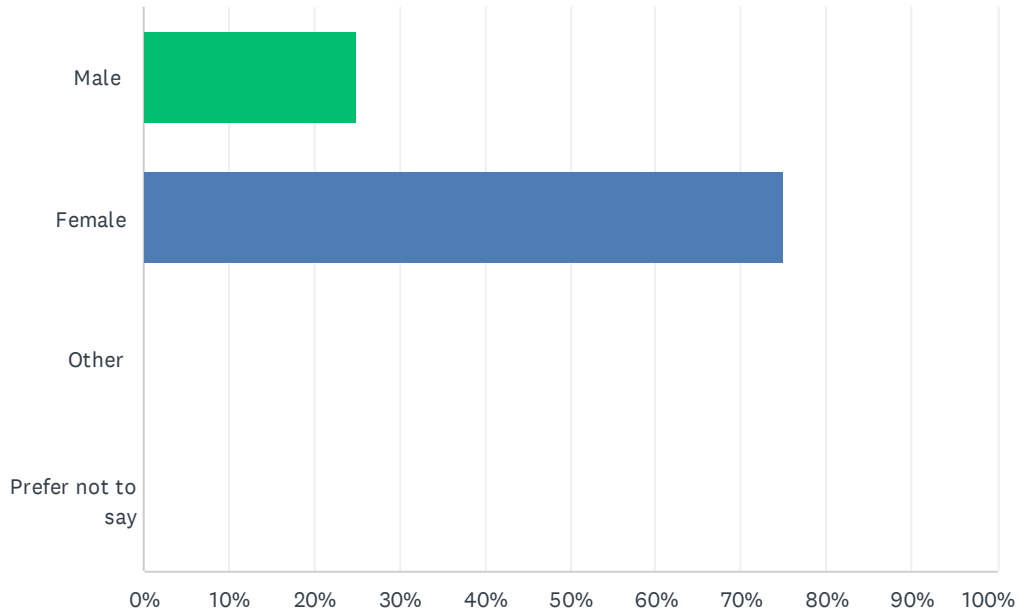
Q18 Please indicate your age

Answered: 7 Skipped: 1

#	RESPONSES	DATE
1	67	2/13/2024 2:16 PM
2	27	2/13/2024 12:54 PM
3	Old	2/13/2024 12:37 PM
4	69	2/10/2024 9:53 AM
5	36	2/10/2024 9:38 AM
6	71	2/10/2024 9:25 AM
7	50	3/5/2023 11:58 AM

Q19 Gender

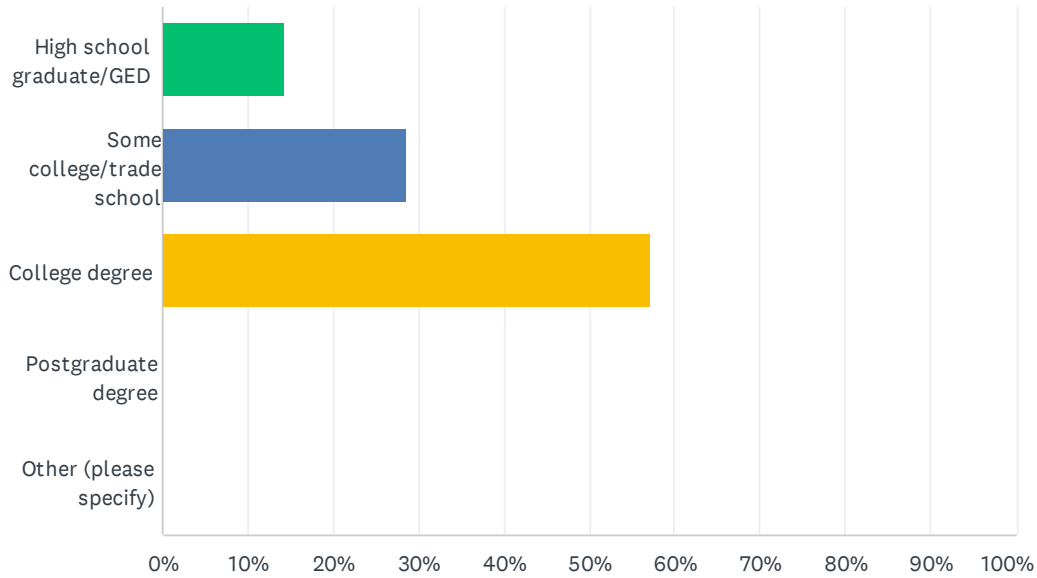
Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
Male	25.00%	2
Female	75.00%	6
Other	0.00%	0
Prefer not to say	0.00%	0
TOTAL		8

Q20 Please indicate your level of education

Answered: 7 Skipped: 1

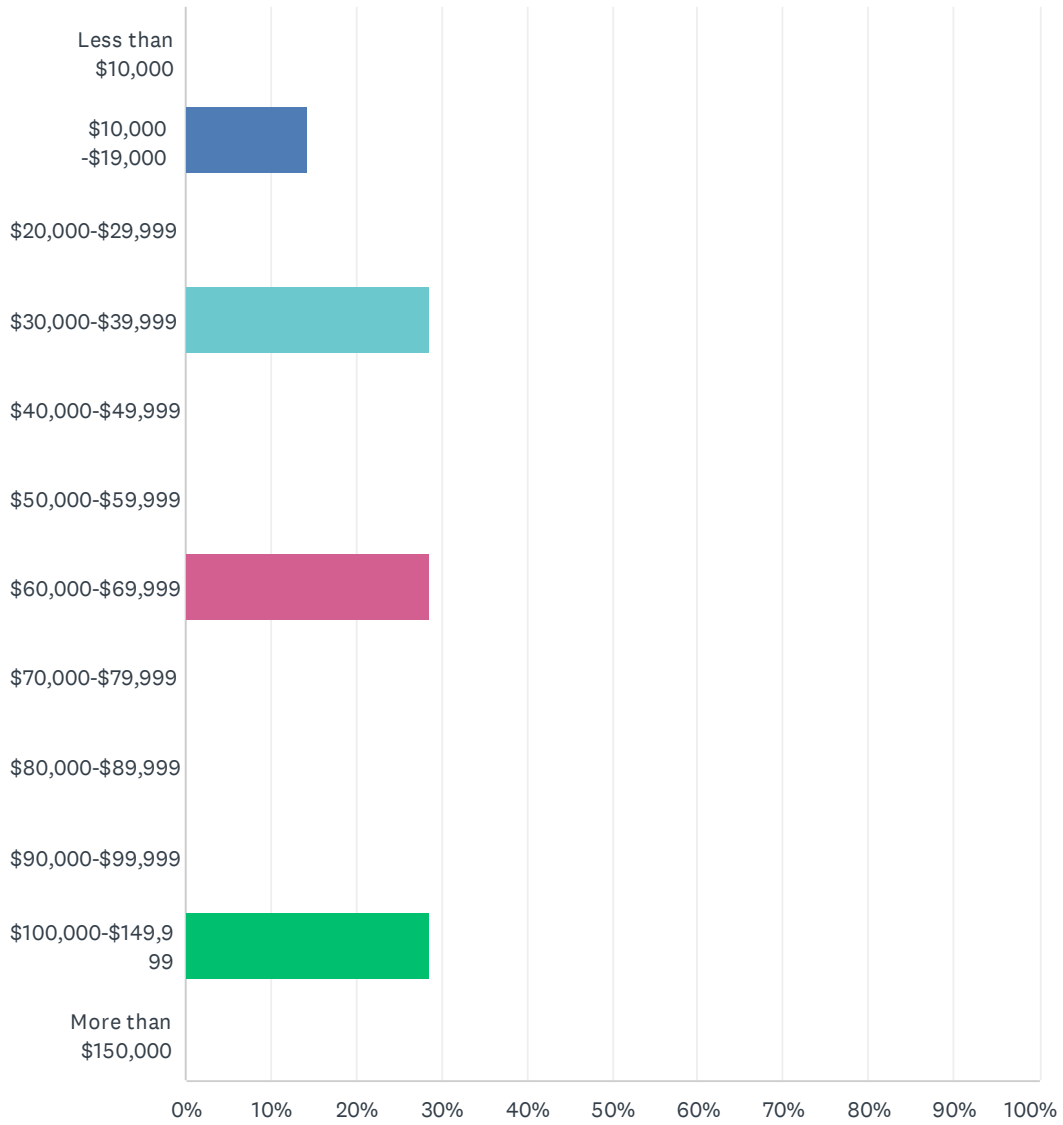


ANSWER CHOICES	RESPONSES
High school graduate/GED	14.29% 1
Some college/trade school	28.57% 2
College degree	57.14% 4
Postgraduate degree	0.00% 0
Other (please specify)	0.00% 0
TOTAL	7

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Q21 What is your total household income?

Answered: 7 Skipped: 1

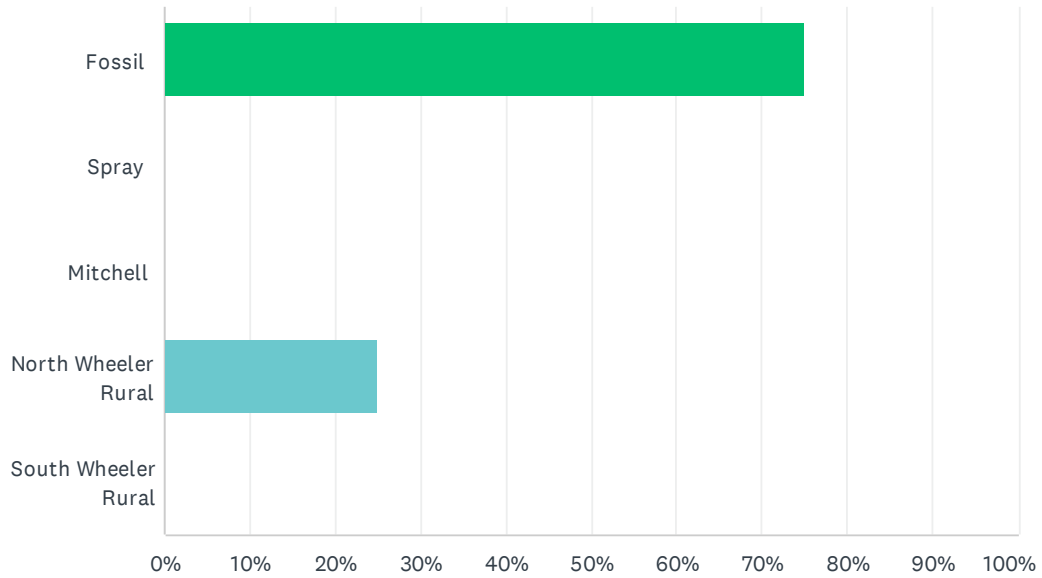


Wheeler County Natural Hazard Survey

ANSWER CHOICES	RESPONSES	
Less than \$10,000	0.00%	0
\$10,000 -\$19,000	14.29%	1
\$20,000-\$29,999	0.00%	0
\$30,000-\$39,999	28.57%	2
\$40,000-\$49,999	0.00%	0
\$50,000-\$59,999	0.00%	0
\$60,000-\$69,999	28.57%	2
\$70,000-\$79,999	0.00%	0
\$80,000-\$89,999	0.00%	0
\$90,000-\$99,999	0.00%	0
\$100,000-\$149,999	28.57%	2
More than \$150,000	0.00%	0
TOTAL		7

Q22 What area of the county do you live in?

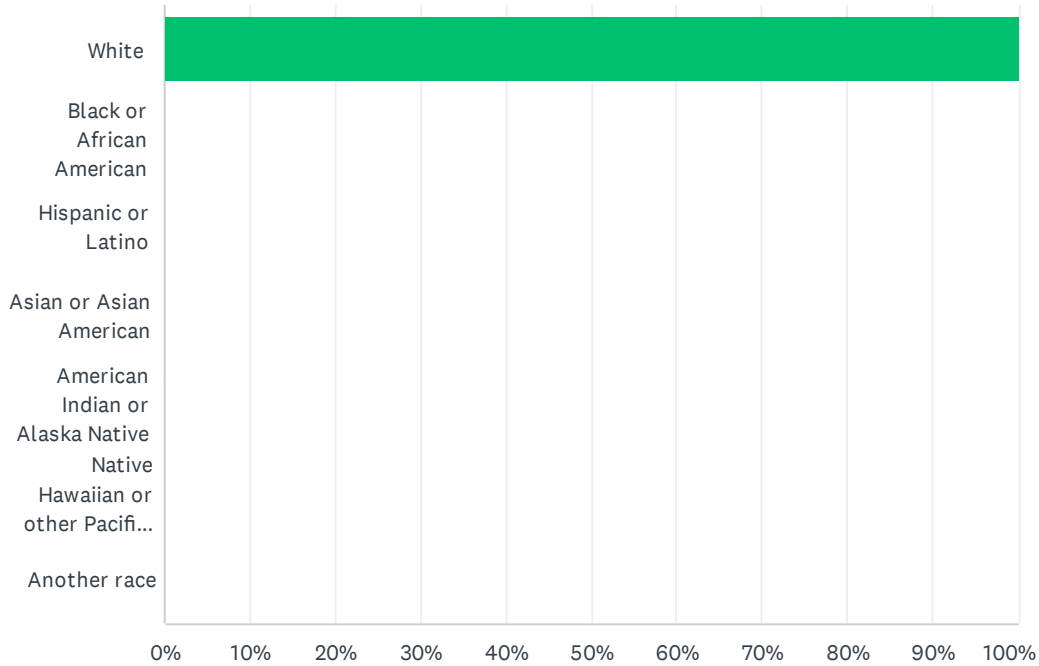
Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
Fossil	75.00%	6
Spray	0.00%	0
Mitchell	0.00%	0
North Wheeler Rural	25.00%	2
South Wheeler Rural	0.00%	0
TOTAL		8

Q23 Please specify your race

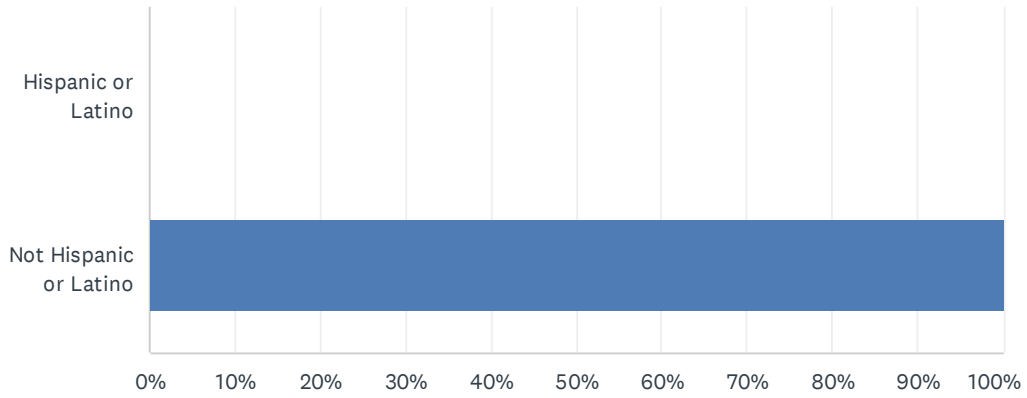
Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
White	100.00%	8
Black or African American	0.00%	0
Hispanic or Latino	0.00%	0
Asian or Asian American	0.00%	0
American Indian or Alaska Native	0.00%	0
Native Hawaiian or other Pacific Islander	0.00%	0
Another race	0.00%	0
TOTAL		8

Q24 Please specify your ethnicity:

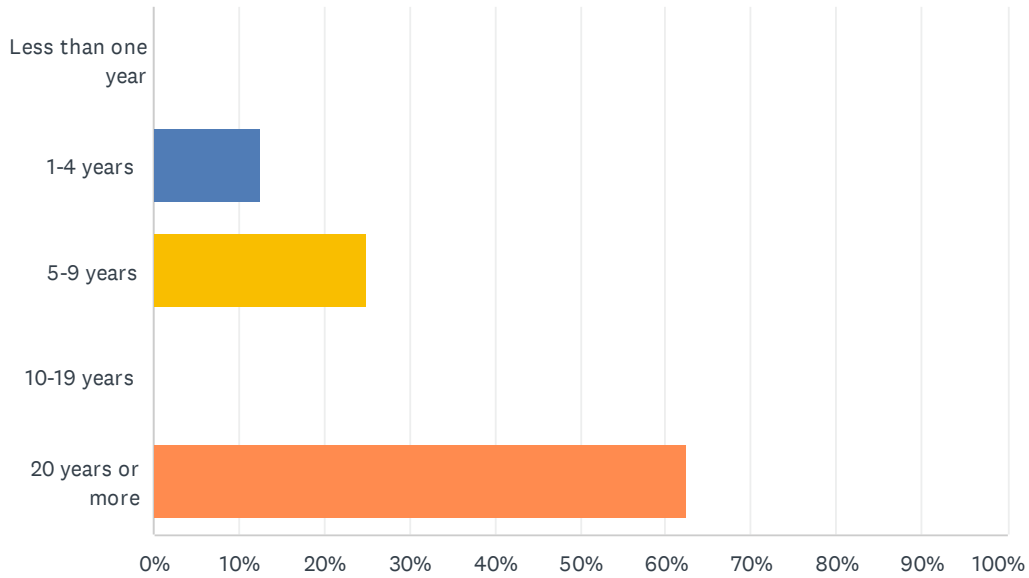
Answered: 7 Skipped: 1



ANSWER CHOICES	RESPONSES	
Hispanic or Latino	0.00%	0
Not Hispanic or Latino	100.00%	7
TOTAL		7

Q25 How long have you lived in the County?

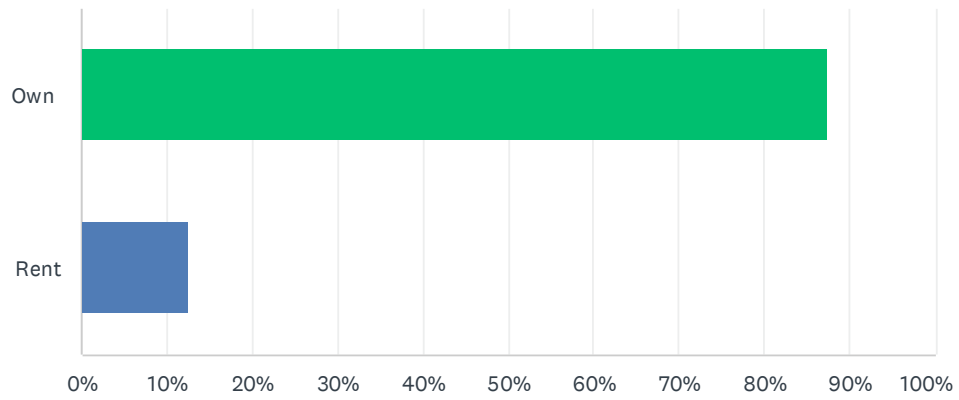
Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
Less than one year	0.00%	0
1-4 years	12.50%	1
5-9 years	25.00%	2
10-19 years	0.00%	0
20 years or more	62.50%	5
TOTAL		8

Q26 Do you own or rent your home?

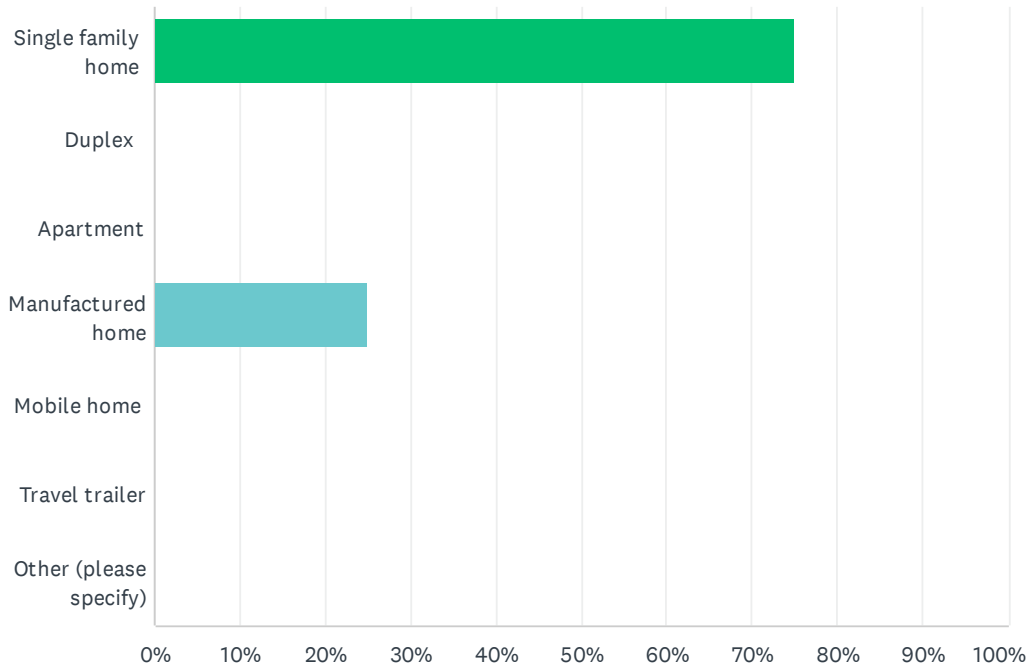
Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
Own	87.50%	7
Rent	12.50%	1
TOTAL		8

Q27 Do you own/rent a:

Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
Single family home	75.00%	6
Duplex	0.00%	0
Apartment	0.00%	0
Manufactured home	25.00%	2
Mobile home	0.00%	0
Travel trailer	0.00%	0
Other (please specify)	0.00%	0
TOTAL		8

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Q28 Please feel free to provide any additional comments in the space below:

Answered: 2 Skipped: 6

#	RESPONSES	DATE
1	Main concern for this community is absentee owners not taking care of properties; creating fire hazards.	2/10/2024 9:53 AM
2	Limiting development in hazard zones needs to be done carefully. Our flood plains are sometimes inaccurately large and should be remeasured on a regular basis, every decade or so.	2/10/2024 9:38 AM

**Appendix G:
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,
https://commons.wikimedia.org/wiki/File:Painted_Hills_-_John_Day_Fossil_Beds_National_Monument_-_Wheeler_County,_Oregon_-_5_May_2013.jpg,
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Future Climate Projections: Wheeler County

A report to the Oregon Department of Landscape Conservation and Development

Prepared by:

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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.)

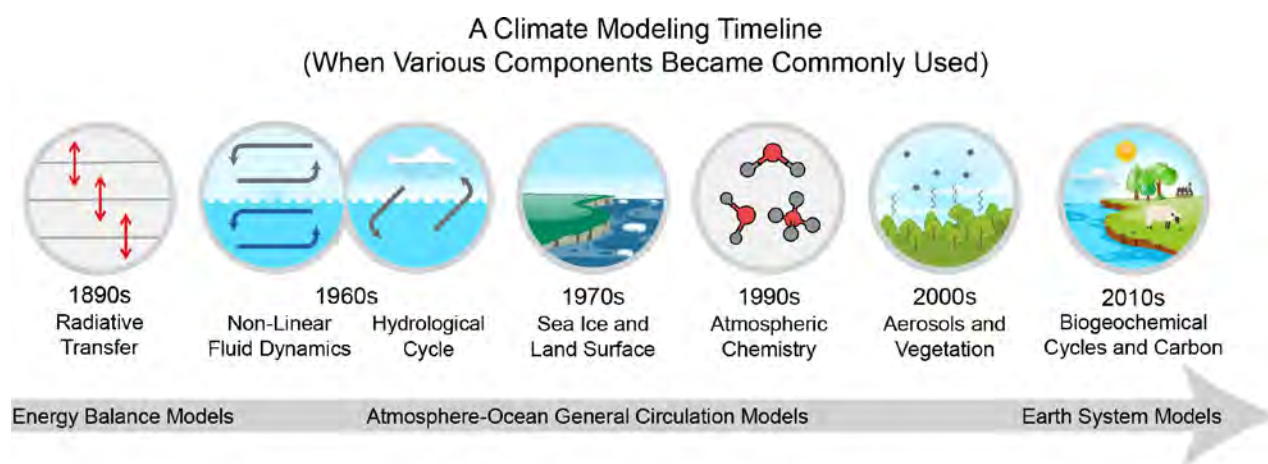


Figure 1 As scientific understanding of climate has evolved over the last 120 years, increasing amounts of physics, chemistry, and biology have been incorporated into calculations and, eventually, models. This figure shows when various processes and components of the climate system became regularly included 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.)

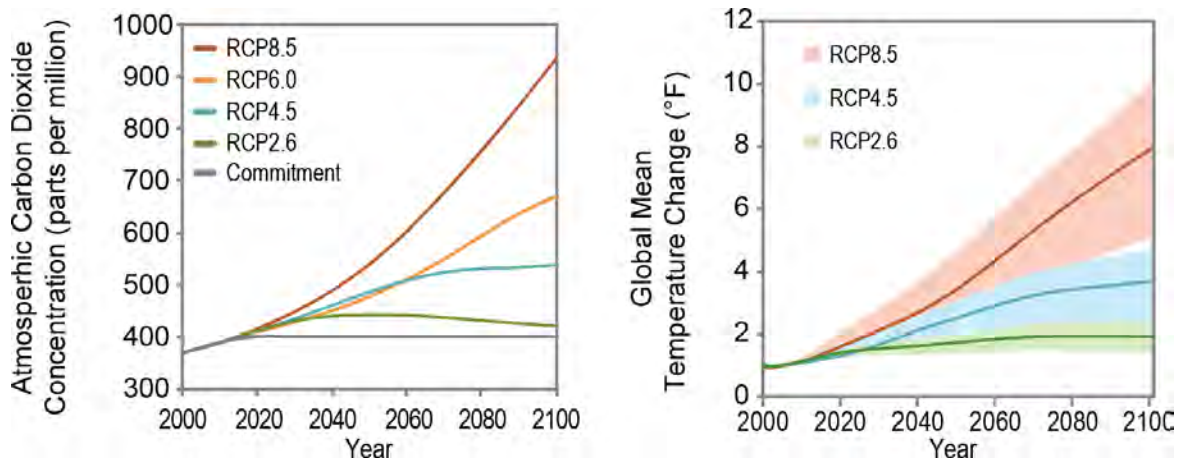


Figure 2 Future scenarios of atmospheric carbon dioxide concentrations (left) and global temperature change (right) resulting from several different emissions pathways, called Representative Concentration Pathways (RCPs), which are considered in the fourth and most recent National Climate Assessment. (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**

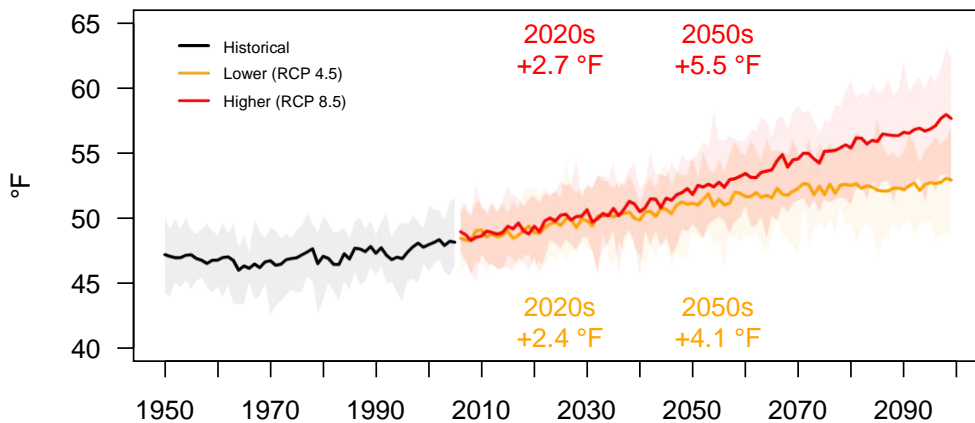


Figure 3 Annual average temperature projections for Wheeler County as simulated by 20 downscaled global climate models under a lower (RCP 4.5) and a higher (RCP 8.5) greenhouse gas emissions scenario. Solid line and shading depicts the 20-model mean and range, respectively. The multi-model mean differences 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)

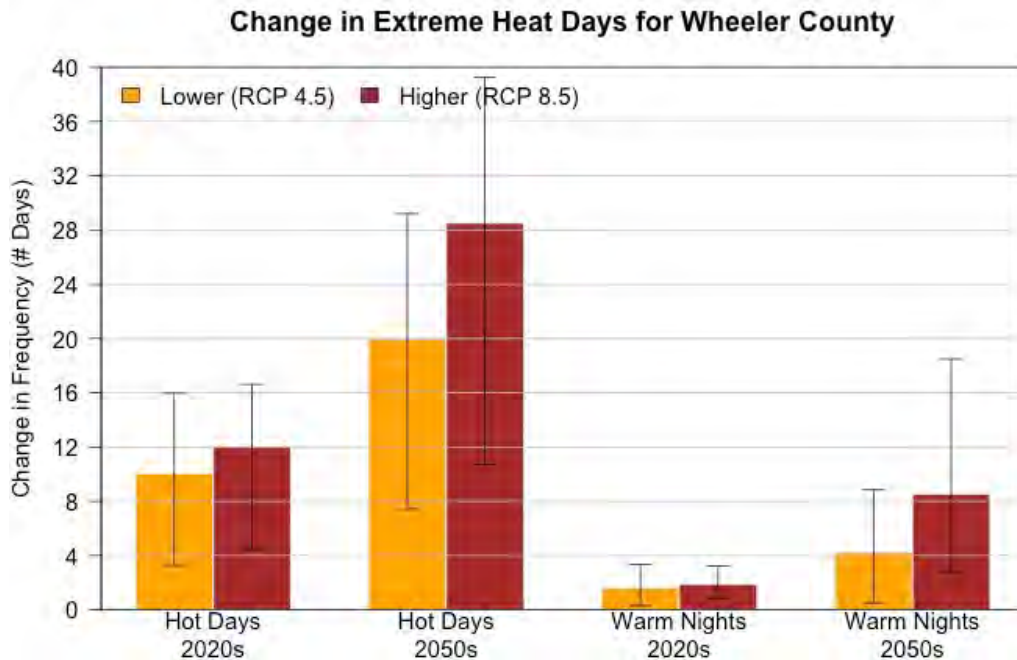


Figure 4 Projected future changes in the number of hot days (left two sets of bars) and number of warm nights (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (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.

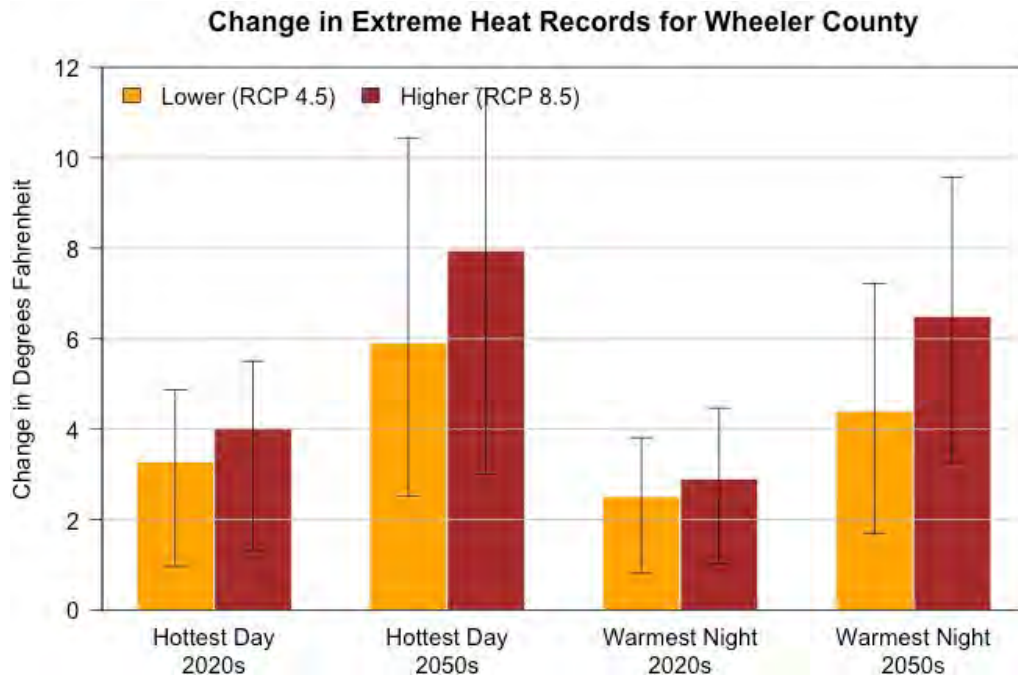


Figure 5 Projected future changes in the hottest day of the year (left two sets of bars) and warmest night of the year (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and 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.

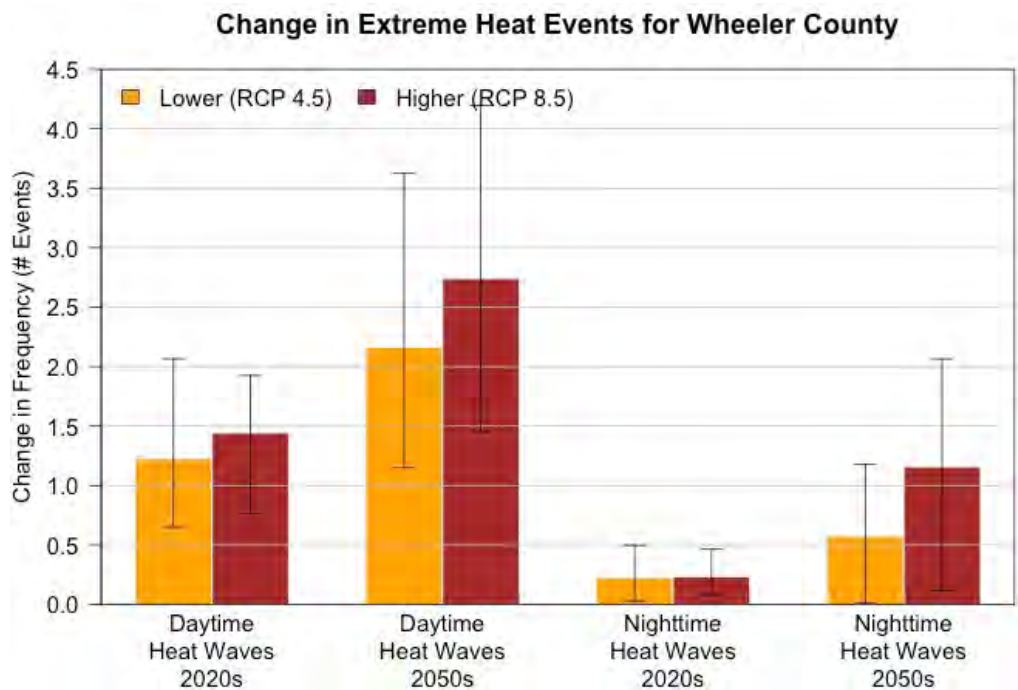


Figure 6 Projected future changes in the number of daytime heat waves (left two sets of bars) and number of nighttime heat waves (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 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)

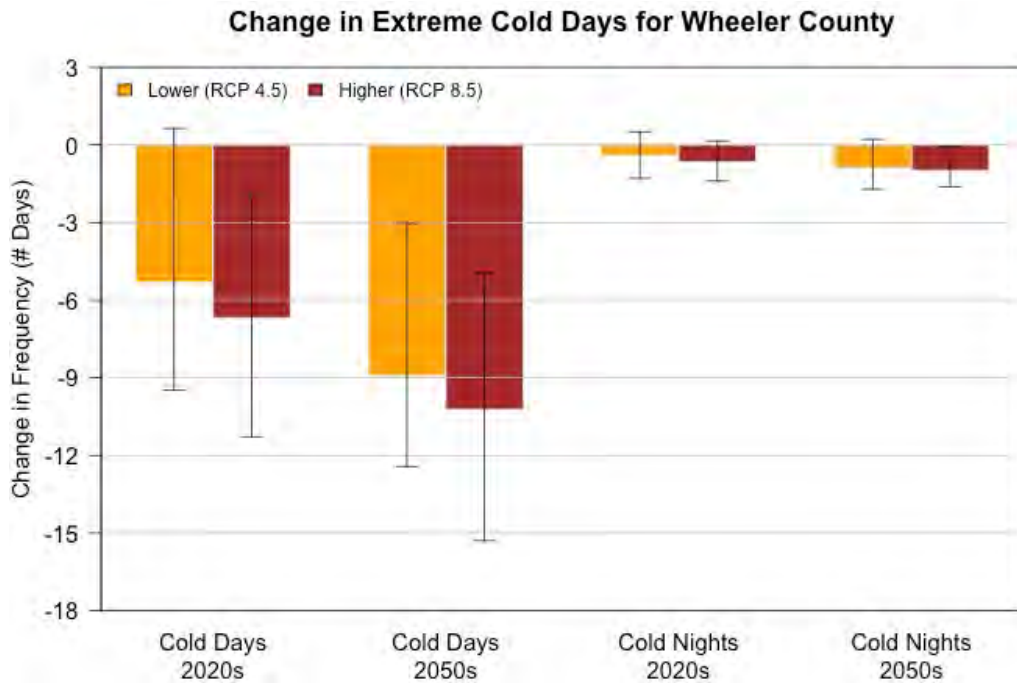


Figure 7 Projected future changes in the number of cold days (left two sets of bars) and number of cold nights (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (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.

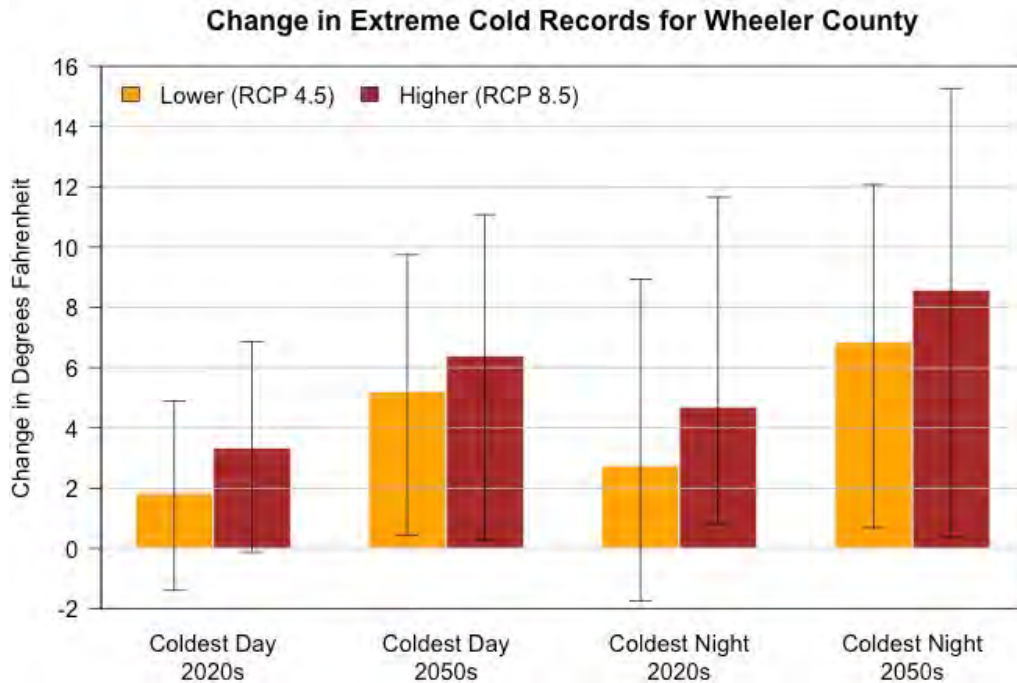


Figure 8 Projected future changes in the coldest day of the year (left two sets of bars) and coldest night of the year (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and 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.

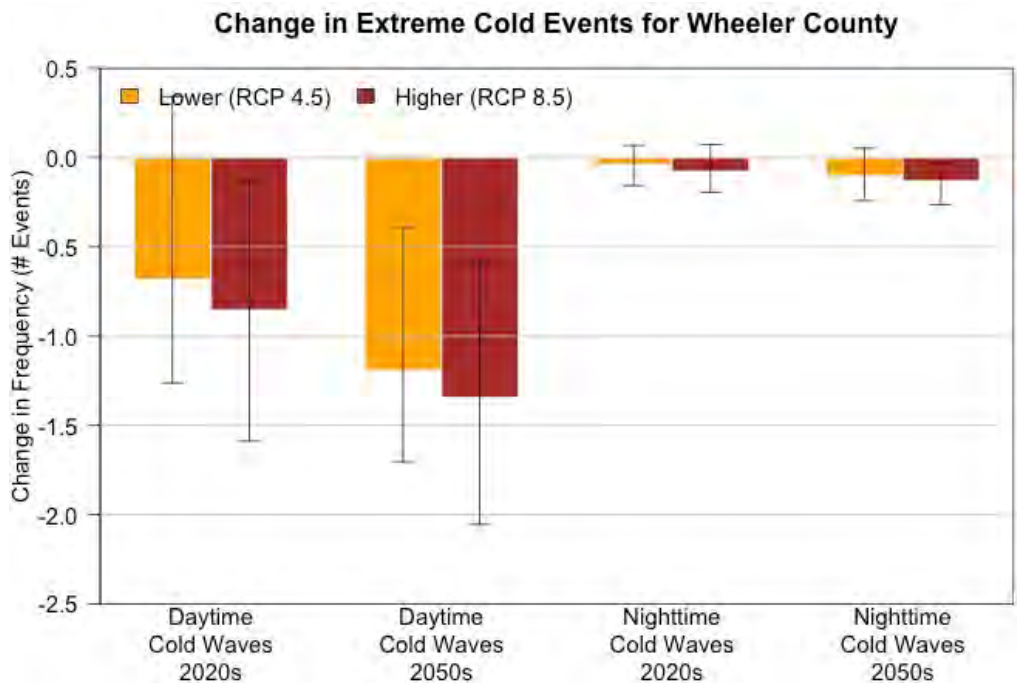


Figure 9 Projected future changes in the number of daytime cold waves (left two sets of bars) and number of nighttime cold waves (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 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)

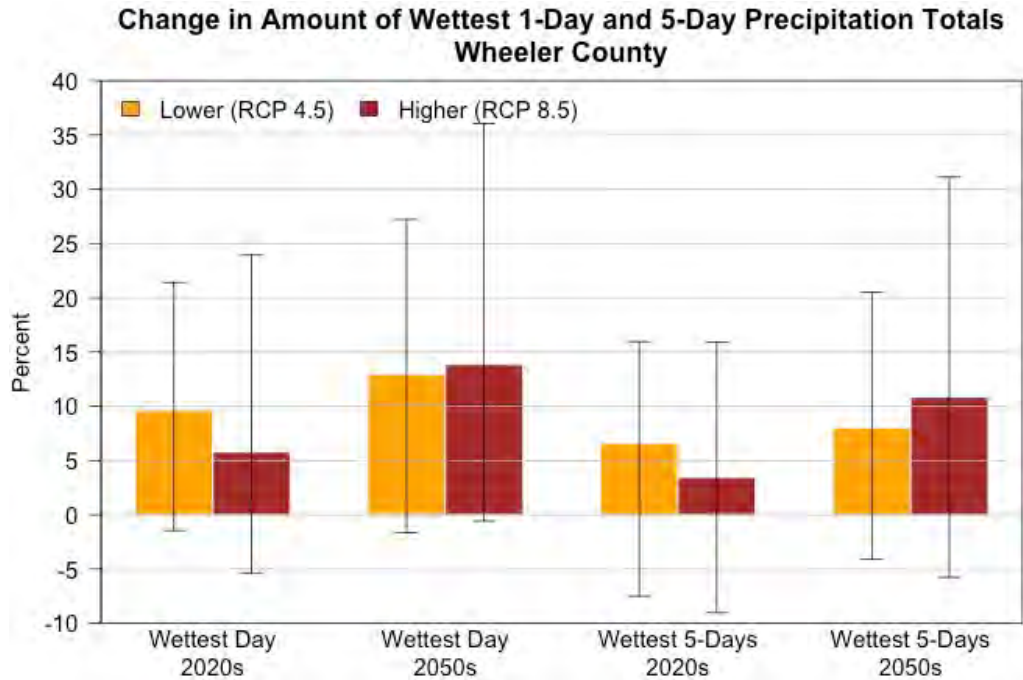


Figure 10 Projected future changes in the wettest day of the year (left two sets of bars) and wettest consecutive five days of the year (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a 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.

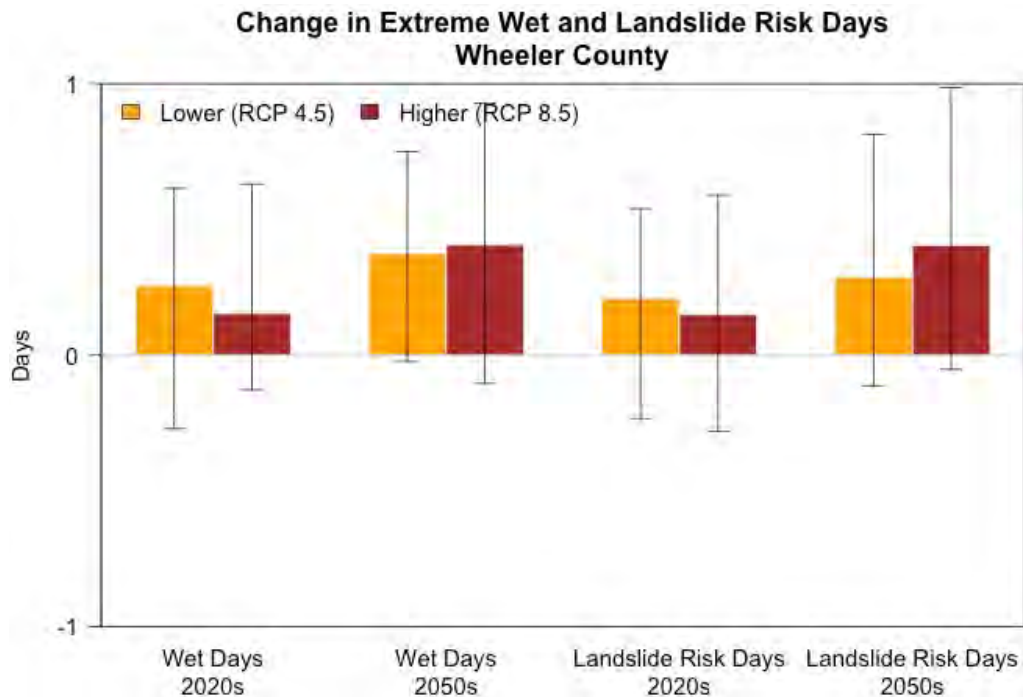


Figure 11 Projected future changes in the frequency of wet days (left two sets of bars) and landslide risk days (right two sets of bars) for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (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.

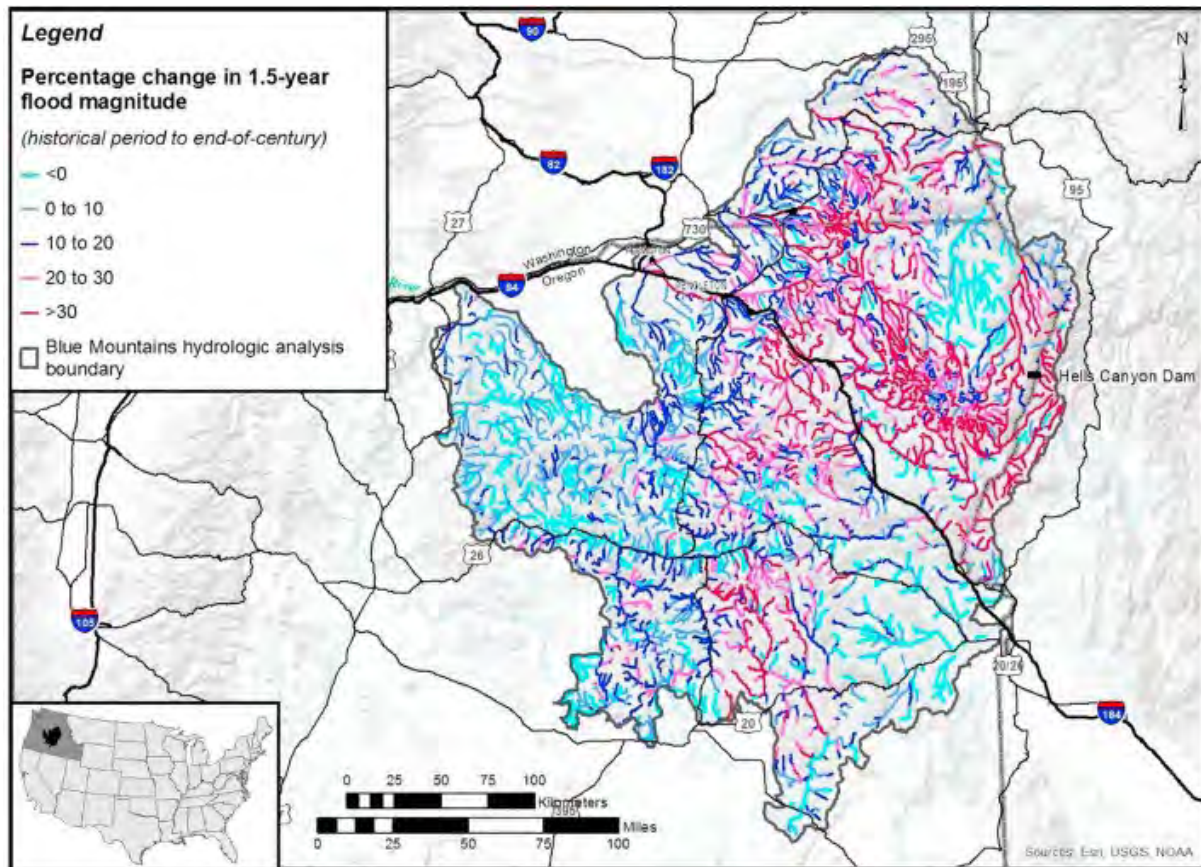


Figure 12 Projected change in the 1.5-year return interval daily flow magnitude between the historical period (1970–1999) and the 2080s (2070–2099) under a medium emissions scenario (SRES-A1B)⁸ for the Blue Mountains region. (Source: Clifton et al., 2018)

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).

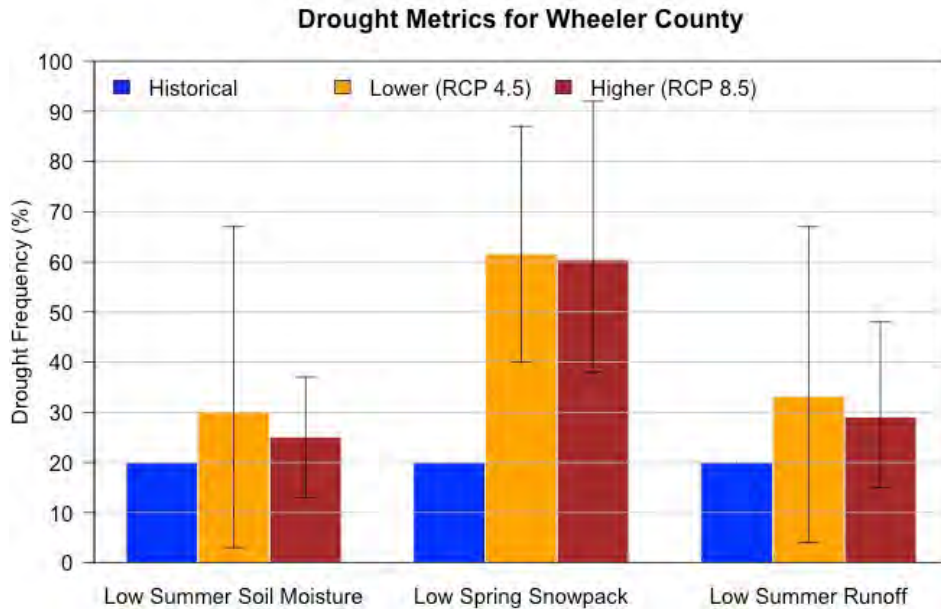


Figure 13 Frequency of the historical baseline (1971–2000) 1-in-5 year event (by definition 20% frequency) of low summer soil moisture (average of June–July–August), low spring snowpack (April 1 snow water equivalent), and low summer runoff (average of June–July–August) for the future period 2040–2069 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).

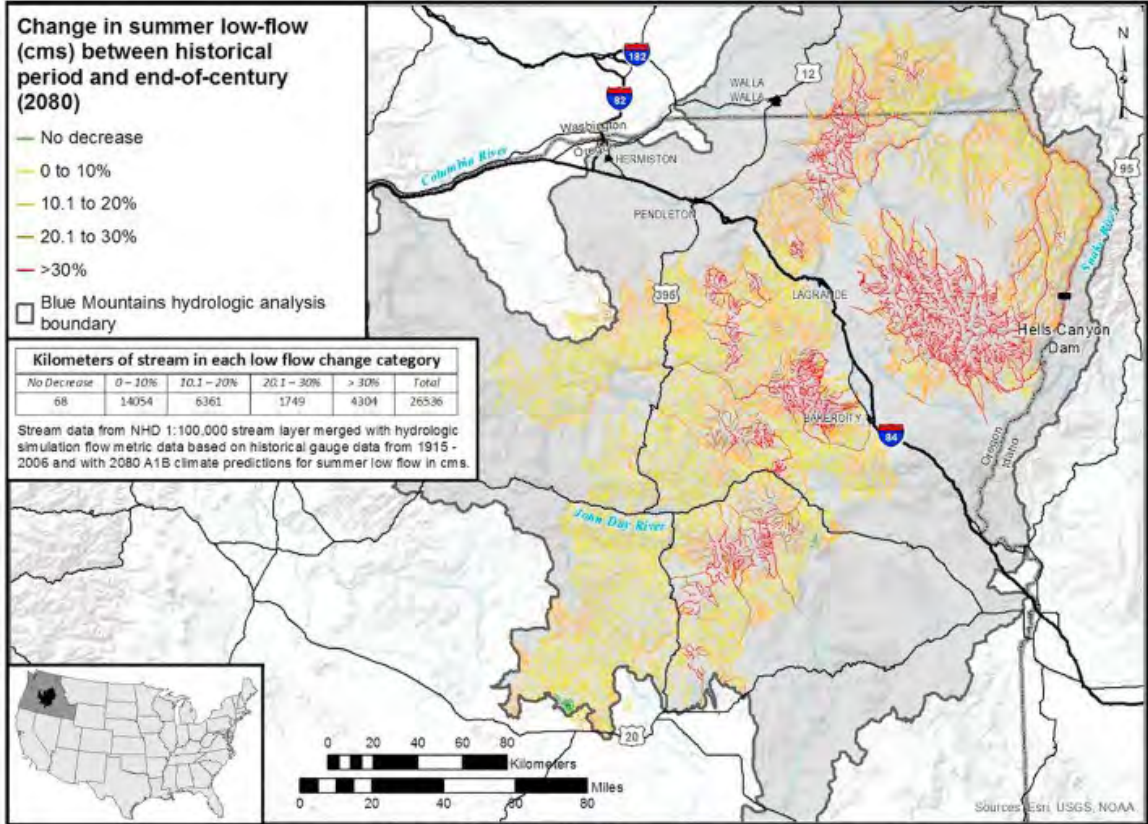


Figure 14 Projected change in mean summer streamflow from the historic time period (1970–1999) to the 2080s (2070–2099) under a medium emissions scenario¹⁰ for streams in the Blue Mountains region. Note, the 0 to 10%, 10.1 to 20%, etc. all indicate decreases in flow. (Source: Clifton *et al.*, 2018)

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)

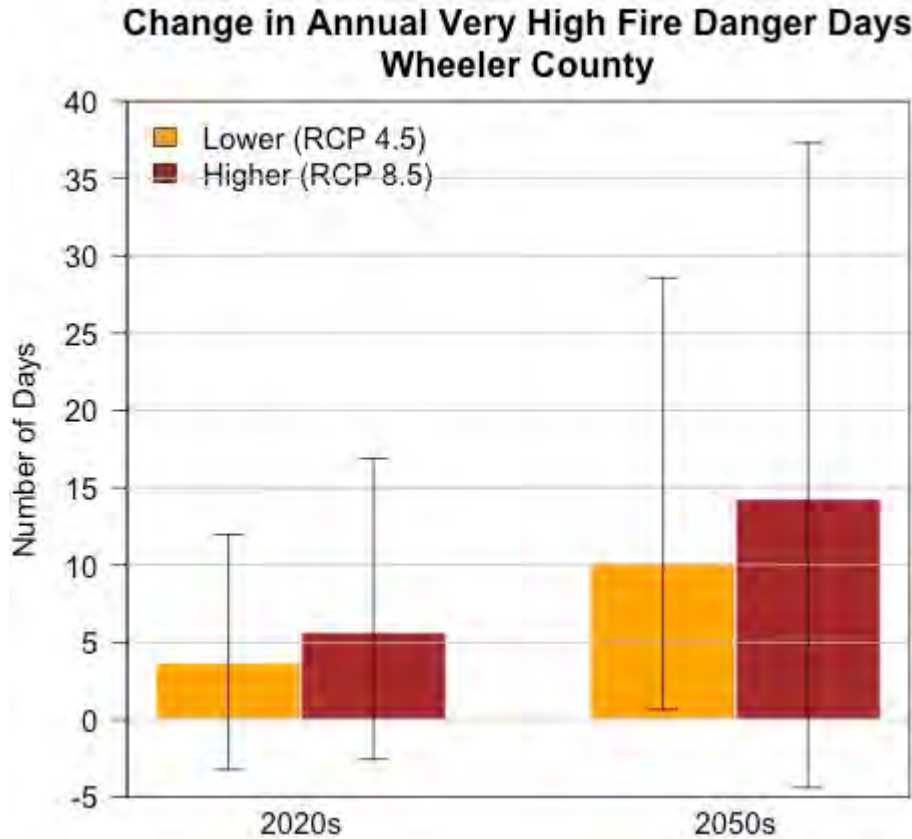


Figure 15 Projected future changes in the frequency of very high fire danger days for Wheeler County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 18 global climate 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.

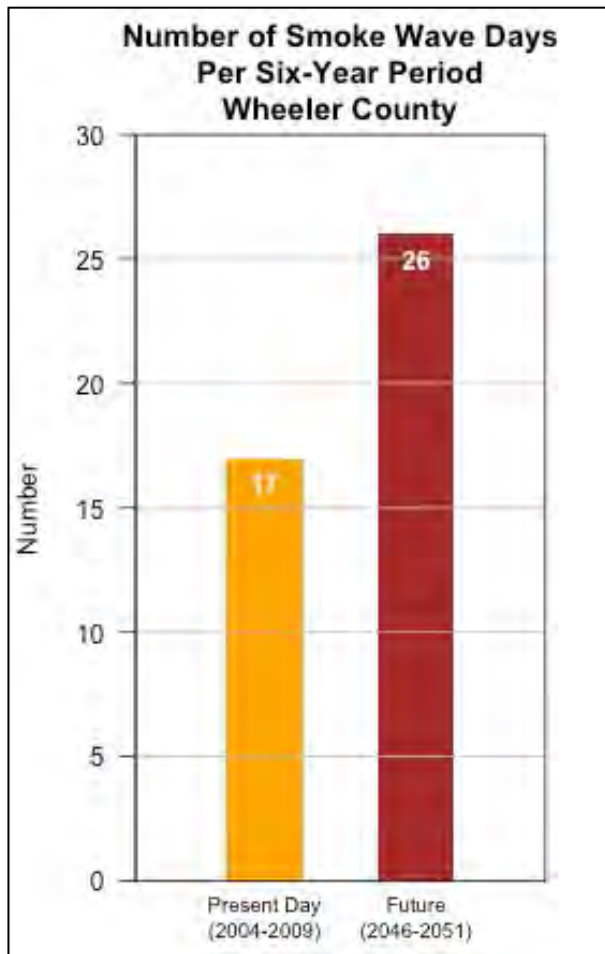


Figure 16 Simulated present day (2004–2009) and future (2046–2051) frequency of “smoke wave” days for Wheeler County under a medium emissions scenario¹¹. The bars display the mean across 15 GCMs. (Data source: Liu *et al.* 2016, <https://khanotations.github.io/smoke-map/>)

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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