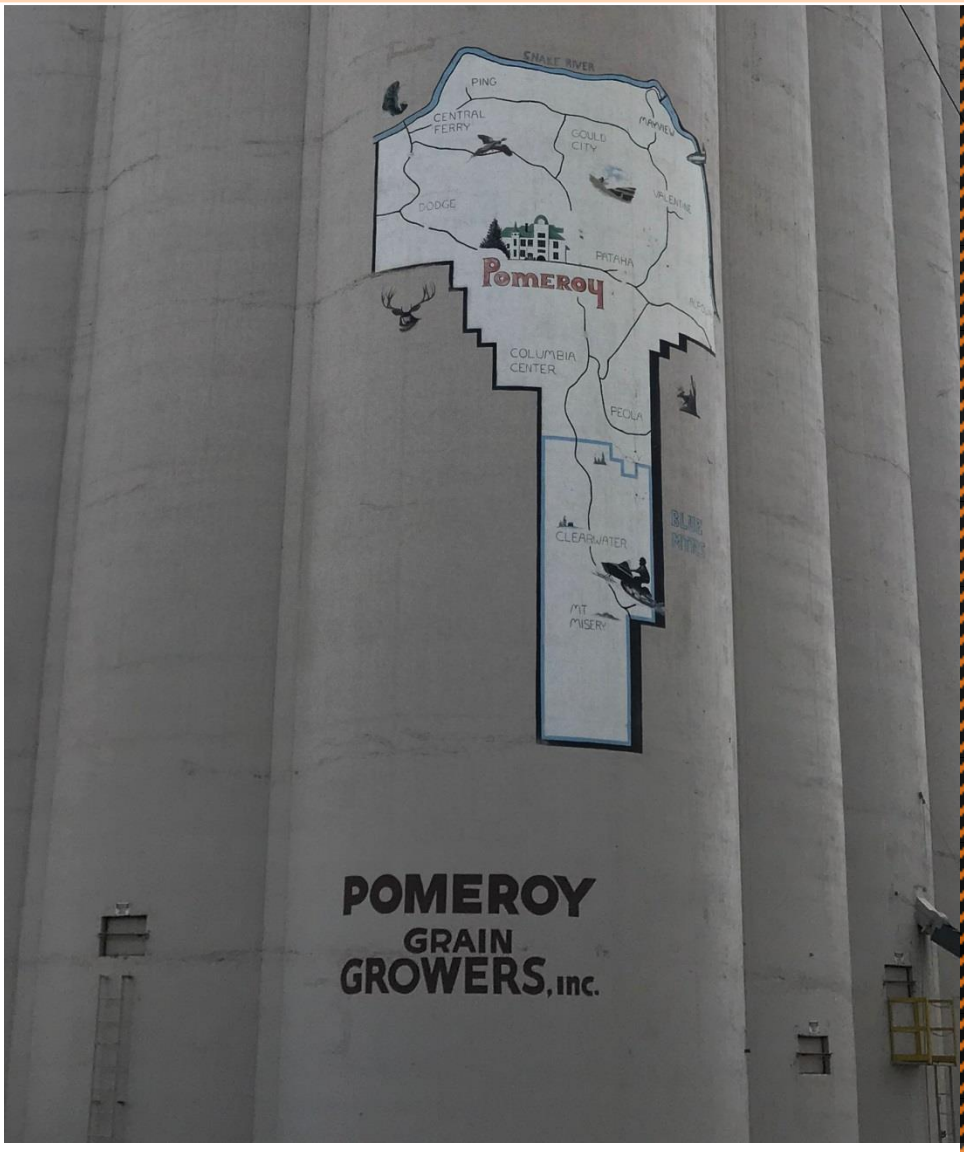
Garfield County, Washington
Multi-Hazard Mitigation Plan Update



2021

Garfield County Emergency Management

Northwest Management, Inc.

1/1/2021

FORWARD

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

The **Garfield County Multi - Hazard Mitigation Plan** was developed throughout 2019-2020 by the Garfield County planning team led by Garfield County Emergency Management, in cooperation with Northwest Management, Inc. of Moscow, Idaho.

This Plan satisfies the requirements for a local multi-hazard mitigation plan and a flood mitigation plan under 44 CFR Part 201.

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

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SECTION 1 - OVERVIEW OF THE PLAN AND ITS DEVELOPMENT

INTRODUCTION

In spring of 2019, Garfield County Emergency Management contracted with Northwest Management, Inc. (NMI) to update the tri-county Southeast Washington Multi-Hazard Mitigation Plan by conducting new and current risk analysis of the natural hazards specific to Garfield County, Washington. Hazardous natural events occur annually in Garfield County; thus, programs and projects that mitigate the impacts of these hazards benefit the residents, property, infrastructure, and the economy.

This 2021 Multi-Hazard Mitigation Plan (MHMP) is the result of analysis, professional collaboration, and assessments of natural hazards and other factors focused on reducing threats to people, structures, infrastructure, and unique ecosystems in the county. This document assists with the identification and assessment of various potential hazards and helps maintain Garfield County's eligibility for grants and other funding. This MHMP will include the current Community Wildfire Protection Plan as a component within the main document.

The advisory group responsible for implementing this project was led by Garfield County Emergency Management with assistance from Northwest Management, Inc. Agencies and organizations that participated in the planning process included:

TABLE 1: AGENCIES AND ORGANIZATIONS REPRESENTED ON THE GARFIELD COUNTY PLANNING TEAM

Garfield County Emergency Management	**Garfield County Sheriff's Office**
City of Pomeroy City Council	**Garfield County Commissioners**
Port of Garfield	**Garfield County Engineering**
Garfield County Hospital District	**Garfield County Health District**
Garfield County Transportation	**Garfield County School District #110**
Garfield County Fire District #1	**United States Forest Service**
American Red Cross	**Ministerial Association**
Pomeroy Conservation District	**Pomeroy Assist**

Planning Philosophy and Goals

Garfield County Planning Philosophy

This planning effort promotes awareness of County-wide natural hazards and proposes workable solutions to mitigate the effects of natural hazards. The MHMP is an action plan and depends upon people and partnerships to carry it forward.

Mission Statement

To make Garfield County residents, economy, resources and ecosystems more resilient to the negative effects of natural and man-made hazards.

Jurisdictional Planning and Mitigation Goals

As part of the 2019-20 planning process, each participating jurisdiction in Garfield County was asked to review its own set of planning and mitigation goals, as presented in the Southeast Washington MHMP. The planning and mitigation goals for Garfield County were reviewed and discussed as a group during one of the planning team meetings. Each individual adopting jurisdiction also had at least one planning goal and one mitigation goal. The review and revision of these goals was administrated by the representative of each jurisdiction outside the planning team meetings. The goals submitted by each jurisdiction are summarized as follows:

Garfield County

1. Planning Goal - Identify all hazards that may affect life and property in Garfield County and develop solutions to effectively mitigate those risks.
2. Mitigation Goal - Enhance the County's ability to respond to and notify the public about hazard situations.
3. Mitigation Goal - Improve response capabilities within the Garfield County Sheriff's office, Road Department, and in the City of Pomeroy.
4. Mitigation Goal - Improve County's GIS capabilities in order to better identify and track hazards and risks.
5. Mitigation Goal - Improve Sheriff's office ability to respond to all types of hazards.

City of Pomeroy

1. Planning Goal - Prioritize the protection of people, structures, infrastructure, and unique ecosystems that contribute to our way of life and the sustainability of the local and regional economy.
2. Planning Goal - Educate communities about the unique challenges of natural hazard preparedness.
3. Planning Goal - Seek ways to reduce fire hazards in critical areas.
4. Planning Goal - Strategically locate and plan infrastructure projects that take into consideration the impacts of natural hazards.

5. Planning Goal - Strengthen emergency operations plans and procedures by increasing collaboration among public agencies, non-profit organizations, business, and industry.
6. Planning Goal - Seek opportunities to protect, enhance, and integrate emergency and essential services with land use planning and natural resource management.
7. Planning Goal - Look for ways to protect City water supplies from vandalism and other hazards.
8. Mitigation Goal - Reduce the impact of hazard events and potential losses incurred by both public and private residents and entities.
9. Mitigation Goal - Develop land use policies to alleviate potential hazard risks and impact for future development. Increase county and city participation in the NFIP and strive to reduce premiums by lowering their CRS score.
10. Mitigation Goal - Establish mitigation priorities and develop mitigation strategies.
11. Mitigation Goal - Identify areas of potential flooding and work with emergency management personnel to establish an action plan for future events.
12. Mitigation Goal - Work with local government agencies to develop a flood warning system for local citizens.
13. Mitigation Goal - Work with local organizations to improve sheltering capacity during severe weather events.

GARFIELD COUNTY FIRE DISTRICT #1

1. Planning Goal - Identify hazards related to structure and wildland fires, hazardous materials, and natural disasters.
2. Mitigation Goal - Provide fire, rescue, and emergency medical response to the residents of Garfield County and the city of Pomeroy.

POMEROY CONSERVATION DISTRICT

1. Planning Goal - Promote conservation practices and best management practices that will protect and enhance the natural resources of Garfield County.
2. Planning Goal - Identify conditions on the land that may harm the public.
3. Mitigation Goal - Assist the farmers and ranchers of Garfield County with service, expertise, and funding to manage for the conservation, preservation, and enhancement of the natural resources within the Pomeroy Conservation District.
4. Mitigation Goal - Help mitigate the cost of conservation activities to landowners and operators.
5. Mitigation Goal - Assist the public in the event of hazards affecting the quality of life and safety.

GARFIELD COUNTY HEALTH DISTRICT

1. Planning Goal - Provide professional, caring services that motivate individuals to a higher level of physical, mental, and environmental health awareness and responsibility.
2. Mitigation Goal - Assist the public in the event of hazards affecting the quality of life and safety.

POMEROY SCHOOL DISTRICT NO. 110

1. Planning Goal - Identify hazards related to structure and wildland fires, hazardous materials, and natural disasters.
2. Mitigation Goal - Continue to improve emergency plans and procedures to reduce or eliminate long-term risk to life and property as a result of hazard events.

GARFIELD COUNTY HOSPITAL DISTRICT

1. Planning Goal - Improve Incident Command Training for personnel throughout the facility.
2. Mitigation Goal - Continue to improve emergency plans and procedures to reduce or eliminate long-term risk to life and property as a result of hazard events.

PORT OF GARFIELD

1. Planning Goal - Develop plans that would lessen hazard impacts (flooding, fire, wind, and rain) on the future economic development on the Port of Garfield industrial property.
2. Mitigation Goal - Create mitigation strategies that will alleviate hazard impacts such as:
    a. Not locating development in the 100-year floodplain without consulting with FEMA
    b. Installing enough fire hydrants to accommodate all structures
    c. Locate new structures out of damaging wind flow patterns
    d. Maintaining industrial grounds to prevent hazardous situations.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

1. Planning Goal – Continue to function as an agency (mostly grant-funded by WSDOT) and to be involved in planning and mitigation strategies with emergency management.
2. Mitigation Goal – Function as a support agency for emergency response by providing transportation to evacuees or displaced residents following a natural disaster.
3. Mitigation Goal – Function as a support agency by transporting or shuttling emergency responders and/or equipment between base camp, Incident Command posts, and staging areas during a large fire or natural disaster.
4. Mitigation Goal - Function as a support agency by transporting non-ambulatory patients and residents from Garfield County Hospital & Memory Manor (nursing home) during an evacuation.

EXISTING LOCAL PLANNING MECHANISMS

During the development of this MHMP, several planning and management documents were reviewed in order to avoid conflicting goals and objectives. Existing programs and policies were reviewed in order to identify those that may weaken or enhance the hazard mitigation objectives outlined in this document. The following narratives help identify and briefly describe some of the existing planning documents and ordinances considered during the development of this plan. This list does not necessarily reflect every plan, ordinance, or other guidance document within each jurisdiction; however, this is a summary of the guidance documents known to and recommended for review by members of the planning advisory group.

Emergency Action Plan for the Hells Canyon Dam and Power Plant

The purpose of the Emergency Action Plan is to provide a detailed plan of operations and a notification flowchart in the event of a hazardous or an emergency condition existing at the Hells Canyon Dam. Following the guidelines and notification flowcharts described in the Emergency Action Plan will provide maximum early warning of a potentially hazardous condition at the Hells Canyon Dam to persons downstream. The document includes contact information, inundation maps, and predicted timeframes for flood waves in the event of a dam break.

Flood Emergency Subplans for Notification and Inundation Maps – Dworshak Dam and Reservoir

The document provides flood emergency planning and guidance for implementing flood control procedures and evacuation of flood areas in case of flood emergencies. The document includes inundation maps and predicted timeframes for floodwaves in the event of a dambreak.

Garfield County Hazard Identification and Vulnerability Assessment (2007)

The Garfield County Hazard Identification and Vulnerability Assessment (HIVA) provides information on potential natural and technological (man-made) hazards, which can adversely impact the people, economy, environment, and property of Garfield County. It serves as a basis for County-level emergency management programs and assists political subdivisions in the development of similar documents focused on local hazards. It is the foundation of effective emergency management and identifies the hazards that organizations must mitigate against, prepare for, respond to, and recover from in order to minimize the effects of disasters and emergencies. The information is extracted from various publications with contributions from technical experts. The HIVA is not a detailed study, but a general overview of hazards that can cause emergencies and disasters.

Garfield County Comprehensive Emergency Management Plan (2008)

The Garfield County Comprehensive Emergency Management Plan is in compliance with the Washington State Comprehensive Emergency Management Plan, May 2002. The Plan, including its appendices, check lists and other supporting documents, provides for coordination of man-made or natural emergency disaster operations throughout all levels of county and municipal governments within Garfield County. The basic concept of operations in a major disaster is the use of mutual aid agreements and letters of understanding entered upon by the City of Pomeroy and Garfield County. The Plan provides guidance and direction to all of Garfield County. The Plan provides a foundation for a continuing effort to incorporate National Incident Management System (NIMS) in plans to meet and overcome emergencies and disasters of all scales, establishing mutual understanding among the numerous government and tribal agencies, business's, industries, volunteer organizations, and citizens of Garfield county, and coordination with comprehensive emergency management plans and programs of the federal government, the State of Washington, emergency management jurisdictions of Garfield County, and the surrounding jurisdictions.

Garfield County Health District Emergency Response Plan (2009)

The Garfield County Health District Emergency Response Plan covers the Health District's operational procedures for dealing with communicable disease and other emergencies, mass prophylaxis treatment and vaccination, and pandemic flu. The Plan includes contact information, response partners, stockpile plans, and other critical information.

Garfield County and City of Pomeroy Hazardous Material/Radiological Disaster Preparedness Plan (2009)

The plan is intended to provide guidance for hazardous materials incident notification and response; off-site emergency planning/notification procedures as required by SARA Title III; and the Emergency Planning & Community Right-to-Know Act of 1986, which shall be referred to as EPCRA. The plan provides a foundation for a continuing effort to incorporate National Incident Management System (NIMS) in plans to meet and overcome emergencies and disasters of all scales, establishing mutual understanding among the numerous government and tribal agencies, businesses, industries, volunteer organizations, and citizens of Garfield County, and coordination with comprehensive emergency management plans and programs of the federal government, the state of Washington, emergency management jurisdictions of Garfield County, and the surrounding jurisdictions.

Garfield County Mass Casualty Plan (2006)

Fire Departments are tasked with the protection of property and life safety. In the event of a disaster, whether natural or the result of a man made event, the immediate response to that incident will be by the fire jurisdiction. Mutual aid and first response agreement s allow for the immediate resources of additional staffing and equipment. In the event of a major incident, the demand for an orchestrated plan allowing coordination of multiple agencies will facilitate resolving that incident safely and efficiently. The purpose of a county (region) wide adopted plan for mass casualty incidents is to achieve overall understanding of personnel assisting neighboring departments. In addition, with a coordinated county plan the use of the common terminology and systematic delivery to a mass casualty incident will integrate the immediate involvement of mutual aid, strike teams, and task forces when requested by incident commanders.

Garfield County Hospital Emergency Incident Command System (2005)

The purpose of this policy statement is to define the operating policies, procedures, staffing, qualifications and use of the Hospital Emergency Incident Command System (HEICS) and to provide for command & control structure in the event of any incident that places a burden on Hospital District Resources exceeding routine conditions.

Garfield County Hospital District Emergency Policies and Procedures Manual

The Garfield County Hospital District has developed a manual outlining all of its policies and procedures for a number of potential incidents including hazard events. The manual includes contact numbers, appropriate reporting forms, evacuation plans, and operational procedures to follow in the event of an emergency or other type of incident.

Garfield County Community Wildfire Protection Plan (2008)

This Community Wildfire Protection Plan (CWPP) for Garfield County is the result of analyses, professional cooperation and collaboration, assessments of wildfire risks and other factors considered with the intent to reduce the potential for wildfires to threaten people, structures, infrastructure, and unique ecosystems in Garfield County, Washington. The plan details the county's response capabilities as well as lists a mitigation strategy and proposed projects recommended to lessen the impacts wildland fire.

Pomeroy School District No. 110 Emergency Procedures

The Pomeroy School District #110 is committed to emergency planning. Emergency procedures specific to the school district have been developed and revised in coordination with community emergency agencies. These procedures will facilitate a rapid, coordinated, effective response in the event of a disaster or other emergency event such as inclement weather, earthquakes, etc.

OTHER PLANS AND ORDINANCES ALSO CONSIDERED DURING THE PLANNING PROCESS

- Comprehensive Plan for Garfield County and the City of Pomeroy
- Garfield County Critical Areas Ordinance
- Garfield County Subdivision and Land Division Ordinance
- Garfield County Zoning Ordinance
- State Environmental Policy Act (SEPA)
- Six Year Transportation Improvement Plan
- Southeast Washington Economic Development Association (SEWEDA) Comprehensive Economic Development Strategy (2018)
- Pomeroy Municipal Code (2016)

INCORPORATING THE HMP INTO EXISTING PLANNING MECHANISMS

Garfield County

Garfield County will utilize the 2021 MHMP update for all hazard mitigation planning and mitigation strategy. Future planning efforts will be conducted in consultation with the research and conclusions identified in this plan. Any county-led develop, project implementation, or policy decisions will have this MHMP has a reference tool and guiding document. The county can and should consider the mitigation action items of all adopting jurisdictions, as defined in Section 5, whenever studying budgets, funding allocations, or project priorities.

City of Pomeroy

The city of Pomeroy will utilize the 2021 MHMP update for all hazard mitigation planning and mitigation strategy. Pomeroy will use this MHMP has a reference tool and guiding document for future planning efforts and project decisions. The city can and should consider both the Garfield County and the city of Pomeroy mitigation action items defined in Section 5 whenever studying budgets, funding allocations, or project priorities.

Garfield County Fire District #1

Garfield County Fire District #1 will utilize the 2021 MHMP update for all hazard mitigation planning and mitigation strategy. The fire district will use this MHMP has a reference tool and guiding document for future planning efforts and project decisions. The fire district can and should consider both theirs and the county's mitigation action items defined in Section 5 whenever studying budgets, funding allocations, or project priorities.

Pomeroy Conservation District

Pomeroy Conservation District will utilize the 2021 MHMP update for all hazard mitigation planning and mitigation strategy. The conservation district will use this MHMP has a reference tool and guiding document for future planning efforts and project decisions. The district can and should consider both theirs and the county's mitigation action items defined in Section 5 whenever studying budgets, funding allocations, or project priorities.

Pomeroy School District #110

Pomeroy School District #110 will utilize the 2021 MHMP update for all hazard mitigation planning and mitigation strategy. The school district will use this MHMP has a reference tool and guiding document for future planning efforts and project decisions. The school district can and should consider both theirs and the county's mitigation action items defined in Section 5 whenever studying budgets, funding allocations, or project priorities.

Garfield County Health District

Garfield County Health District will utilize the 2021 MHMP update for all hazard mitigation planning and mitigation strategy. The health district will use this MHMP has a reference tool and guiding document for future planning efforts and project decisions. The district can and should consider both theirs and the county's mitigation action items defined in Section 5 whenever studying budgets, funding allocations, or project priorities.

Port of Garfield

The Port of Garfield will utilize the 2021 MHMP update for all hazard mitigation planning and mitigation strategy. The Port District will use this MHMP has a reference tool and guiding document for future planning efforts and project decisions. The Port can and should consider both theirs and the county's mitigation action items defined in Section 5 whenever studying budgets, funding allocations, or project priorities.

Garfield County Hospital District

Garfield County Hospital District will utilize the 2021 MHMP update for all hazard mitigation planning and mitigation strategy. The hospital district will use this MHMP has a reference tool and guiding document for future planning efforts and project decisions. The district can and should consider both theirs and the county's mitigation action items defined in Section 5 whenever studying budgets, funding allocations, or project priorities.

Garfield County Transportation Authority

Garfield County Transportation Authority will utilize the 2021 MHMP update for all hazard mitigation planning and mitigation strategy. The GCTA will use this MHMP has a reference tool and guiding document for future planning efforts and project decisions. The GCTA can and should consider both theirs and the county's mitigation action items defined in Section 5 whenever studying budgets, funding allocations, or project priorities.

GUIDING PRINCIPLES

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

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

In order to be eligible for project funds under the Flood Mitigation Assistance (FMA) program, communities are required under 44 CFR Part 79.6(d)(1) to have a mitigation plan that addresses flood hazards. On October 31st, 2007, FEMA published amendments to the 44 CFR Part 201 at 72 Federal Reg. to incorporate mitigation planning requirements for the FMA program (44 CFR Part 201.6). The revised Local Mitigation Plan Review Crosswalk (October 2011) used by FEMA to evaluate local hazard mitigation plans is consistent with the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by Section 322 of the Disaster Mitigation Act of 2000, the National Flood Insurance Act of 1968, as amended by the National Flood Insurance Reform Act of 2004 and 44 Code of Federal Regulations (CFR) Part 201 – Mitigation Planning, inclusive of all amendments through July 1, 2008, was used as the official guide for development of a FEMA-compatible Garfield County, Washington Multi-Hazard Mitigation Plan.

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

A FEMA designed plan will be evaluated on its adherence to a variety of criteria, including:

- Adoption by local governing bodies and multi-jurisdictional plan adoption
- Multi-jurisdictional planning participation and documentation of the planning process Identifying hazards and profiling hazard events

- Assessing vulnerability by identifying assets, estimating potential losses, and analyzing development trends
- Multi-jurisdictional risk assessment
- Local hazard mitigation goals and identification, analysis, and implementation of mitigation measures
- Multi-jurisdictional mitigation strategy
- Monitoring, evaluating, and updating the plan
- Implementation through existing programs
- Continued public involvement

STATE AND FEDERAL CWPP GUIDELINES

The Community Wildfire Protection Plan integrated into this document is compatible with FEMA requirements for a Hazard Mitigation Plan, while also adhering to the guidelines proposed in the National Fire Plan, and the Healthy Forests Restoration Act (2003). The Community Wildfire Protection Plan has been prepared in compliance with:

- Healthy Forests Restoration Act (2003).
- The National Fire Plan: A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan (December 2006).
- The Federal Emergency Management Agency's Region 10 guidelines for a Local Hazard Mitigation Plan as defined in 44 CFR parts 201 and 206, and as related to a fire mitigation plan chapter of a Multi-Hazard Mitigation Plan.
- National Association of State Foresters – guidance on identification and prioritizing of treatments between communities (2003).

UPDATE AND REVIEW GUIDELINES

Deadlines and Requirements for Regular Plan Reviews and Updates: In order to apply for a FEMA PDM project grant, Tribal and local governments must have a FEMA-approved mitigation plan. Tribal and local governments must have a FEMA-approved mitigation plan in order to receive HMGP project funding for disasters declared on or after November 1, 2004. States and Tribes must have a FEMA-approved Standard or Enhanced Mitigation Plan in order to receive non-emergency Stafford Act assistance (i.e., Public Assistance Categories C-G, HMGP, and Fire Management Assistance Grants) for disasters declared on or after November 1, 2004. State mitigation plans must be reviewed and reapproved by FEMA every three years. Local Mitigation Plans must be reviewed and reapproved by FEMA every five years.

Plan updates. In addition to the timelines referenced above, the Rule includes the following paragraphs that pertain directly to the update of State and local plans:

- ✓ §201.3(b)(5) [FEMA Responsibilities] …Conduct reviews, at least once every three years, of State mitigation activities, plans, and programs to ensure that mitigation commitments are fulfilled….

- ✓ §201.4(d) Review and updates. [State] Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval…every three years.
- ✓ §201.6(d) [Local] plans must be reviewed, revised if appropriate, and resubmitted for approval within five years in order to continue to be eligible for project grant funding.

Plan updates must demonstrate that progress has been made in the past three years (for State plans), or in the past five years (for local plans), to fulfill commitments outlined in the previously approved plan. This will involve a comprehensive review and evaluation of each section of the plan and a discussion of the results of evaluation and monitoring activities detailed in the Plan Maintenance section of the previously approved plan. FEMA will leave to state discretion, consistent with this plan update guidance, the documentation of progress made. Plan updates may validate the information in the previously approved plan, or may involve a major plan rewrite. In any case, a plan update is NOT an annex to the previously approved plan; it must stand on its own as a complete and current plan.

The objective of combining these complementary guidelines is to facilitate an integrated natural hazard risk assessment, identify pre-hazard mitigation activities, and prioritize activities and efforts to achieve the protection of people, structures, the environment, and significant infrastructure in Garfield County while facilitating new opportunities for pre-disaster mitigation funding and cooperation.

SECTION 2 – THE PLANNING PROCESS

DOCUMENTING THE PLANNING PROCESS

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

DESCRIPTION OF THE PLANNING PROCESS

2011: SOUTHEAST WASHINGTON MULTI-HAZARD MITIGATION PLAN (SEWA MHMP)

This plan, hereafter referred to as the SEWA MHMP, was developed through a collaborative process led by the emergency managers of each county through regional group meetings. The planning philosophy employed in this project included the open and free sharing of information with interested parties. Information from federal and state agencies was integrated into the database of knowledge used in this project. Meetings with the committee were held throughout the planning process to facilitate a sharing of information between cooperators.

The planning process included five distinct phases which were in some cases sequential (step 1 then step 2) and in some cases intermixed (step 4 completed throughout the process):

1. **Collection of Data** about the extent and periodicity of hazards in each County to ensure a robust dataset for making inferences about hazards in Asotin, Columbia, and Garfield Counties specifically.

2. **Field Observations and Estimations** about risks, juxtaposition of structures and infrastructure to risk areas, access, and potential mitigation projects.

3. **Mapping** of data relevant to pre-disaster mitigation control and mitigation, structures, resource values, infrastructure, risk assessments, and related data.

4. **Facilitation of Public Involvement** from the formation of the planning committee to news releases, public meetings, public review of draft documents, and acknowledgement of the final plan by the signatory representatives.

5. **Analysis and Drafting of the Report** to integrate the results of the planning process, providing ample review and integration of committee and public input, followed by signing of the final document.

GARFIELD COUNTY HAZARD MITIGATION PLAN, 2021 UPDATE

After it was decided not to proceed with an update to the SEWA MHMP, Garfield County began the planning process for a Garfield-only MHMP. The county, secured the grant from FEMA, selected Northwest Management, Inc. as contractor, and formed the planning team from the already existing LEPC. After some initial meetings and consultation with NMI, more groups and individuals were invited to take part in the planning process.

THE PLANNING TEAM

Garfield County Emergency Manager John Hirsch led the planning efforts alongside the consultants from NMI. The planning team was a group of resource professionals that included county and city staff, fire protection districts, local organizations, and state and federal agencies.

During discussions on hazards, communities at risk, community capabilities, mitigation projects, and other topics, there were times that different stakeholders or groups were mentioned as potential planning partners. These organizations or individuals would then be included in planning discussions, invited to teams meetings, or asked to contribute in some other way.

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

MULTI-JURISDICTIONAL PARTICIPATION

CFR requirement §201.6(a)(4) calls for multi-jurisdictional planning in the development of Hazard Mitigation Plans that impact multiple jurisdictions. To be included as an adopting jurisdiction in the updated Garfield County Multi-Hazard Mitigation Plan, jurisdictions were required to participate in the following ways:

- Attend planning meetings or meet with planning team leadership individually
- Complete a hazard summary worksheet
- Approve already existing mitigation and planning goals or provide new goals
- Submit mitigation action items
- Adopt the final Plan by resolution

The following is a list of jurisdictions that participated in the 2021 update as adopting jurisdictions:

***new adopting jurisdiction for the 2021 plan update**

Garfield County
City of Pomeroy
Garfield County Fire District #1
Pomeroy School District #110
Garfield County Transportation Authority*
Garfield County Hospital
Garfield County Health District
Port of Garfield
Pomeroy Conservation District

These jurisdictions were represented at monthly planning meetings and they participated in community and hazard profiles, risk assessments, mitigation strategies, and general document review. Additional input was gathered from each jurisdiction in a combination of the following ways:

- Planning team members reached out to colleagues for assistance and other kinds of involvement to help with updates, revisions and review of the HMP
- Planning team members periodically reported back to their respective advisory boards or governing bodies on the progress of the planning process.
- A public meeting was hosted at Pomeroy High School on November 20, 2019. The meeting involved a presentation by NMI, and was attended by several members of the planning team, as well as a member of the public. More public meetings were planned for the spring of 2020 but were never scheduled due to the COVID-19 pandemic and all the complications associated with it.
- One-on-one correspondence and discussions between NMI, Emergency Management, and the representatives of the adopting jurisdictions was facilitated as needed to ensure understanding of the process, collect data and other information, and develop specific mitigation strategies.
- NMI representatives emailed and/or called each jurisdiction individually at least once during the planning process to answer questions and request additional information.
- NMI consultants used an email distribution list of all the stakeholders to announce meetings, distribute draft sections for review, and request information. All participating jurisdictions provided comments to the draft document during the data gathering phase as well as during the various review phases.

PLANNING TEAM MEETINGS

During regularly scheduled team meetings, NMI led the planning team through a systematic review and update process in which the pertinent Garfield County information was retrieved from the SEWA MHMP and developed into this updated plan. Items addressed during planning team meetings included, examination and discussion of the hazards, review and development of planning philosophies and goals, risk and vulnerability analysis, a dialogue on public outreach efforts, and developing the best mitigation strategies for each jurisdiction.

The planning kickoff meeting was held in July of 2019 with regular meetings held through November 2019. After the holidays, planning meetings resumed in February 2020, but were again suspended due to the COVID-19 pandemic. During this time work on the plan was conducted remotely through email and phone correspondence between various planning team members and NMI. Virtual meetings began in June 2020, and continued regularly for several weeks through August 2020. At this point in the planning process, the energy shifted away from team meetings toward individual meetings and efforts then focused on specific areas of the plan that still needed work.

The final team meetings were conducted on November 20 for the planning team to review and approve final draft of the plan before releasing the draft for the public review and comment period.

The following list of people participated in the planning process by attending at least one team meeting and/or by providing necessary and valuable information that was included in the plan. Most of these individuals also contributed in some other way, such as by reviewing the document and providing

feedback, and were integral in the planning process. Each adopting jurisdiction is represented among this list of contributors.

TABLE 2: GARFIELD COUNTY PLANNING TEAM FOR THE 2021 MHMP

Name	Representative of	Title/Department
Drew Hyer	Garfield County Sheriff's Office	Sheriff
Tina Meier	Garfield County Sheriff's Office	911/Emergency Management Director
Susie Bowles	Pomeroy City Council	Council Member
Mike Cassetto	Pomeroy City Council	Council Member
Diana Ruchert	Port of Garfield	Port Manager
Grant Morgan	Garfield County Public Works	Director/Engineer
Justin Dixon	Garfield County Commissioners	Commissioner
Ken Moyer	Garfield County Hospital District	Maintenance Supervisor (ret.)
Launy Caulkins	Garfield County Hospital District	Maintenance Supervisor
Laura Dixon	Garfield County Health District	Admin Assistant/Fiscal Manager
Rachel Anderson	Garfield County Transportation Authority	General Manager
Jeff Ruchert	Garfield County Transportation Authority	Operations Manager
Jim Nelson	Pomeroy School District #110	School Resource Officer
James Cleveland	Garfield County Fire District #1	Fire Chief
Deedee Weymouth	Garfield County Fire District #1	EMT/District Secretary
Kyle Pearson	Garfield County Fire District #1	Assistant Fire Chief
Shane Severs	United States Forest Service	
Roger Pederson	Pomeroy Assist/GC Ministerial Association	Director/Pastor
John Hirsch	Garfield County	Emergency Management Director
Duane Bartels	Pomeroy Conservation District	District Manager
Lance Frederick	Pomeroy Conservation District	CD staff
Jim Warren	Garfield County	Citizen
Adam Herrenbruck	Northwest Management, Inc.	Planner
Eric Nelson	Northwest Management, Inc.	Planner
Brad Tucker	Northwest Management, Inc.	Project Manager
Vaiden Bloch	Northwest Management, Inc.	GIS Coordinator

Garfield County Emergency Management solicited participation from each adopting jurisdiction, state and federal agencies, as well as local stakeholders and interested parties. With the full integration of the Community Wildfire Protection Plan and the HMP processes, local fire districts were also asked to participate in the planning team meetings. For full documentation of the planning team meetings, including agendas, notes, and sign in sheets, see the Section 6 Appendix.

PUBLIC INVOLVEMENT

Public involvement in this plan was made a priority during the creation of the SEWA MHMP, and that attitude of informing and including the public was assumed for Garfield County's update. During the update process, there were several ways that public involvement was sought and facilitated throughout the planning process. In some cases, this led to members of the public providing information and seeking an active role in protecting their communities, while in other cases it led to the public becoming more aware of the process without becoming directly involved in the planning.

MEDIA

Under the auspices of Garfield Emergency Management, an initial media release was submitted to local news outlets and posted on the Garfield County website and Facebook page. Additional media releases provided information regarding the public meeting, public survey, and public comment period including how to find electronic versions of the draft on the Garfield County website and instructions on how to submit comments. A record of published articles regarding the HMP is included in the Section 6 Appendix.

PUBLIC MEETINGS

One Public meeting was held on November 20, 2019 in the Pomeroy High School auditorium. Consultants from NMI presented a PowerPoint overview of the purpose of the plan, risk assessments for each hazard, and mitigation activities that may benefit Garfield County. There were map displays to help facilitate open discussion. Five planning-team members were present at the meeting and one non-team member attended also. More public meetings were planned for the spring of 2020 but these plans were cancelled due to COVID-19 health restrictions. Because of the inability to hold more public meetings, the planning team opted to conduct a public survey campaign to solicit input from the community.

PUBLIC SURVEY

During later stages of the plan-drafting process, the planning team took on a public outreach campaign through a public survey. The survey was built on Survey Monkey and released on various websites and social media platforms associated with Garfield County and the adopting jurisdictions. The purpose of the survey was to collect general information about how members of the public view the various hazards covered in the plan and hazard mitigation in general. The results of the survey were documented and are included in the Section 6 Appendix.

DOCUMENTED REVIEW PROCESS

Review and comment on this plan has been provided through a number of avenues for the planning team as well as for members of the general public. A record of this review process has been established through email correspondence, media releases, published articles, meeting notes, and meeting sign-in sheets.

During regularly scheduled planning-team meetings in 2019-2020, team members met to discuss findings, review mapping analysis, and provide written comments on draft sections of the document.

During the public meetings attendees observed map analyses, discussed general findings from the risk assessments, and made recommendations on potential project areas.

Sections of the draft plan were delivered to the planning advisory group members during the regularly scheduled planning meetings. The planning team spent several weeks and months editing sections of the plan and providing changes or updated information. Many jurisdictions met individually to review and revise their specific risk assessment and mitigation strategy including the prioritization of action items. The completed first draft of the MHMP update was presented to the group in November for full review. Once the team's review was completed, the draft document was released for public review and comment. The public review period remained open from December 7 to December 21.

PLAN MONITORING AND MAINTENANCE

As part of the policy established for the original SEWA MHMP, and continued by Garfield County hereafter, this entire Multi-Hazard Mitigation Plan should be reviewed annually (from date of adoption). The annual review will occur at a special meeting of the planning team, open to the public and involving all jurisdictions, where action items, priorities, budgets, and modifications can be made or confirmed.

The Garfield County Emergency Manager (or an official designee) is responsible for the scheduling, publicizing, and leadership of the annual review meeting. During this meeting, participating jurisdictions will report on their respective projects and identify needed changes and updates to the existing plan. Maintenance to the plan should be detailed at this meeting, documented, and attached to the formal plan as an amendment to the Multi-Hazard Mitigation Plan.

Re-evaluation of this plan should be made every five years during a plan update process. The five-year update process should include a new series planning team meetings, updates to the hazard risk assessment, a full review of the mitigation strategy, and a public review and comment period. The updated MHMP will then be submitted to the Washington State Emergency Management Division and FEMA for approval. The governing body of each adopting jurisdiction would then need to officially recognize the updated plan via formal resolution.

ANNUAL REVIEW AGENDA

At the annual review meeting, the planning team should strive to include the following topics:

- Update historical events record based on any events in the past year.
- Review county profile and individual community assessments for each hazard and note any major changes or mitigation projects that have altered the vulnerability of each entity.
- Update the Emergency Resources information as necessary for each emergency response organization.
- Add a section to note accomplishments or current mitigation projects.
- All action items in the Mitigation Strategy will need updated as projects are completed and as new needs or issues are identified.

- Address Emergency Operations Plans – how can we dovetail the two plans to make them work for each other? Specifically, how do we incorporate the Garfield County EOP into the action items for the MHMP?
- Address Updated County Comprehensive Land Use Plans – how can we dovetail the two plans to make them work for each other? Specifically, how do we incorporate Garfield County's Comprehensive Plan into the action items for the MHMP?
- Incorporate additional hazard Sections as funding allows.

All meeting notes, media releases, and other documentation of revisions should be kept on record by Garfield County Emergency Management.

FIVE-YEAR PLAN UPDATE

For the five-year update of the Garfield County Multi-Hazard Mitigation Plan, proactive steps must be taken to secure a grant in advance of the plan's expiration date. Garfield County Emergency Management should begin the grant process during the fourth year after the most recent adoption date. This will allow time for the county to secure grant funding, request bids, select a contractor, and assemble the planning team for the update process. If county representatives do not wish to utilize a contractor for the five-year plan update, beginning the update process during the fourth year can give Emergency management time to assemble the planning team and prepare for the plan update process.

The focus of the planning team during the five-year plan update process should include all of the topics suggested for the annual review in addition to the following items:

- Review of the current planning team, discuss what other planning partners, stakeholders or interested parties should be included in the planning process.
- Update County demographic and socioeconomic data.
- Address any new planning documents, ordinances, codes, etc. that have been developed by the county or cities.
- Review listed communication sites.
- Discuss current and potential partnerships, mutual aid agreements, and shared responsibilities with neighboring counties, cities, organizations, or agencies.
- Review municipal water sources, particularly those in the floodplain or landslide impact areas.
- Redo all risk analysis models incorporating new information such as an updated county parcel master database, new construction projects, development trends, population vulnerabilities, changing risk potential, etc.
- Update county risk profiles and individual community assessments based on new information reflected in the updated models.

All meeting notes, media releases, and other documentation of revisions should be kept on record by Garfield County Emergency Management.

CONTINUED PUBLIC INVOLVEMENT

All participating entities are dedicated to the continued involvement of the public in the hazard mitigation process. The plan will be available on the Garfield County website with the understanding that questions or comments can be directed to staff at any time. Any formal meetings to discuss the plan will be announced on the website also.

The public will have the opportunity to provide feedback about the plan annually on the anniversary of the adoption at a meeting of the County Board of Commissioners. A public meeting can also be held as part of each annual review process, if deemed necessary by the planning team. The Garfield County Emergency Manager, or a designee, is responsible for requesting the commissioners meeting and for initiating the public meeting if it is deemed necessary.

Hard-copies of the Garfield County Multi-Hazard Mitigation Plan will be kept and made available for public review at the Garfield County Courthouse. Garfield County Emergency Management shall be responsible for receiving, tracking, and filing public comments regarding the Multi-Hazard Mitigation Plan.

SECTION 3 - COMMUNITY PROFILES

The purpose of this Section is to link the unique qualities, features, and characteristics of each jurisdiction to local and regional natural hazards. Each community profile includes relevant information about demographics, infrastructure, commerce, industry, natural resources, and geography and identifies any community-components that are of interest, especially as they relate to natural hazards. Following the community profile is a risk and vulnerability assessment that summarizes the probability of a given natural hazard event affecting a jurisdiction, the potential impacts that a natural hazard event could have on a jurisdiction, and which community-components are at risk.

GARFIELD COUNTY PROFILE

DESCRIPTION OF THE REGION

Garfield County is situated in the southeast corner of Washington State with Asotin County to the east, Columbia County to the west, Whitman County to the north, and the state of Oregon to the south. The only city in Garfield County is Pomeroy, located roughly in the center of the county. Other major population centers close by include the neighboring cities of Lewiston, Idaho and Clarkston, Washington, and the nearby town of Dayton, Washington. The economy of the region is directly tied to dryland farming. Principal crops include wheat, barley, and hay. Livestock production consists of cattle and sheep. The Snake River is a major waterway in the region and it forms the north border between Garfield County and Whitman County. Water recreation and river transportation for commerce are also important regional industries.

REGIONAL HISTORY

In 1805-1806, Lewis and Clark passed through the region as well as Captain Bonneville in 1834. A ferry was established on the Snake River in 1855 to accommodate thousands of miners rushing to the goldfields. A stage route established in 1862 between Walla Walla and Lewiston brought many settlers to the area. The city of Pomeroy, in the Pataha Valley, is one of the pioneer communities of the State of Washington. Pomeroy was established in 1864 by its founder, Joseph M. Pomeroy. He arrived in the Pataha Valley in 1864 and operated a stage station and a farm. Settlers continued to pour into the region in the latter 1870's and early 1880's. In 1881, a ferry was established at Asotin in nearby Asotin County. The railroad arrived in 1886 and provided an outlet for wheat shipment that replaced movement by steamship.

GEOGRAPHY AND LAND USE

Garfield County and the southeast Washington region is comprised of a geologically diverse landscape that ranges from a rather arid four-season climate to mountainous slopes covered with evergreen forests. The Snake River connects this region to the world with barge access to ports from as far east as Lewiston, Idaho, and as far west as the mouth of the Columbia River. In the southern part of the county,

near the border with Oregon, rise the Blue Mountains. These mountains vary in elevation from 3,000 feet in the valleys to over 6,300 feet at the highest peaks. The Blue Mountain Range is characterized by steep, rugged terrain, deeply dissected by streams. Most of the forested lands in Garfield County and the region are found within the Umatilla National Forest. These forested lands are primarily drained by the Grand Ronde, Walla Walla, Tucannon and Touchet River systems. At lower elevations, in the central and northern extents of the region, rolling hills with steep slopes and narrow valleys characterize the topography. The hills and valleys generally exhibit good agricultural soil, which is highly conducive for wheat production.

TABLE 3: APPROXIMATE LAND USE IN GARFIELD COUNTY

Land Owner/Use	Total Acres	Percent
Private	328,718	72%
Incorporated Cities	1,120	<1%
Forest Industry	1,011	<1%
US Army Corps of Engineers	8,617	2%
US Forest Service	95,266	21%
Washington Department of Natural Resources	17,299	4%
U.S. Bureau of Land Management	140	<1%
Washington Department of Fish and Wildlife	7,081	2%
Total	459,252	100%

Climate, Vegetation, and Soils

The Cascade Mountain Range helps protect this region from the damp coastal weather that is often associated with the Northwest, particularly the Puget Sound area. The Rocky Mountains to the east of this region help keep winters relatively mild. As a result, the climate in southeast Washington is typical of eastern Washington. The summers are warm and dry with temperatures approaching 100 degrees and winters are cold with temperatures reaching below zero. The annual average temperature is about 51 degrees Fahrenheit. The annual precipitation ranges from 13 inches near Central Ferry to 20 inches in parts of the Umatilla National Forest.

The prevailing winds are generally from the southwest. During spring and fall seasons, rapidly moving weather systems result in considerable blowing dust. Wind speeds may reach 50 mph once in two years and 80 mph winds are expected once in 50 years. In severe winters with light snow cover, frost may penetrate the soil at depths between 20 and 30 inches.

Vegetation in this region is a mix of forestland and agricultural ecosystems. An evaluation of satellite imagery provides some insight to the composition of the vegetation in the area. The full extent of the area was evaluated for cover type by the USDA Forest Service in 2001 as determined from Landsat 7 ETM+ imagery in tabular format. The most represented vegetated cover types for Garfield County can be seen in the following table.

TABLE 4: VEGETATION COVER TYPES IN GARFIELD COUNTY

Vegetation Cover by Types	% covered (459,252 acres)
Open Water	1.0%
Developed, Open Space	2.0%
Developed, Low Intensity	0.0%
Developed, Medium Intensity	0.0%
Developed, High Intensity	0.0%
Barren Land (Rock/Sand/Clay)	0.0%
Deciduous Forest	0.0%
Evergreen Forest	20.0%
Mixed Forest	0.0%
Shrub/Scrub	10.0%
Grassland Herbaceous	27.0%
Pasture/Hey	1.0%
Cultivated Crops	39.0%
Woody Wetlands	0.0%
Emergent Herbaceous Wetlands	0.0%

Vegetative communities within this region follow the strong moisture and temperature gradients related to the major drainages. As moisture availability increases, so does the abundance of conifer species, with subalpine forest communities present in the highest elevations where precipitation and elevation provide more moisture during the growing season.

Generally, the soils located within this region present no limitations for conventional development except when combined with the steeper topography. The Soil Survey conducted by the US Soil Conservation Service includes detailed soil maps which can be used for examining a particular site's suitability for specific land uses.

More specifically, the soils on the valley floors typically consist of well-drained bottom lands. These soils formed under bunchgrass in alluvium mixed with wind-laid deposits and some volcanic ash. The permeability of these soils is moderate, run-off is slow, and hazards for water and wind erosion are slight.

Climbing out of the valley bottom soils, a variety of soil series are encountered. These typically consist of well-drained soils in the uplands, which were formed under bunchgrass and sagebrush in calcareous loess. There is a high potential for erosion of this soil, especially on the steeper slopes. In areas where slopes often exceed 50%, soil types resulting from soil formed under rabbitbrush and bunchgrass in a mixture of wind-laid silty material and material weathered from basalt are quiet common. Generally, the basalt can be found at 10-20 inches below the soil surface. In these areas, the erosion hazard is severe.

POPULATION AND DEMOGRAPHICS

The most recent census data available for Garfield County is the July 2019 population estimates published by the U.S. Census Bureau and can be found on their website.[2] The most recent estimates for the city of Pomeroy are from 2018. Garfield County is the smallest county by population in the state of Washington and the county has only one incorporated community, Pomeroy, the county seat. Based on the 2018 estimates, 1,410 Garfield residents live in Pomeroy – roughly 63% of the population.

TABLE 5: YEARLY POPULATION ESTIMATES FOR GARFIELD COUNTY AND POMEROY SINCE THE 2010 U.S. CENSUS

Jurisdiction	2010 Census	2011 Est.	2012 Est.	2013 Est.	2014 Est.	2015 Est.	2016 Est.	2017 Est.	2018 Est.	2019 Est.
Garfield County	**2,266**	**2,237**	**2,209**	**2,237**	**2,201**	**2,222**	**2,246**	**2,215**	**2,240**	**2,225**
Pomeroy	**1,425**	**1,408**	**1,389**	**1,407**	**1,383**	**1,395**	**1,409**	**1,385**	**1,410**	**N/A**

Historical populations of Pomeroy and Garfield County were on the decline throughout the 20th century and into the 21st century, as shown in the table below. Pomeroy's population has seen more fluctuation but the general trend has been downward. If 2018 estimates prove to be accurate, it is possible the populations of both the county and city may be stabilizing over the current decade.

TABLE 6: HISTORIC POPULATION TRENDS IN GARFIELD COUNTY AND POMEROY; USING DECENNIAL CENSUS DATA AND 2018 ESTIMATES

Jurisdiction	1950	1960	1970	1980	1990	2000	2010	2018
Garfield County	**3,204**	**2,976**	**2,911**	**2,468**	**2,248**	**2,397**	**2,266**	**2,240**
Pomeroy	**1,775**	**1,677**	**1,823**	**1,716**	**1,393**	**1,517**	**1,425**	**1,410**

TABLE 7: AGE, SEX, AND RACE DEMOGRAPHICS FROM THE 2018 AMERICAN COMMUNITY SURVEY 5-YEAR ESTIMATES, PUBLISHED BY THE U.S. CENSUS, FOR GARFIELD COUNTY AND POMEROY

2018 ACS Statistic	City of Pomeroy	Garfield County
Median Age (years)	50.4	45.5
Percent of population under 18 years	22.7%	23.8%
Percent of population 65 years and over	23.7%	21.8%
Percent Male	47.6%	49.4%
Percent Female	52.4%	50.6%
Race Percentages	-	-
White	90.6%	91.7%
Black of African American	0.0%	0.0%
American Indian and Alaska Native	0.7%	0.4%
Asian	2.9%	3.2%
Native Hawaiian, Pacific Islander	0.0%	0.0%
Some other race	0.0%	0.0%
Two or more races	5.7%	4.7%
Hispanic or Latino (of any race)	3.6%	2.1%

[2] United States Census Bureau. "Explore Census Data." Available online at https://data.census.gov/cedsci/

SOCIOECONOMICS

This plan will use data from the 2017 U.S. Census Bureau's American Community Survey (ACS) for a general outlook on socioeconomics. The 2017 ACS reports that Garfield County contains an estimated total of 1,254 housing units with 758 of those located in the city of Pomeroy, or roughly 60%. The study also reports that 80% of the housing units are occupied and 69% are owner-occupied. The median value of owner-occupied housing units is $143,800, but the largest percentage of housing are valued between $150,000 and $199,999.

Using 2017 inflation-adjusted dollars, the following table breaks down the income groups in Pomeroy and Garfield County.

TABLE 8: INCOME STATISTICS FOR POMEROY AND GARFIELD COUNTY

2017 Income Statistic	City of Pomeroy Estimate	Garfield County Estimate
Number of households	594	1,007
Less than $10,000	4.7%	7.1%
$10,000-$14,999	5.7%	3.9%
$15,000-$24,999	15.3%	14.8%
$25,000-$34,999	16.8%	11.9%
$35,000-$49,999	14%	10%
$50,000-$74,999	27.1%	25.4%
$75,000-$99,999	11.1%	14.4%
$100,000-$149,999	4.7%	10.7%
$150,000-$199,999	0%	1.5%
$200,000 or more	0.5%	0.3%
Median income	$43,125	$51,399
Mean income	$48,097	$55,554

Selected poverty statistics were examined for Pomeroy and Garfield County. Most statistics appear to be following the same trends as Washington state as a whole. However, the unemployment rates of both the county, and the city of Pomeroy are higher that the state.

TABLE 9: POVERTY STATUS IN GARFIELD COUNTY AND POMEROY

Poverty status statistics	Garfield County	City of Pomeroy	State of Washington
% of all families below the poverty level	4.4%	6.9%	8%
% of families below the poverty level with related children of the household under 18 years	12.3%	20.7%	12.8%
% of Individuals below poverty level	11.7%	13.8%	12.2%
Unemployment rate	7.2%	11.5%	6%

Employment within Garfield County leans heavily toward private wage and salary workers which together, comprise 51% of the region's workforce. Government workers represent 32.9% of the work force and roughly 16% is classified as workers self-employed in their own unincorporated business.

TABLE 10: EMPLOYMENT AND INDUSTRY STATISTICS FOR GARFIELD COUNTY

Employment and Industry Statistics		
OCCUPATION	**Garfield County total**	**Garfield County %**
Management, professional, and related occupations	315	33.7
Service occupations	186	19.9
Sales and office occupations	221	23.7
Natural resources, construction, and maintenance occupations	89	9.5
Production, transportation, and material moving occupations	123	13.2
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	156	16.7
Construction	58	6.2
Manufacturing	46	4.9
Wholesale trade	46	4.9
Retail trade	120	12.8
Transportation and warehouse, and utilities	60	6.4
Information	24	2.6
Finance, insurance, real estate, and rental and leasing	24	2.6
Professional, scientific, management, administrative, and waste management services	15	1.6
Educational services, healthcare and social assistance	235	25.2
Arts, entertainment, recreation, accommodation and food services	36	3.9
Other services (except public administration)	32	3.4
Public administration	82	8.8

TRANSPORTATION & INFRASTRUCTURE

This section describes general transportation capabilities and an overview of some of the vital infrastructure within Garfield County such as schools and medical facilities. Detailed descriptions of the specific adopting jurisdictions are highlighted in another part of this Section.

US Highway 12 is the major route for vehicle traffic in Garfield County. It connects Pomeroy, the largest population center, directly to nearby population centers including Dayton, Washington and Clarkston, Washington. This is an east-west route that cuts through the center of the county. Other important routes include State Route 127, which branches off US 12 at Dodge Junction in the northwest part of the county and runs north, crossing the Snake River and eventually connecting to SR 26 in Whitman County. From Pomeroy, SR 128 runs south toward the Umatilla National Forest before exiting the county to the east and heading toward Clarkston. Also called the Peola Road, SR 128 has connector roads that access the north end of the national forest.

The only medical facilities in the county are found in Pomeroy, including Garfield County Memorial Hospital and Pomeroy Medical Clinic. Pomeroy Elementary School and Pomeroy Jr./Sr. High School are the only sources of public education in the county.

DEVELOPMENT TRENDS

Southeastern Washington is primarily a rural, agricultural area with a handful of thriving communities. Development and growth in these areas has been relatively slow and often decreasing for more than 100 years.

A relatively large percentage of the region is privately owned. Private parcels are becoming more and more expensive as the population grows and properties close to communities or in desirable recreation areas are developed. Additionally, new jobs associated with the establishment of the numerous wind turbines may bring additional population growth and a higher demand for land.

Agriculture is the dominant industry throughout the area, but particularly in Garfield County. Port districts in the county handle a significant amount of barge traffic carrying grains to ports in the Portland-Vancouver area.

Some recent development includes a $9 million remodel project for Pomeroy High School in 2012.

HAZARD MANAGEMENT CAPABILITIES

Garfield County maintains its own emergency manager, fire districts, and emergency medical service districts. Garfield Fire District #1 provides structural and wildland fire protection as well as emergency medical service to all of the populated areas in the county (excludes the National Forest). The district will also respond to emergency medical calls on the Umatilla National Forest.

DESCRIPTIONS OF THE OTHER ADOPTING JURISDICTIONS

CITY OF POMEROY

Pomeroy was established in 1864 and incorporated in 1886. The city sits along Pataha Creek at an elevation of 1,855 feet and makes up 1.78 square miles. In 2003, a 10-block section of Pomeroy's downtown was placed on the National Historic Register. Other historic places of interest include Pataha Flour Mills just east of Pomeroy and the Garfield County Museum in Pomeroy. The city is home to the Denny Ashby Library with the mission of inspiring lifelong learning, promoting literacy, and strengthening the community in Garfield County. The city of Pomeroy contains a jr./sr. high school and elementary school, a hospital and clinic, a port district, the Pomeroy Ranger Station of the Umatilla National Forest, public transportation services, a local fire department, law enforcement, and EMS. Agriculture is the major industry in Pomeroy, along with education, health care, tourism, and several service industry businesses.

GARFIELD COUNTY FIRE DISTRICT #1

The Pomeroy Fire Department was established in 1887 and in 2010 it combined with the Garfield County Fire District #1 to become one fire protection district. They provide fire suppression, Basic Life Support (BLS) ambulance transport, rescue services, fire code enforcement, and public education to the residents and visitors of Garfield County. "It is the mission of Garfield County Fire District #1 to provide professional and dependable Emergency Medical Services, Fire Protection, and Rescue services to protect life, property, and the environment for the citizens and visitors of Garfield County."

POMEROY SCHOOL DISTRICT #110

Pomeroy School District #110 (PSD) has two buildings consisting of Pomeroy Elementary School and Pomeroy Jr./Sr. High School. PSD's two main buildings each have gymnasium and locker room facilities. Office equipment in both buildings includes computer, copiers, printers, fax machines, phones and audio/visual equipment. Both buildings are equipped with AEDs. The high school building has a cafeteria with a full kitchen. PSD owns a bus barn with buses, Suburbans, and a car for transportation.

According to their official website, the school district currently employs 18.5 teachers, .5 counselors, and 2 administrators while serving 320 students in kindergarten through 12th grade. The school district currently has partnerships in place with Lewis Clark State College and Walla Walla Community College. Garfield County voters consistently vote to pass levies that provide funding for the district and its various programs.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

The GCTA is a fully accessible transportation service of Garfield County, aiming to serve all citizens. The stated commitment of the GCTA is to ensure "that no person is excluded from participation in, or denied the benefits of its transit services on the basis of race, color, or national origin, as protected by Title VI in Federal Transportation Administration (FTA) Circular 4702.1.A". GCTA provides demand response transportation to all Garfield County residents, including Monday-Friday AM/PM commuter service to the Lewis-Clark Valley, Monday-Friday local service within Garfield County, and midday medical/shopper service to the L-C Valley on Tuesdays and Thursdays. The GCTA is governed by a board of directors

consisting of all three Garfield County Commissioners, and the Mayor of Pomeroy that meet once monthly on the third Monday of the month.

GARFIELD COUNTY HOSPITAL DISTRICT

One of the most important functions of emergency response for the Hospital District is its Incident Command Policy. To enhance their emergency capabilities, the Hospital District uses a "Ladder Approach" to its incident command response training. The Hospital is developing a standard for the routine update of the incident command policies and procedures, training, and disaster drills. Training includes orientation to the Emergency Response Manual, monthly drills with short in-services involving the different codes. The district's goal is to conduct quarterly "table top" exercises for individual's roles in a scenario. Then, yearly facility-wide exercises conducted with walk-through scenarios.

The following information can be found on the Garfield County Hospital District official website:

Garfield County Hospital District provides a Swing Bed Program in which the hospital beds can be used either for acute care needs or for skilled nursing, depending on the necessary conditions. Garfield County Memorial Hospital has a full service lab and provides basic radiology services. The hospital hosts monthly mammogram clinics and provides referrals for cardiology exams, complex radiological exams and other diagnostic services around the region. The hospital is part of the Washington State Trauma System and is certified as a Level V Trauma Provider. The hospital provides in-patient acute care and observation services. The staff provides comprehensive care planning, evaluation, and management of acute conditions. Therapy services are also offered at Garfield County Memorial Hospital. Patients are treated for a variety of conditions.

Pomeroy Medical Clinic is a rural health clinic offering primary care to the community of Pomeroy and the surrounding area. The medical team strives to help patients meet personal health goals, assist with management of chronic conditions, and connect patients with specialists in the area.

GARFIELD COUNTY HEALTH DISTRICT

The Garfield County Health District is a district within Garfield County. The Public Health District has several stated roles:

- Monitor health status to identify community health problems.
- Diagnose and investigate health problems and health hazards in the community.
- Inform, educate, and empower people about health issues.
- Mobilize community partnerships and action to identify and solve health problems.
- Develop policies and plans that support individual and community health efforts.
- Enforce laws and regulations that protect health and ensure safety.
- Link people to needed personal health services and assure the provision of health care when otherwise unavailable.
- Assure a competent public health and personal health care workforce.
- Evaluate effectiveness, accessibility, and quality of personal and population-based health services.

- Research for new insights and innovative solutions to health problems.

Their governing body is made up of a board including three county commissioners and two community members.

PORT OF GARFIELD

The following information can be found on the Port of Garfield official website:

In 1911, the Washington Legislature authorized local voters to create publicly owned and managed port districts. The law allows port districts to develop facilities that provide services for economic development and transportation, which in turn enhances the local economy. On November 4, 1958 the voters of Garfield County approved the formation of the entire county into a port district and subsequently elected commissioners to serve. It is the mission of the Port of Garfield to pursue Economic and Community Development, to promote tourism and to improve the District for Garfield County and its citizens.

The Port of Garfield operates within a two-tiered level of authority. The top tier is derived from the state's RCW's which enable the ports to pursue economic development projects that strengthen the economy of their region. The second tier is derived through the comprehensive plan which sets policies, goals, and objectives used to attain specific economic development. Goals, policies, and objectives are utilized to add flexibility to a plan by giving general directions for decisions to take, but not specific projects for achievement. At the same time, goals and objectives provide a measure for evaluating and monitoring progress toward a desired end.

POMEROY CONSERVATION DISTRICT

The following information can be found on the Pomeroy Conservation District official website:

The district's role in Garfield County is to aid in the conservation of all the natural resources by providing information/education, funding programs, and other resources to the local farmers and ranchers. The district assists the farmers and ranchers with the implementation of best management practices that reduce soil erosion and improve water quality.

SECTION 4 – HAZARD PROFILES & RISK ASSESSMENTS

The purpose of this section is to link the unique qualities, features, and characteristics of Garfield County and each adopting jurisdiction to the identified natural hazards. Each adopting jurisdiction has a risk and vulnerability assessment that summarizes the probability of a given natural hazard event affecting a jurisdiction, the potential impacts that a natural hazard event could have on a jurisdiction, and summarizes values of resources at risk.

Each hazard will be described and discussed in this Section so there is common understanding of terms and definitions used throughout the risk assessment. The following hazards were identified in the 2011 Southeast Washington MHMP and reexamined during the 2019/2020 update process.

- Flood
- Earthquake
- Landslide
- Severe Weather
- Wildland Fire
- Avalanche
- Tsunami
- Volcano
- Drought

A hazard summary worksheet was facilitated with the planning team to determine the relative frequency of a hazard's occurrence and the potential impact a hazard event could have on people, property, infrastructure, and the economy based on local knowledge of past occurrences. The results of the hazard summary can be found in Table 12 and Table 13.

JURISDICTIONAL RISK AND VULNERABILITY RATING

The planning team utilized a hazard summary worksheet to classify each hazard that was identified as potentially having an impact on Garfield County residents, businesses and/or economy. A definition for each classification is listed below. The Overall Significance rating is a combination of extent, severity and probability associated with the hazard.

TABLE 11: CRITERIA USED IN THE HAZARD SUMMARY WORKSHEET

Location (Geographic Area Affected)	
Negligible	Less than 10% of planning area or isolated single-point occurrences
Limited	10 to 25% of the planning area or limited single-point occurrences
Significant	25 to 75% of the planning area or frequent single-point occurrences
Extensive	75 to 100% of the planning area or consistent single-point occurrences
Maximum Probable Extent (Magnitude/Strength based on historic events or future probability)	
Weak	Limited classification on scientific scale, moderate speed of onset or moderate duration, resulting in little to no damage
Moderate	Moderate classification on scientific scale, moderate speed of onset or moderate duration, resulting in some damage and loss of services for days
Severe	Severe classification on scientific scale, fast speed of onset or long duration, resulting in

	devastating damage and loss of services for weeks or months
Extreme	Extreme classification on scientific scale, immediate onset or extended duration, resulting in catastrophic damage and uninhabitable conditions
Probability of Future Events (Occurrence in the next 50 years)	
Unlikely	Less than 1% probability of occurrence in the next year or a recurrence interval of greater than every 100 years
Occasional	1 to 10% probability of occurrence in the next year or a recurrence interval of 11 to 100 years
Likely	10 to 90% probability of occurrence in the next year or a recurrence interval of 1 to 10 years
Highly Likely	90 to 100% probability of occurrence in the next year or a recurrence interval of less than 1 year
Overall Significance	
Low	Two or more criteria fall in lower classifications or the event has a minimal impact on the planning area.
Medium	The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating
High	The criteria consistently fall in the high classifications and the event is likely/highly likely to occur with severe strength over a significant to extensive portion of the planning area

The criteria shown above was used to classify the geographic area affected (location), relative magnitude (max probable extent) and the probability of future events (frequency) that each hazard may have on a community. The classifications were then given a numerical value and then totaled to show the overall significance ranking for each hazard.[3] This process was conducted for each adopting jurisdiction. Table 12 summarizes the results of the Hazard Summary exercise for Garfield County and Table 13 shows the totals (overall significance value) for each adopting jurisdiction within the plan.

TABLE 12: HAZARD SUMMARY WORKSHEET RESULTS FOR GARFIELD COUNTY

Hazard	Location (Geographic Area Affected)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Flood	2 – Limited	2 – Moderate	1 – Unlikely	5 – Low
Earthquake	3 – Significant	1 – Weak	1 – Unlikely	5 – Low
Landslide	1 – Negligible	2 – Moderate	1 – Unlikely	4 – Low
Severe Weather	4 – Extensive	3 – Severe	4 – Highly Likely	11 – High
Wildland Fire	4 – Extensive	3 – Severe	4 – Highly Likely	11 – High
Avalanche	1 – Negligible	1 – Weak	1 – Unlikely	3 – Low
Tsunami	1 – Negligible	1 – Weak	1 – Unlikely	3 – Low
Volcano	3 – Significant	2 – Moderate	1 – Unlikely	6 – Medium
Drought	4 – Extensive	4 – Extreme	4 – Highly Likely	12 – High

[3] Hazard Summary Worksheet. Local Mitigation Planning Handbook. 2013. Pp A-29, A-30.

TABLE 13: ADOPTING JURISDICTIONS' OVERALL SIGNIFICANCE VALUE

Hazard	Garfield County	City of Pomeroy	Port of Garfield	Garfield County Health District	Garfield County Hospital District	Pomeroy School District #110	Garfield County Fire District #1	Pomeroy Conservation District	Garfield County Transportation Authority
Flood	Low	Low	Medium	Medium	Low	Medium	Low	Low	Medium
Earthquake	Low	Low	Low	High	Low	Low	Low	Low	Low
Landslide	Low	Low	Low	Low	Low	Low	Low	Low	Low
Severe Weather	High	High	High	High	High	Low	High	High	High
Wildland Fire	High	High	Medium	High	High	Low	High	High	High
Avalanche	Low	Low	Low	Low	Low	Low	Low	Low	Low
Tsunami	Low	Low	Low	Low	Low	Low	Low	Low	Low
Volcano	Medium	Medium	Low	High	Low	Low	Low	Medium	Low
Drought	High	High	Low	High	High	Low	Medium	High	Medium

FLOOD HAZARD PROFILE

Floods have been a serious and costly natural hazard affecting Washington. Floods damage roads, farmlands, and structures, often disrupting lives and businesses. Simply put, flooding occurs when water leaves the river channels, lakes, ponds, and other confinements where we expect it to stay. Flood-related disasters occur when human property and lives are impacted by flood waters. An understanding of the role of weather, runoff, landscape, and human development in the floodplain is therefore the key to understanding and controlling flood-related disasters. Washington has had many major disaster declarations related to flooding over the last several decades, and every county has received a Presidential Disaster Declaration since 1970. Since the previous MHMP was adopted, declarations were made in every year but two.

Riverine flooding includes those events that are classically thought of as flooding; i.e., a gradual rise of volume of a stream until that stream exceeds its normal channel and spills onto adjacent lands. Such events are generally associated with major meteorological events: spring runoff, winter rain/snowmelt events, and ice jams. Riverine floods typically have low velocities, affect large land areas, and persist for a prolonged period.

Flash floods may have a higher velocity in a smaller area and may recede relatively quickly. Such floods are caused by the introduction of a large amount of water into a limited area (e.g., extreme precipitation events in watersheds less than 50 square miles), crest quickly (e.g., eight hours or less), and generally occur in hilly or otherwise confined terrain. Steep mountainous terrain is particularly susceptible to flash floods and debris flows which can occur within thirty (30) minutes of the onset of heavy rain. Flash floods occur in both urban and rural settings, principally along smaller rivers and drainage ways that do not typically carry large amounts of water. According to the National Weather Service, "Flash floods are usually characterized by raging torrents after heavy rains that rip through river beds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall."[4]

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

- Water held back by the ice jam or debris dam can cause flooding upstream, inundating a large area and often depositing ice or other debris which remains after the waters have receded. This inundation may occur well outside of the normal floodplain.
- High velocity flooding can occur downstream when the jam breaks. These flood waters can have additional destructive potential due to the ice and debris load that they may carry.[5]

[4] National Weather Service. "Flood and flash flood definitions". Available online at https://www.weather.gov/mrx/flood_and_flash.

[5] Idaho Bureau of Homeland Security. 2007. State of Idaho Hazard Mitigation Plan. Hazard Mitigation Program. November 2007. Available online at http://www.bhs.idaho.gov/Resources/PDF/SHMPFinalw-signatures.pdf.

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

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

"That land that has been or may be covered by floodwaters, or is surrounded by floodwater and inaccessible, during the occurrence of the regulatory flood."[6]

Winter weather conditions are the main driving force in determining where and when base floods will occur. The type of precipitation that a winter storm produces is dependent on the vertical temperature profile of the atmosphere over a given area. Southeast Washington experiences riverine flooding from two distinct types of meteorological events: spring runoff and winter rain-on-snow events.

The major source of flood waters in Washington is normal spring snow melt. As spring melt is a "natural" condition, the stream channel is defined by the features established during the average spring high flow (bank-full width). Small flow peaks exceeding this level and the stream's occupation of the floodplain are common events.

Unusually heavy snow packs or unusual spring temperature regimes (e.g., prolonged warmth) may result in the generation of runoff volumes significantly greater than can be conveyed by the confines of the stream and river channels. Such floods are often the ones that lead to widespread damage and disasters. Floods caused by spring snow melt tend to last for a period of several days to several weeks, longer than the floods caused by other meteorological sources.

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

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

On small drainages, the most severe floods are usually a result of rainfall on frozen ground but moderate quantities of warm rainfall on a snow pack, especially for one or more days, can also result in rapid runoff and flooding in streams and small rivers. Although meteorological conditions favorable for short-duration warm rainfall are common, conditions for long-duration warm rainfall are relatively rare. Occasionally, however, the polar front becomes situated along a line from Hawaii through Oregon, and warm, moist, unstable air moves into the region.

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

There are three types of flash flooding:

- Extreme precipitation and runoff events
- Inadequate urban drainage systems overwhelmed by small intense rainstorms
- Dam failures

Debris flows are hazards that are closely related to flash floods, triggered by heavy rainfall, are more commonly considered as a type of earth movement (a geological hazard).

Extreme Precipitation and Runoff Events: Events that may lead to flash flooding include:

- Significant rainfall and/or snowmelt on frozen ground in the winter and early spring months.
- High intensity thunderstorms, usually during the summer months.
- Rainfall onto burn areas (such as those affected by wildfire) where high heat has caused the soil to become hydrophobic or water repellent which dramatically increases runoff potential during rain.

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

Flooding from ice jams is relatively common in southeastern Washington. Ice jam formation depends on air temperature and physical conditions in the river channel. Ice cover on a river (a precursor to the ice jam) is formed when water reaches the freezing point and air temperature is sub-freezing; large quantities of ice are produced, flow downstream, and consolidate.

An ice jam is a stationary accumulation of ice that restricts flow. Ice jams can cause considerable increases in upstream water levels, while at the same time downstream water levels may drop, exposing water intakes for power plants or municipal water supplies. Types of ice jams include freezeup jams, made primarily of frazil ice; breakup jams, made primarily of fragmented ice pieces; and combinations of both.

River geometries, weather characteristics, and floodplain land-use practices contribute to the ice jam flooding threat at a particular location. Ice jams initiate at a location in the river where the ice transport capacity or ice conveyance of the river is exceeded by the ice transported to that location by the river's flow.

The magnitude of most floods in southeast Washington depend on the particular combinations of intensity and duration of rainfall, pre-existing soil conditions, area of a basin, elevation of the rain or snow level, and amount of snow pack. Man-made changes to a basin also can affect the size of floods. Although floods can happen at any time during the year, there are typical seasonal patterns for flooding in southeast Washington, based on the variety of natural processes that cause floods:

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

Flooding on rivers east of the Cascades usually results from periods of heavy rainfall on wet or frozen ground, mild temperatures, and from the spring runoff of mountain snow pack. Southeastern Washington is also prone to flash flooding. Thunderstorms, combined with steep ravines, alluvial fans, dry or frozen ground, and lightly vegetated ground that does not absorb water, can cause flooding.

Occasionally, communities experience surface water flooding due to high groundwater tables or inadequate urban storm drainage. This occurred during the 1996-97 winter storms. In many communities, residents outside the flood plain had several inches of water in basements due to groundwater seepage. These floods contaminated domestic water supplies, fouled septic systems, and inundated electrical and heating systems. Firefighting access was restricted, leaving homes vulnerable to fire. Lake levels were the highest in recent history, and virtually every county had areas of ponding not previously seen.

In general, the meteorological factors leading to flooding are well understood. They are also out of human control, so flood mitigation must address the other contributing factors. Unlike precipitation and ice formation, steps can be taken to mitigate flooding through manipulation or maintenance of the floodplain. Insufficient natural water storage capacity and changes to the landscape can be offset through water storage and conveyance systems that run the gamut from highly engineered structures to constructed wetlands.

Careful planning of land use can build on the natural strengths of the hydrologic response. Re-vegetation of burned slopes diverts overland flow (fast and flood producing) to subsurface flow (slower and flood moderating). Details on rehabilitating burned areas to reduce flash floods, debris flows and landslides can be found in the Landslide Section of this document.

Floods generally come with warnings and flood waters rarely go where they are totally unexpected by experts. Those warnings are not always heeded, though, and despite the predictability, flood damage continues.

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

Development in or near floodplains increases the likelihood of flood damage in two ways. First, new developments near a floodplain add structures and people in flood areas. Secondly, new construction alters surface water flows by diverting water to new courses or increases the amount of water that runs off impervious pavement and roof surfaces. This second effect diverts waters to places previously safe from flooding. Unlike the weather and the landscape, this flood-contributing factor can be controlled. Development and occupation of the floodplain places individuals and property at risk. Such use can also increase the probability and severity of flood events (and consequent damage) downstream by reducing the water storage capacity of the floodplain, or by pushing the water further from the channel or in larger quantities downstream.

DAM FAILURE

The Snake River defines the northern border Garfield County. Because this major watershed is regulated by upstream dams, potential flooding as a result of a malfunction or dam break is a serious, but unlikely concern. However, Garfield County is farther downstream than Asotin County, and the major population centers in Garfield County are not located along the Snake River, unlike the population centers in Asotin County.

There are two upstream dams that could impact the Snake River in this area; the Hells Canyon Dam on the Snake River approximately 106 miles upstream from Clarkston and Dworshak Dam on the Clearwater River approximately 43 miles upstream from Clarkston. According to the inundation maps included in the Emergency Action Plan for the Hells Canyon Dam[7], communities in Asotin County would be heavily impacted by a floodwave within 9 hours of a Hells Canyon Dam breach. The river is expected to rise approximately 4 feet at Clarkston under probable maximum flood conditions. Shorelines in Garfield County are likely to be affected by floodwaters from a breach at Hells Canyon Dam. While this type of event is expected to cause considerable property damages in the form of erosion and land use

[7] Idaho Power. Emergency Action Plan for the Hells Canyon Dam and Power Plant. Idaho Power Company. Boise, Idaho. September 2009.

changes, there are relatively few structures, critical infrastructure, or other improvements in the areas likely to be affected by this type of flood water..

According to the inundations maps included in the Dworshak Dam Flood Emergency Subplans[8], a breach of Dworshak Dam would heavily impact the Snake River shorelines in Garfield County. The Corps of Engineers anticipates that the initial floodwave from a complete Dworshak Dam breach would arrive in Clarkston within approximately 3 hours and that the peak flood would occur within 9.5 hours of failure. The peak water surface elevation at Clarkston is expected to reach 793 feet under the assumed conditions of the study.

The Emergency Action Plan for the Hells Canyon Dam and Power Plant developed by the Idaho Power Company and the Flood Emergency Subplans for Notification and Inundation Maps – Dworshak Dam and Reservoir North Fork Clearwater River developed by the US Army Corps of Engineers provide detailed emergency operational information including protocols, authorities, contact information, maps, and timelines. There is very little the Southeast Washington Counties can do to mitigate risk or lessen the impacts of a dam break flood event; however, all jurisdictions in this area should be prepared to deal with this type of disaster as much as possible.

FLOOD RISK ASSESSMENT

Pataha Creek is the principal tributary to the Tucannon River and is often considered as a separate water body. Draining an area of 183 square miles, Pataha Creek generally flows westward from its headwaters near Stentz Spring in the Blue Mountains (5,647 ft) to its confluence with the Tucannon River (748 feet) near Delaney in Columbia County. Primary tributaries to Pataha Creek include Bihmaier Gulch, Sweeney Gulch, and Tatman Gulch. Average annual precipitation is approximately 16 inches per year. While this does not lend to particularly large flows, warm rains following a period of accumulating snow have resulted in damaging floods in 1950, 1964, 1966, 1971, and 1996.[9] The main channel of Pataha Creek parallels U.S. Highway 12 through most of Garfield County creating what is known as the Pataha Valley. Nearly all of Garfield County's population resides in the Pataha Valley either within the city of Pomeroy or in the Pataha community.

Flooding does not typically occur on the Snake River due to flood control capacity of both upstream and downstream dams. The water level of Snake River reservoirs are monitored and highly regulated for the purposes of providing not only irrigation water to the surrounding agricultural developments and hydroelectric power, but also to provide flood control for communities along this major drainage.

Several other waterways in Garfield County flood every two to five years including Deadman Creek, Meadow Creek, and Alpowa Creek. Flooding on streams in Garfield County occurs as a result of periods

[8] USACE. Flood Emergency Subplans for Notification and Inundations Maps – Dworshak Dam and Reservoir North Fork Clearwater River, Idaho. US Army Corps of Engineers Walla Walla District. Envirecord, Inc. Walla Walla, Washington. August 1982.

[9] Bonneville Power Administration. Pataha Creek Model Watershed: Habitat Conservation Projects. Progress Report 2000-02. DOE/BP-14994-2. April 2003.

with heavy rainfall, mild temperatures melting the snow pack, Chinook winds, and severe thunderstorms. Streams in Garfield County are also prone to flash flooding. Thunderstorms, steep topography, alluvial fans, dry or frozen ground, and light vegetation, tends to increase overland water flow.

Both the Deadman Creek and Meadow Creek drain the northern half of the county and flow directly into the Snake River at an inlet near Central Ferry.

Alpowa Creek drains much of the eastern edge of Garfield County. This waterway flows out of the Darland Ridge area near Columbia Center in a northeasterly direction, and then parallels U.S. Highway 12 before emptying into the Lower Granite Lake on the Snake River near Silcott in Asotin County. Alpowa Creek is prone to flooding as a result of rain-on-snow events and normal spring runoff. This watershed is also likely to flash flood due to a constricted channel, relatively steep topography, and limited streamside vegetation.

LOCAL EVENT HISTORY

March 1963 – Flooding occurred in Columbia, Garfield, Grant, Whitman and Spokane Counties.

1971 - The 1971 flood event inundated Pomeroy and several other widely dispersed areas throughout the County resulting in over a half million dollars in damage.

February 6, 1996 – Heavy rains caused flooding in the counties of Adams, Asotin, Benton, Clark, Columbia, Cowlitz, Garfield, Grays Harbor, King, Kitsap, Kittitas, Klickitat, Lewis, Lincoln, Pierce, Skagit, Skamania, Snohomish, Spokane, Thurston, Wahkiakum, Walla Walla, Whitman, and Yakima and the Yakima Indian Reservation. Snowfall began on January 26, 1996 followed by heavy rain in February. Mild temperatures and mountain snow melt caused severe flooding throughout the entire northwest. Three people died in Washington. Snow closed Interstate 90 at Snoqualmie Pass. Mudslides and flooding closed Interstate 5 in Lewis County.

December 1996 thru January 1997 - Again in 1997 flooding occurred, but with streams cleared and bridges armored after the flood events earlier in 1996, the overall impact was reduced. During the 1996-97 winter storms, areas not prone to stream flooding experienced surface water flooding due to high groundwater tables in floodplain areas or inadequate storm sewer drainage systems. Floods contaminated domestic water supplies, fouled septic systems, and inundated electrical and heating systems. Fire-fighting access was restricted, leaving homes vulnerable to fire.

According to the most recent analysis presented in the State of Washington Enhanced Hazard Mitigation Plan, Garfield County is considered to have a medium-high flood risk ranking. Past analysis conducted by the state did not list Garfield County as one of the counties in Washington most at risk and vulnerable to flood. The change in ranking appears to be due to the fact that 1) a high percentage of the county's population can be affected by flooding; 2) the built environment of the county is has a high percentage of being affected by flooding; and 3) both state and first responder facilities are at a higher percentage of risk to flooding. This is based on the exposure of these populations, built environments, and facilities

to the floodplain. The critical infrastructure, vulnerable populations, and overall area of Garfield County are all considered to be at low exposure and low vulnerability to flooding.[10]

The last major disaster declaration made for flooding in Garfield County was in January of 2016.

PROBABILITY OF FUTURE EVENTS

Participation in the National Flood Insurance Program (NFIP) and subsequent adoption of the Uniform Building Codes, or more stringent local building codes, provide basic guidelines to communities on how to regulate development. When a county participates in the NFIP it enables property owners in the county to insure against flood losses. By employing wise floodplain management, a participating county can protect its citizens against much of the devastating financial loss resulting from flood disasters. Careful local management of development in the floodplains results in construction practices that can reduce flood losses and the high costs associated with flood disasters to all levels of government.

TABLE 14: NATIONAL FLOOD INSURANCE PROGRAM POLICY INFORMATION FOR GARFIELD COUNTY AND POMEROY[11]

Community Name	Policies In-Force	Total Coverage	Written Premium + FPF	FIRM Effective Date	Floodplain Ordinance/ Manager	CRS Ranking
Garfield County (unincorporated)	5	$205,000	$2,676	11/15/1977	No/Yes	NA
Pomeroy	20	$1,899,900	$24,004	9/30/1993	Yes/Yes	NA

Description Definitions

Policies in Force *– The number of policies in force for a given state and combination of attributes.*
Total Coverage *– The total building and contents coverage for the policies in force.*
Total Written Premium + FPF *– This represents the sum of the premium and FPF (federal policy fee) for the policies in force.*

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

Overall participation by individuals and business in the NFIP appears to be low. Potential reasons are:

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

[10] Washington Military Department Emergency Management Division. Washington State Enhanced Hazard Mitigation Plan. Available online at https://mil.wa.gov/asset/5d1626c2229c8. 10/1/2018.
[11] National Flood Insurance Program. "Reports". https://nfipservices.floodsmart.gov/home/reports. November, 2020.

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

IMPACTS OF FLOOD EVENTS BY JURISDICTION

GARFIELD COUNTY

The number of structures within each identified flood zone was calculated using a Washington State structure GIS layer. Currently, there are approximately 52 structures within the FEMA-identified floodplain in the community of Pataha. There are an additional 13 structures in the Pataha Creek floodplain upstream of the Pataha Valley and another 39 structures in the floodplain west of Pomeroy.

FIGURE 1: MAP SHOWING FEMA FLOOD ZONES IN GARFIELD COUNTY

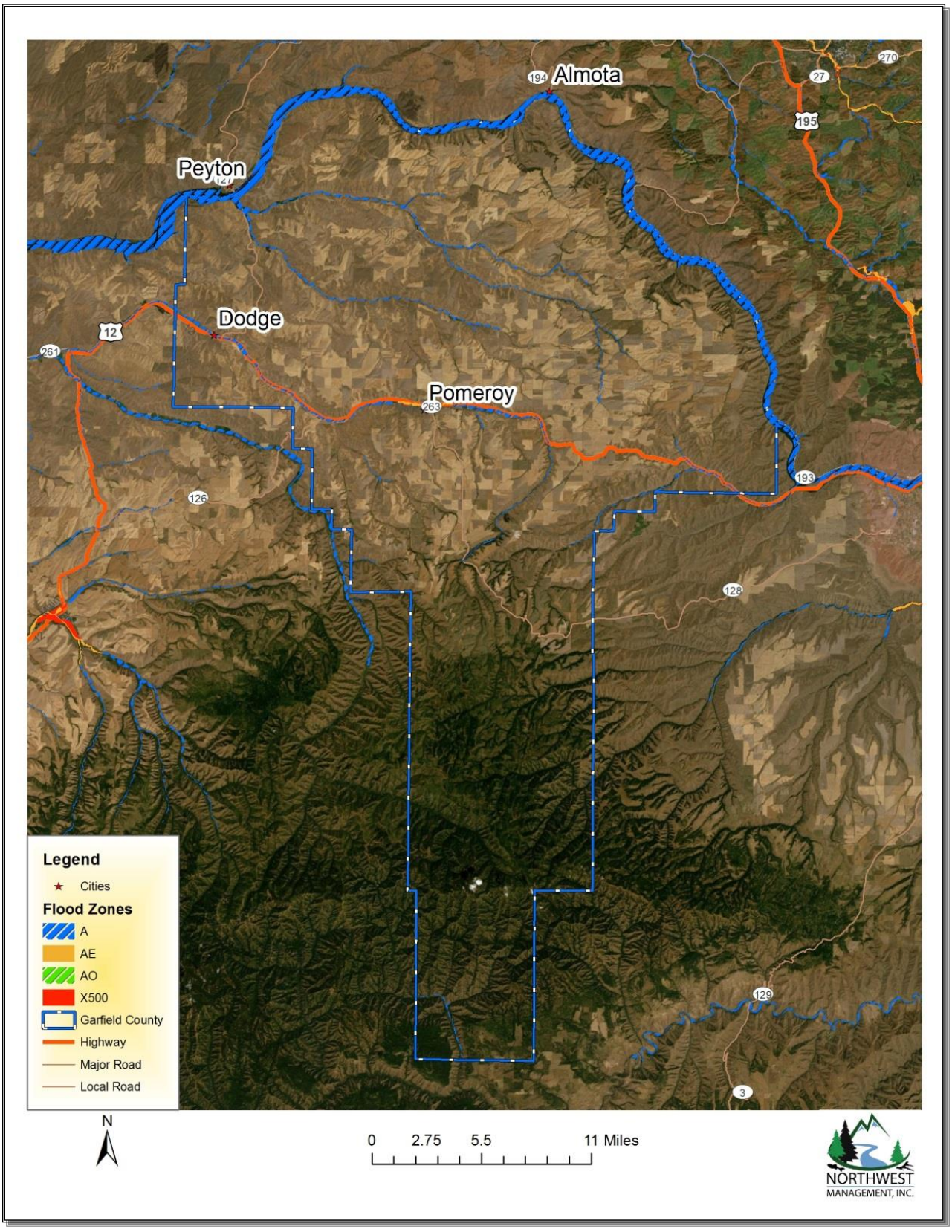


FIGURE 2: PATAHA AREA STRUCTURES IN FLOOD ZONE

FIGURE 3: PATAHA CREEK AREA STRUCTURES IN FLOOD ZONE

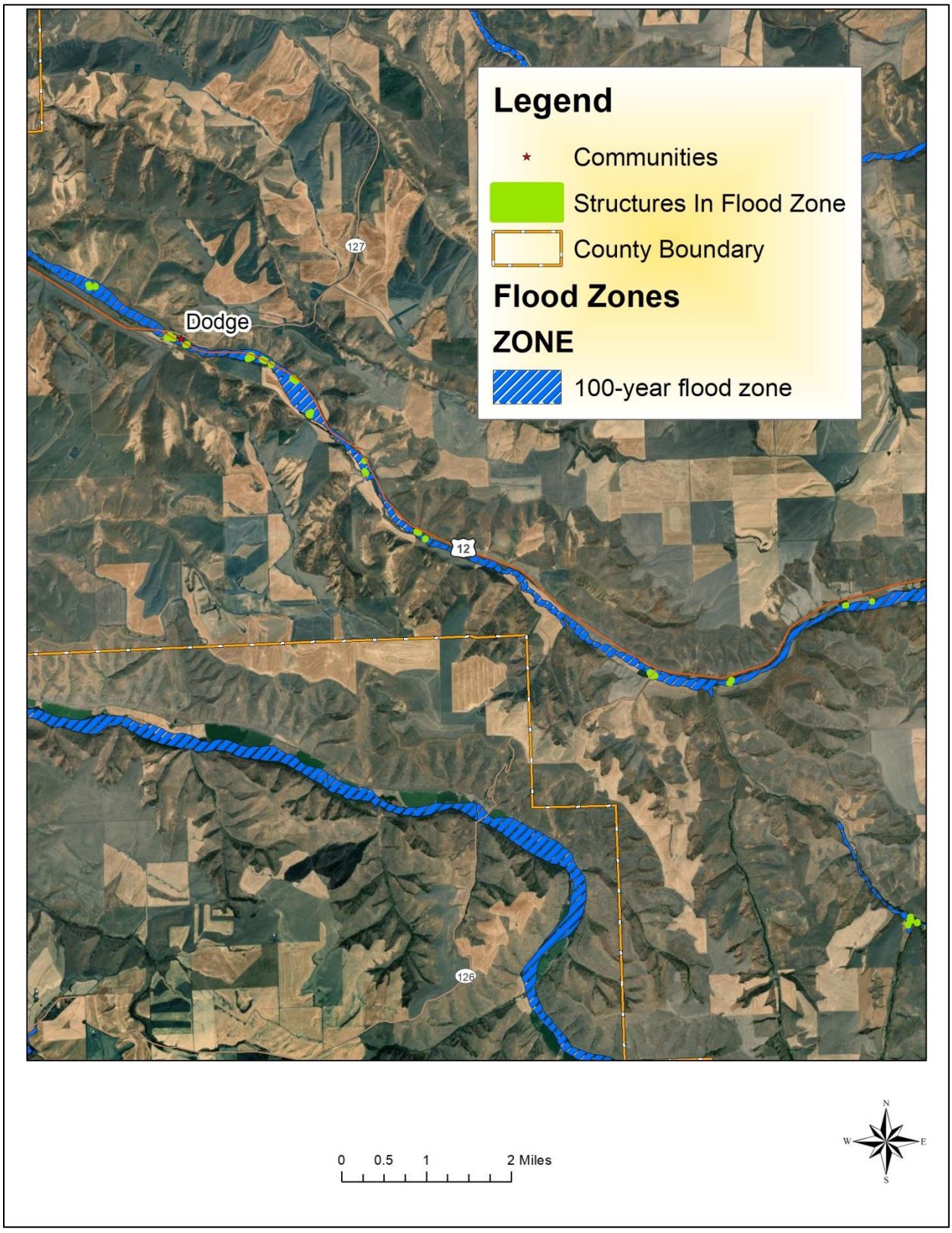


FIGURE 4: UPPER PATAHA CREEK AREA STRUCTURES IN FLOOD ZONE

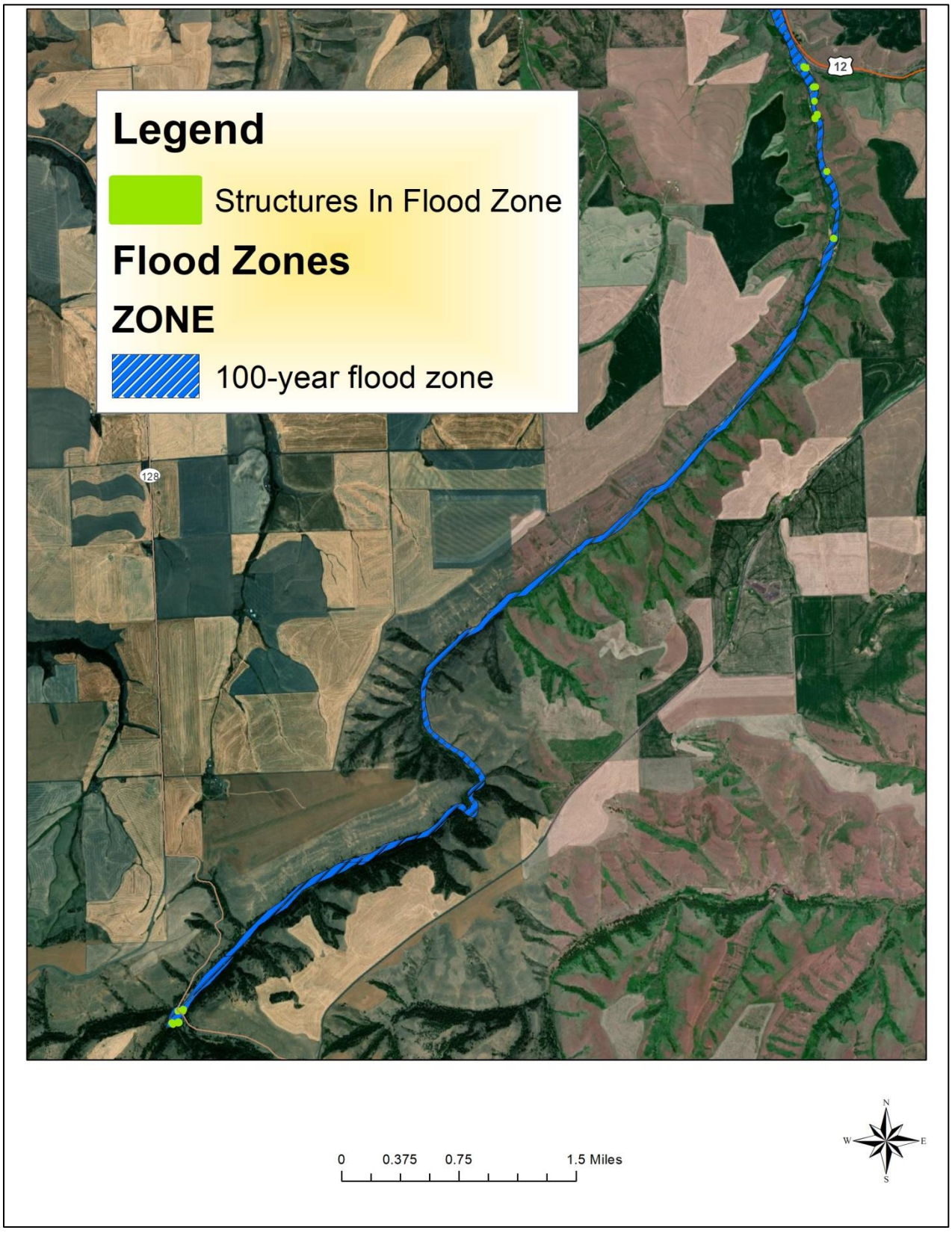
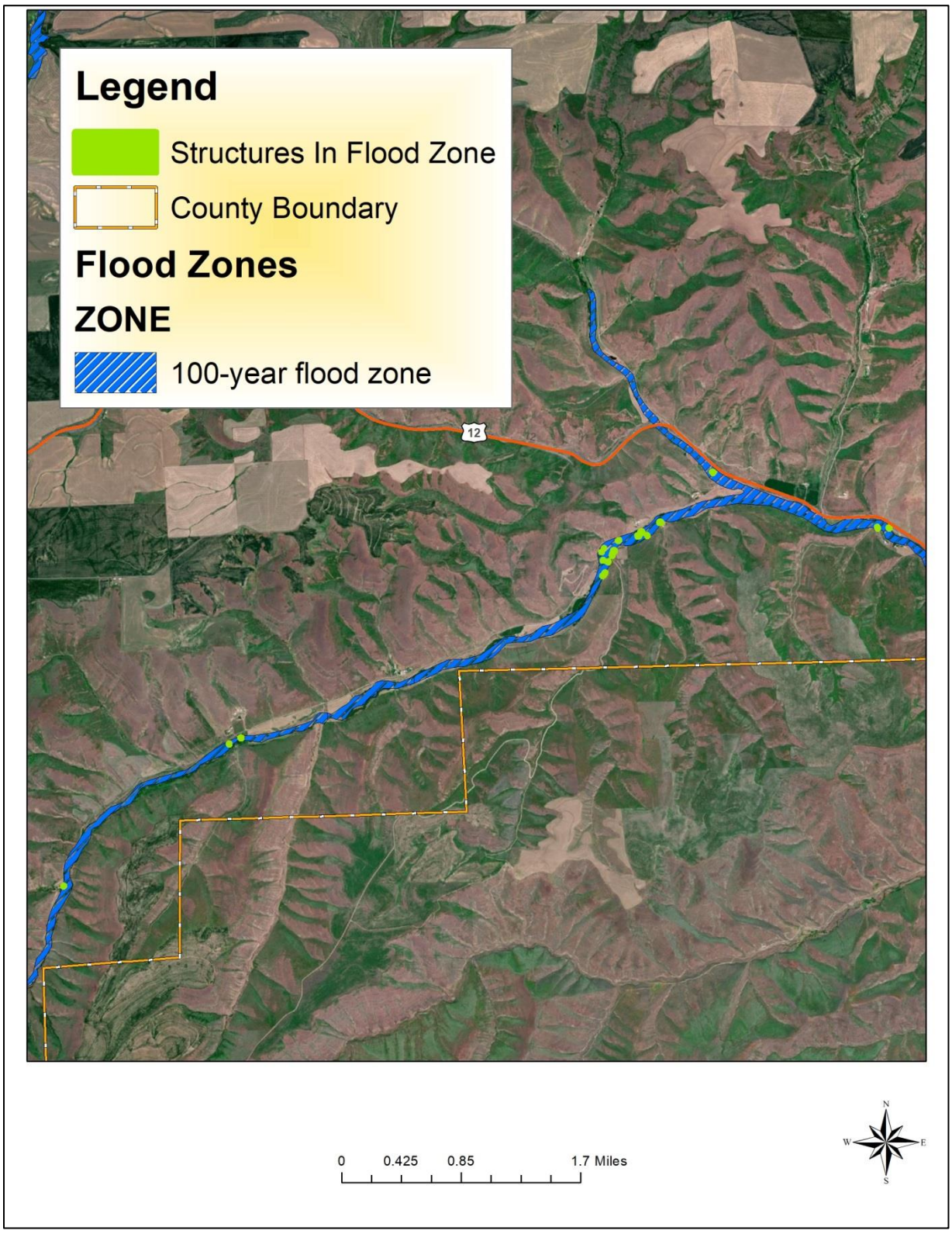


FIGURE 5: DEADMAN CREEK AND MEADOW CREEK AREA STRUCTURES IN FLOOD ZONE

FIGURE 6: ALPOWA CREEK AREA STRUCTURES IN FLOOD ZONE



Due to the lack of significant topography as well as population in the Deadman Creek and Meadow Creek drainages, flooding on these waterways typically results in the floodwaters occupying their natural floodplain at low depths. Damage from flood events in this area is generally minor; however, there are approximately 30 structures in the FEMA-identified Meadow Creek floodplain and 33 structures in the Deadman Creek floodplain (north and south forks).

There are currently about 17 structures in the FEMA-identified floodplain for Alpowa Creek in Garfield County. These structures are primarily located in the upper reaches of the drainage.In the event of a major flood on the Snake River, State Highway 127 at Central Ferry and Lower Granite Dam are the most vulnerable. There are 23 residences and other structures near Lower Granite Dam in Garfield County within the FEMA-identified floodplain for the Snake River.

Critical infrastructure located within the identified floodplain for the unincorporated areas of the County includes the Central Ferry Bridge, Lower Granite Dam, two electrical substations (one at Lower Granite Dam and one at Weimer Gulch and Meadow Creek), Butler Spring, and the water well near the Fairgrounds.

Value of Resources at Risk

There are approximately 955 parcels within the FEMA-identified floodplains (100- and 500-year) in all of Garfield County, and 469 total assessed improvements, yielding a total improvement value of more than $39.3 million. There are currently no repetitive loss properties in Garfield County. The average value of improvements in the flood zone is $83,810.

CITY OF POMEROY

The main channel of Pataha Creek runs directly through the city of Pomeroy on the south side of U.S. Highway 12; primarily between Columbia Street and Pataha Street. Within Pomeroy, flooding is generally limited to large rain-on-snow events such as occurred in 1996 due to the relatively deep stream bed and flood control measures. Flash floods along this stretch of the watershed are not likely to cause significant damage. Nevertheless, debris blockages often occur along Pataha Creek near the trailer park, 9th Street, and 8th Street as well as on 20th and 21st Streets. Debris or ice tends to get caught at bridge abuments causing the channel to become constricted and floodwaters to back up. The city of Pomeroy and Garfield County are aware of the trouble spots and frequently check the channel for blockages that could cause flooding.

Benjamin Gulch is a small tributary of Pataha Creek that joins the main channel from the south at Pomeroy. Benjamin Gulch is prone to both high runoff events and flash flooding. Flash flooding may also occur due to runoff in the much smaller Heaton Gulch, Pomeroy Hill, and Dutch Flat drainages, which also flow into Pataha Creek at Pomeroy. These drainages are normally dry, but due to steep topography and a lack of larger vegetation, flash flooding as a result of a localized storm could have serious impacts on people and structures at the mouth of these draws.

Pomeroy's municipal water system is supplied by several wells in the area. Flooding as well as several other hazards and numerous potential non-point sources could cause contamination of the water supply

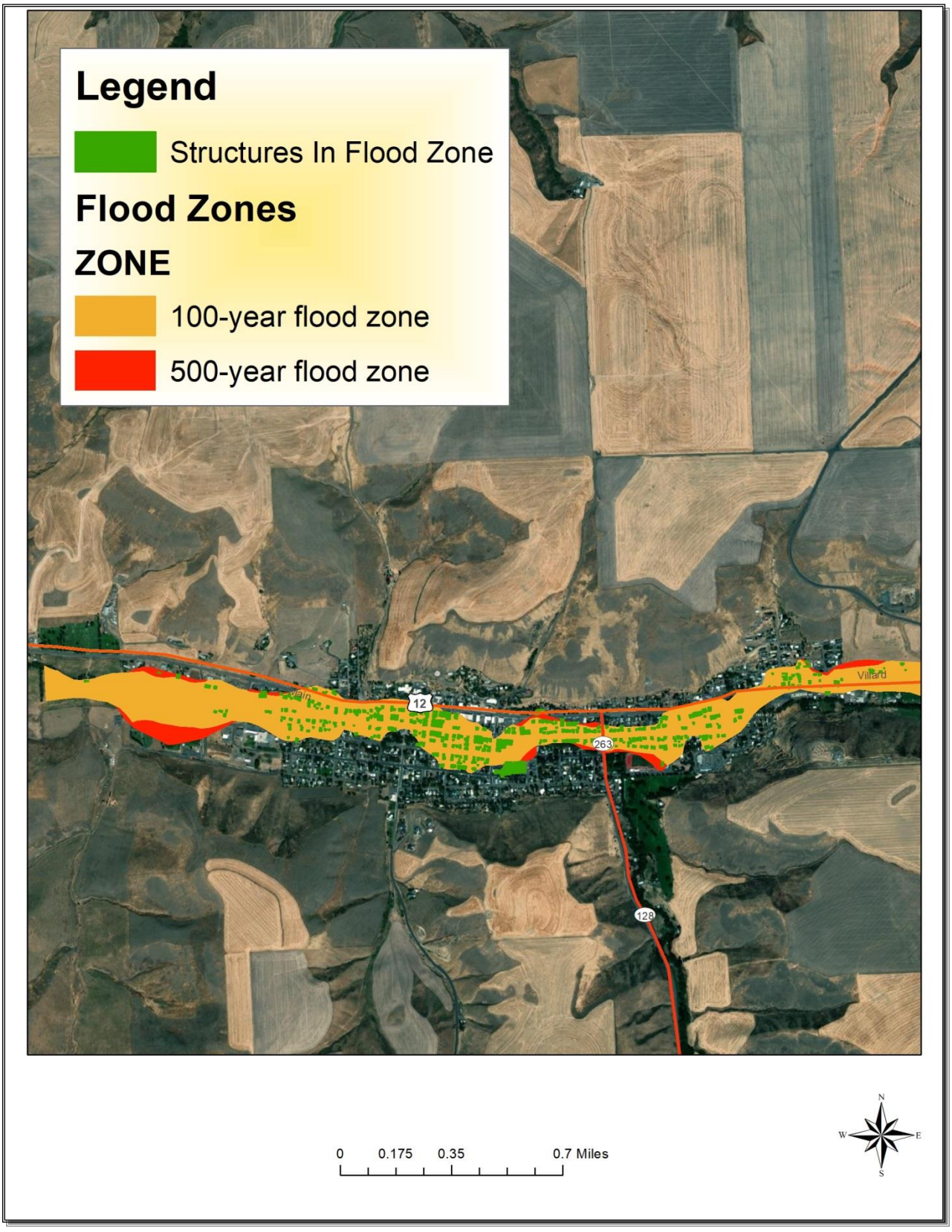
or affect the capacity of the system. All of the homes and businesses in Pomeroy and the Pataha area are fed by the municipal system; thus, the impact of these events could affect the majority of the population including the hospital and schools.

Value of Resources at Risk

There are approximately 406 parcels within the FEMA-identified floodplains (100- and 500-year) in Pomeroy, and 306 total assessed improvements, yielding a total improvement value of more than $25.3 million. The number of structures within the flood zone in Pomeroy was calculated using a Washington State GIS structures layer. The Pomeroy flood zone contains an estimated 312 structures.

Critical infrastructure located within the identified floodplain for Pomeroy includes the City shop, Pomeroy Elementary and High Schools, the Senior Center (also a community shelter), the municipal water system, and the sewer treatment facility. The sewer treatment facility is located on the west end of Pomeroy on the south side of Pataha Creek. The facility is technically located in the floodplain; however, the city has elevated the infrastructure to a height that is not likely to be damaged by normal flood events.

FIGURE 7: CITY OF POMEROY STRUCTURES IN FLOOD ZONE



GARFIELD COUNTY FIRE DISTRICT #1

The Fire District is not located in the FEMA-identified floodplain; thus, does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, a flash flood on Pomeroy Hill and any resulting mudflows could impact the fire station. This type of event could also hinder the District's response capabilities due to floodwaters or debris blocking the access points.

Value of Resources at Risk

The Garfield County Fire District #1 station in Pomeroy has a small chance of being impacted by flash flooding. The combined stations are valued at $1,500,000 with an additional $1,500,000 worth of contents. During a typically flood event along Pataha Creek, the District provides emergency response capabilities and/or manpower for flood control measures such as sandbagging.

POMEROY CONSERVATION DISTRICT

The Pomeroy Conservation District office is located in downtown Pomeroy. The facility as well as assets owned by the District are not located in a floodplain. Nevertheless, the Conservation District is involved with many area landowners on flood diversion and erosion mitigation projects on a regular basis. Garfield County is an agriculturally-based community; thus, protecting crops, structures, and other property from the effects of flooding and erosion as a result of runoff, is a primary objective for the Conservation District.

Value of Resources at Risk

The Pomeroy Conservation District facility in Pomeroy is not in the floodplain. The District has no direct risk of flood damage.

POMEROY SCHOOL DISTRICT #110

The Pomeroy School District No. 110 campus straddles Pataha Creek between South 10th Street and South 12th Street in Pomeroy. The Elementary School sits on the north side of the creek and the High School is located on the south side of Pataha Creek. Both structures are included in the FEMA-identified floodplain. Pataha Street runs between the two structures with the creek on the north side of the roadway.

The Pataha Creek channel is well-developed along this stretch; thus, it is unlikely that even very high water events would cause major flooding onto the School grounds. However, there is a high potential for debris to cause a blockage at the bridge on South 10th Street, which is located just off the southwest corner of the Elementary School. Restricted flow during a high water event could cause floodwaters to back up and eventually exceed the channel's capacity. The Elementary School yard and ball fields and the High School parking lot would likely be inundated prior to floodwaters reaching the structures. Additionally, flooding and/or blockages occurring upstream could also have serious impacts on the School.

Value of Resources at Risk

In the event of a large flood event that temporarily closed either one or both of the Schools, children would likely be sent to the Catholic School or the Fairgrounds to continue regular classes. Replacement of the existing School District No. 110 structures would cost an estimated 18.5 million.

GARFIELD COUNTY HEALTH DISTRICT

The Garfield County Health District office is located at the Pomeroy Elementary School, which is within the FEMA-identified floodplain of Pataha Creek. Public Health would have the same vulnerabilities to flooding as the School District. In addition, the Public Health office would be responsible for preventing and/or responding to contamination of the city's water supply. The municipal water system is primarily fed by springs; thus, it is vulnerable to contamination from numerous non-point sources. The District is also responsible for any illnesses (gastroenteritis type diseases) that are directly linked to a flood event, such as West Nile.

Value of Resources at Risk

In the event of a large flood event that temporarily closed the Elementary School, Public Health would close its office and vacate to another location. The Public Health District does not own any facilities at risk to floods; however, their equipment, files, and other assets may be damaged.

PORT OF GARFIELD

The Port of Garfield office and warehouse is located within the floodplain of Pataha Creek. The warehouse and part of the back portion of the office is rented. It is likely that both structures as well as the contents would incur severe damages or even total loss during a severe flood event.

Value of Resources at Risk

The Port of Garfield office facility is valued at $1.6 million with its contents estimated value at $700,000 (half of the structure value). The warehouse facility has an approximate value of $500,000.

GARFIELD COUNTY HOSPITAL DISTRICT

Garfield County Memorial Hospital is located in Pomeroy on the north side of town. The hospital facilities including the ambulance garage, Medstar landing pad, and long-term care home are outside of any floodplains. In the event of a flood on Pataha Creek or even the occasional flash flood in Heaton Gulch about 200 yards to the west, Memorial Hospital would not be impacted directly. Nevertheless, the hospital may see an increase in injuries as a result of flood events. In addition, the hospital facilities are dependent on Pomeroy's municipal water system. A flood event may impact or contaminate the community's water supply.

During normal operations, the Hospital has approximately 10 available beds. An additional 25 beds are available at the long-term care facility. Relocating individuals from either of these facilities as a result of a flood or other hazard event would be very difficult.

Value of Resources at Risk

Memorial Hospital has no known assets or other resources at direct risk to flooding.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

Flood events would primarily affect GCTA by impacting transportation routes and disrupt its service. Washed out or flooded roads could cause closures, leading to temporary suspensions. This would negatively affect many people who rely on GCTA services.

Value of Resources at Risk

GCTA has no known assets or other resources at direct risk to flooding.

EARTHQUAKE HAZARD PROFILE

According to the USGS, "An earthquake is the ground shaking caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that we feel during an earthquake. Faults are caused by the tectonic plates grinding and scraping against each other as they continuously and slowly move."

Washington has the second highest risk of economic loss from earthquakes in the U.S., only behind California.[12] They may affect large areas, cause great damage to structures, cause injury, loss of life and alter the socioeconomic functioning of the communities involved. The hazard of earthquakes varies from place to place, dependent upon the regional and local geology.

OVERVIEW OF EARTHQUAKE HAZARDS[13]

Primary earthquake hazards include:

- **Ground shaking**: "The Earth shakes with the passage of earthquake waves, which radiate energy that had been "stored" in stressed rocks, and were released when a fault broke and the rocks slipped to relieve the pent-up stress."
- **Landslides**: "…includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows."
- **Liquefaction**: "…a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading." (whereupon they *liquefy* and act as a fluid)
- **Surface rupture**: "…an offset of the ground surface when fault rupture extends to the Earth's surface. Any structure built across the fault is at risk of being torn apart as the two sides of the fault slip past each other."

Secondary earthquake hazards include tsunami, seiche, flooding, and fire. Earthquakes may cause landslides and rupture dams. Severe earthquakes destroy power and telephone lines, gas, sewer, or water mains, which, in turn, may set off fires and/or hinder firefighting or rescue efforts. Earthquakes also may cause buildings and bridges to collapse.

Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated landfill and other unstable soil, or trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths and injuries and extensive property damage.

[12] Washington Military Department Emergency Management Division. "Washington State Enhanced Hazard Mitigation Plan." available online at https://mil.wa.gov/asset/5d1626c2229c8. September 2020.
[13] Pacific Northwest Seismic Network. "Earthquake Hazards Overview". available online at https://www.pnsn.org/outreach/earthquakehazards. September 2020.

The USGS says that aftershock and foreshock are terms that describe earthquakes relative to the main earthquake event. "Aftershocks are smaller earthquakes that occur in the same general area during the days to years following a larger event…" The USGS also states: "As a general rule, aftershocks represent readjustments in the vicinity of a fault that slipped at the time of the 'mainshock'. The frequency of these aftershocks decreases with time. If an aftershock is larger than the first earthquake then we call it the 'mainshock' and the previous earthquakes in a sequence become foreshocks."[14]

Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related injuries result from collapsing walls, flying glass, and falling objects as a result of the ground shaking, or people trying to move more than a few feet during the shaking.[15]

Overview of Earthquake Sources[16]

- **Deep earthquakes**: "The most common source of damaging earthquakes in Washington and Oregon are deep earthquakes that rupture faults within the subducting Juan de Fuca plate - "intraplate" earthquakes." Deep earthquakes in 1949 and 1965 together killed 15 people and caused more than $500 million (2020 dollars) in property damage. The other deep earthquake (highlighted in red in Figure 8) is referring to the 2001 Nisqually earthquake.

- **Crustal earthquakes**: "Shallow earthquakes in Cascadia, with depths no greater than about 35 km, are caused by the rupture of faults within the North American Plate." Shallow (crustal) faults can cause intense local shaking – urban areas are especially vulnerable. The Puget Sound Region has the highest risk for large crustal earthquakes, though evidence has been found for large earthquakes in eastern Washington near Wenatchee, Yakima and further east, near Richland.

- **Cascadia Subduction Zone "megathrust" fault**: "The Juan de Fuca plate moves toward, and eventually is shoved beneath, the continent (North American plate)."

- **Volcanic earthquakes**: "Volcanically triggered earthquakes have the potential to cause cracks, ground deformation, and damage to manmade structures. They typically are much smaller than earthquakes caused by non-volcanic sources. The largest felt volcanic earthquake in the Cascades was a magnitude 5.5 in 1981, under Mount St. Helens."

[14] USGS. "Earthquake Facts & Earthquake Fantasy". available online at https://www.usgs.gov/natural-hazards/earthquake-hazards/science/earthquake-facts-earthquake-fantasy?qt-science_center_objects=0#qt-science_center_objects. September 2020.
[15] FEMA. Federal Emergency Management Agency. Available online at www.fema.gov. September 2007.
[16] Pacific Northwest Seismic Network. "PNW Earthquake Sources Overview". available online at https://www.pnsn.org/outreach/earthquakesources. September 2020.

FIGURE 8: SOURCES OF EARTHQUAKES IN WASHINGTON[17]

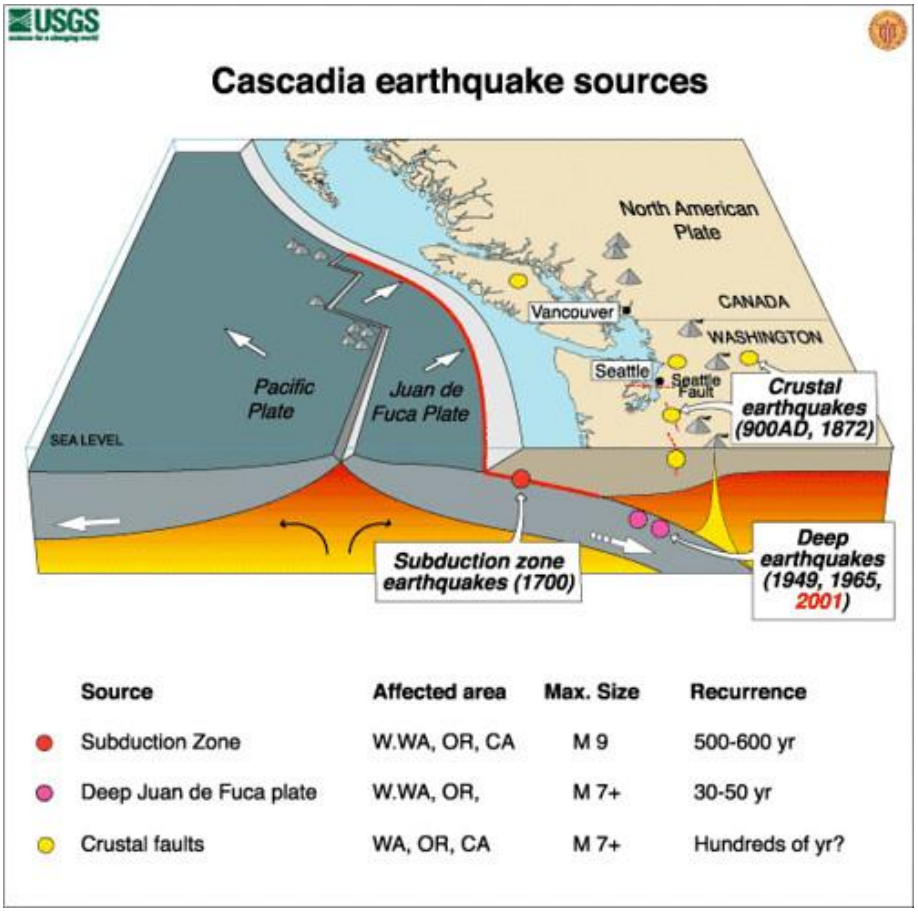
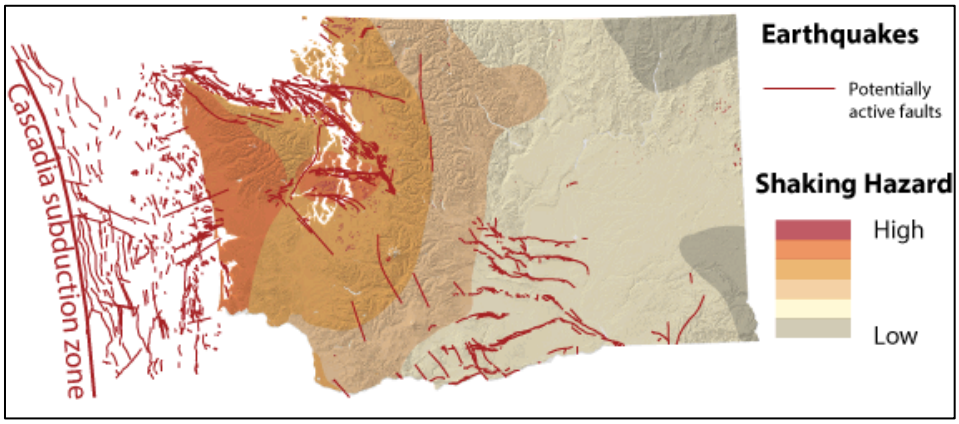


FIGURE 9: SEISMIC RISK FROM HIGH TO LOW AND POTENTIALLY ACTIVE FAULTS IN WASHINGTON[18]



[17] Pacific Northwest Seismic Network. "PNW Earthquake Sources Overview". available online at https://www.pnsn.org/outreach/earthquakesources. September 2020.

[18] Washington Department of Natural Resources. "Earthquakes and Faults". https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/earthquakes-and-faults

TABLE 15: SELECTED EARTHQUAKES IN WASHINGTON[19]

Date	Location	Magnitude	Deaths	Injuries	Total damage
2/28/2001	Puget Sound	6.8	0-1	400	$1-4 billion
7/3/1999	Satsop	5.8	0	7	$8.1 million
4/29/1965	Puget Sound	6.7	7		$12.5 - $28 million
11/6/1962	Clark County	5.2			Minor
4/13/1949	Olympia	6.7	8	At least 64	$25 million
6/23/1946	Strait of Georgia	7.3	2		Limited
4/29/1945	North Bend	5.5			Minor
12/15/1872	North Cascades	6.5 – 7			

The 2001 Nisqually earthquake occurred on February 28 and was centered near the Nisqually Delta northwest of Olympia. The quake lasted about 40 seconds and structures in Olympia were impacted the most, including the state capitol building.

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

Structures that are in compliance with the 1970 Uniform Building Codes (UBC), which are now replaced by the International Building Code, are generally less vulnerable to seismic damages because that was when the UBC started including seismic construction standards to be applied based on regional location. This stipulated that all structures be constructed to at least seismic risk Zone 2 Standards. The State of Washington adopted the UBC as its state building code in 1972, so it is assumed that buildings built after that date were built in conformance with UBC seismic standards and have a lesser degree of vulnerability. Obviously, issues such as code enforcement and code compliance are factors that could impact this assumption. However, for planning purposes, establishing this line of demarcation can be an effective tool for estimating vulnerability. In 1994, seismic risk Zone 3 Standards of the UBC went into effect in Washington, requiring all new construction to be capable of withstanding the effects of 0.3 times the force of gravity. More recent housing stock is in compliance with Zone 3 standards. In 2003, the state again upgraded the building code to follow International Building Code Standards.

The Washington State Legislature also adopted the 2006 version of the International Residential Code (2006 WBCC) as the official state building code starting on July 1, 2007. The 2006 IRC governs the new construction of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with separate means of egress. Provisions in the

[19] Wikipedia. "List of Earthquakes in Washington". available online at https://en.wikipedia.org/wiki/List_of_earthquakes_in_Washington_(state).

2006 IRC for earthquake structural and foundation design are determined by the seismic design category of a proposed structure as defined in Figure R301.2(2) of the 2006 IRC.[20]

EARTHQUAKE RISK ASSESSMENT

LOCAL EVENT HISTORY

Based on historical records, Garfield County has not experienced any seriously damaging earthquakes in recorded history. Several distant earthquakes produced intensities strong enough to be felt in southeastern Washington, but only two earthquakes epicenters, one in 1893 and another in 1936, were recorded for the region. Both of these earthquakes were rated as a VII on the Modified Mercalli intensity scale and produced only very slight property damages such as broken dishes and cracked plaster.[21]

PROBABILITY OF FUTURE EVENTS

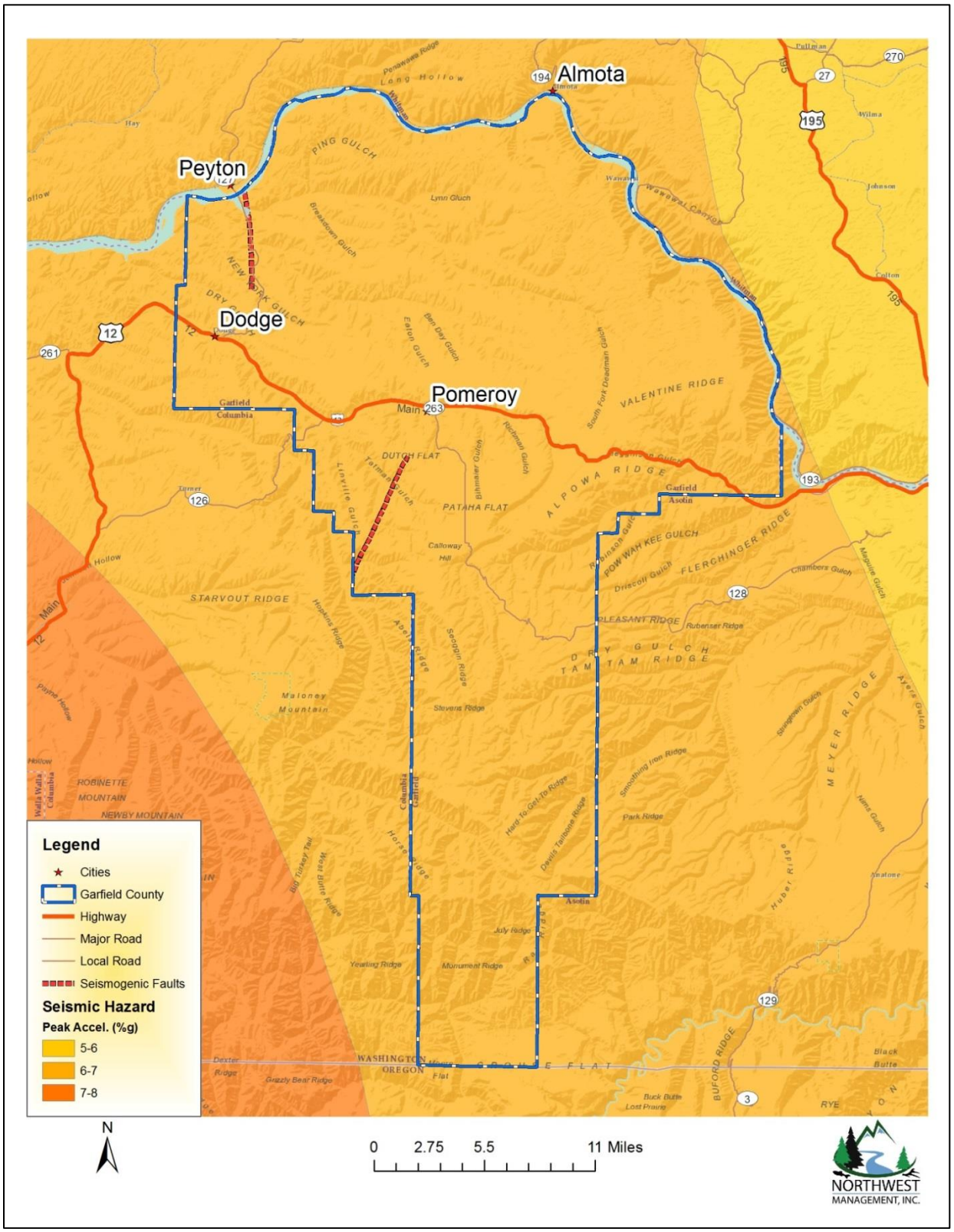
Garfield County can expect some structural failure of older multistory unreinforced masonry buildings as a result of even lower intensity earthquakes. Cornices, frieze, and other heavy decorative portions of these types of structures may fail. The potential impacts of a substantial earthquake event are highly variable. Many of the structures and infrastructure throughout the county may not incur any damages at all; however, damage to roads, bridges, unreinforced masonry, chimneys, foundations, water lines, and many other components are at risk. Fires can also be a secondary hazard to structures sustaining earthquake damage.

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

There are two fault lines in Garfield County. One is a short segment located near Dodge and running due north to the Snake River. The other begins south of Pomeroy and runs in a southwestern direction into Columbia County. Neither of these faults is currently active. As seen in Figure 10, Garfield County has a 10% chance of exceeding a 6-7% pga in the next 50 years. No specific jurisdictions or special districts were identified as having differing issues or levels of risk associated with this hazard.

[20] FEMA. "Homebuilders Guide to Earthquake Resistant Design and Construction." available online at https://www.fema.gov/media-library-data/20130726-1535-20490-7694/fema232part1.pdf. September 2020.
[21] Noson, Linda Lawrance, et al. Washington State Earthquake Hazards. Washington Division of Geology and Earth Resources Information Circular 85. Olympia, Washington. 1988.

FIGURE 10: SEISMIC HAZARD RISK IN GARFIELD COUNTY



IMPACTS OF EARTHQUAKE EVENTS BY JURISDICTION

GARFIELD COUNTY

Past events suggest that an earthquake in the Garfield County area would cause little to no damage. Nonetheless, severity can increase in areas that have softer soils, such as unconsolidated sediments. Damage would be negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; and considerable in poorly built, old, or badly designed structures.

Value of Resources at Risk

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

There are no known publicly accessible unreinforced masonry buildings in the unincorporated areas of Garfield County. The number and value of unreinforced masonry homes or homes with masonry chimneys throughout Garfield County is unknown.

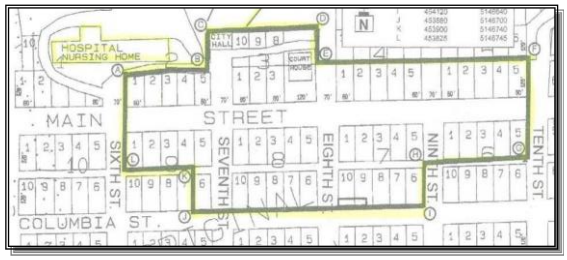
CITY OF POMEROY

There are no recorded occurrences of earthquakes significantly impacting the city of Pomeroy; however, some minimal shaking has been felt as a result of larger earthquakes elsewhere. Pomeroy has 10% chance of exceeding a 6-7% pga in the next 50 years and does not have any differing issues or levels of risk associated with this hazard than Garfield County as a whole.

Value of Resources at Risk

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

In Pomeroy, nearly all of the downtown Historic District structures (estimated at 61 structures) are likely unreinforced masonry. Additionally, the Garfield County Courthouse, City Hall, Garfield County Memorial Hospital, the Pomeroy School, the Methodist Church, and the Catholic Church are public buildings constructed of unreinforced masonry. The number and value of unreinforced masonry homes or homes with masonry chimneys in Pomeroy is unknown.



GARFIELD COUNTY FIRE DISTRICT #1

There are no recorded occurrences of earthquakes significantly impacting Garfield County Fire District #1. The area covered by the District has a 10% chance of exceeding a 6-7% pga in the next 50 years and does not have any differing issues or levels of risk associated with this hazard than Garfield County as a whole. However, in the event of a damaging earthquake, Fire District #1 would provide emergency response and search and rescue services.

Value of Resources at Risk

The Garfield County Fire District #1 station in Pomeroy was built with concrete blocks in the 1950s; thus, it is likely an unreinforced masonry structure. The combined stations are valued at $1,500,000 with an additional $1,500,000 worth of contents. The ambulance garage is a wood frame structure dating to the 1980s and has a low probability of incurring damage during an earthquake. However, the rock wall near the ambulance bay could be susceptible to shaking damages; possibly toppling into the ambulance garage. The ambulance garage is valued at approximately $80,000 with an additional $280,000 worth of contents.

POMEROY CONSERVATION DISTRICT

There are no recorded occurrences of earthquakes significantly impacting the Pomeroy Conservation District. The area covered by the District has a 10% chance of exceeding a 6-7% pga in the next 50 years and does not have any differing issues or levels of risk associated with this hazard than Garfield County as a whole.

Value of Resources at Risk

The building occupied by the Pomeroy Conservation District was built in the 1960s and is likely unreinforced masonry. The building is valued at $350,000 with an additional $100,000 worth of contents.

POMEROY SCHOOL DISTRICT #110

There are no recorded occurrences of earthquakes significantly impacting Pomeroy School District No. 110. The area covered by the District has a 10% chance of exceeding a 6-7% pga in the next 50 years. The Pomeroy High School is located on soils that have been proven unstable for construction purposes as evidenced by the settling and sinking that is currently causing structural damages to the facility. Even a minor earthquake could exacerbate this situation.

In the event of a damaging earthquake during school hours, the School District would also be responsible for the safety of over 400 children. Since both of the School structures are unreinforced masonry, sheltering at this facility is not an option.

Value of Resources at Risk

The Pomeroy schools are older, unreinforced masonry structures. It is likely that structural damage resulting from an earthquake would close the school due to safety issues until repairs or reconstruction could occur. This would cause the District to either set up temporary facilities and/or transport children

to schools outside the District, either of which would result in considerable costs and hardships to constituents. Replacement of the existing School District No. 110 structures would cost an estimated 18.5 million.

GARFIELD COUNTY HEALTH DISTRICT

There are no recorded occurrences of earthquakes significantly impacting Garfield County Health District. The area covered by the District has a 10% chance of exceeding a 6-7% pga in the next 50 years and does not have any differing issues or levels of risk associated with this hazard than Garfield County as a whole. However, in the event of a damaging earthquake, the Garfield County Health District may have difficulty communicating with other departments and agencies in Pomeroy and Garfield County due to a lack of integration with their system.

Value of Resources at Risk

The Public Health office is located at the Pomeroy Elementary School, which is an unreinforced masonry structure. However, the structure is owned by the School District; thus, the Public Health District is not responsible for damages or upgrades to the facility.

PORT OF GARFIELD

There are no recorded occurrences of earthquakes significantly impacting the Port of Garfield. The Port is located in an area that has a 10% chance of exceeding a 6-7% pga in the next 50 years and does not have any differing issues or levels of risk associated with this hazard than Garfield County as a whole.

Value of Resources at Risk

The main Port of Garfield administration building is an unreinforced masonry valued at approximately $ 1.6 million. Structural damage to this building would likely result in temporary, or possibly permanent due to the age of the buildings, closure due to safety hazards. Additionally, major structural damage may result in the loss of the Port's records.

GARFIELD COUNTY HOSPITAL DISTRICT

There are no recorded occurrences of earthquakes significantly impacting the Garfield County Hospital District. The area covered by the District has a 10% chance of exceeding a 6-7% pga in the next 50 years and does not have any differing issues or levels of risk associated with this hazard than Garfield County as a whole. However, in the event of a damaging earthquake, Garfield County Memorial Hospital would likely experience an influx of injuries resulting from the quake. In the event that the Hospital structure or associated equipment was damaged, patients would require transport to other nearby medical facilities. Longer wait times may lead to more serious injuries or even deaths.

Value of Resources at Risk

Garfield County Memorial Hospital is an unreinforced masonry structure valued at approximately $1 million. Significant damage to the building would likely result in closure of the hospital for safety reasons, until repairs could be made. Additionally, structural damage may, in turn, cause damage or complete loss of much of the medical equipment within the building due to collapses or contamination.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

Garfield County Transportation Authority would be impacted by an earthquake event in the same ways that the county would be impacted. However, if a severe earthquake event caused building closures, building or infrastructure damage, vehicle damage, and other disaster conditions, this would also likely disrupt business as usual for the GCTA and lead to a temporary suspension of services. A closure would negatively impact many people who rely on GCTA services on a regular basis.

Value of Resources at Risk

The GCTA building is an unreinforced masonry structure valued at approximately $1 million. Significant damage to the building would likely result in its closure for safety reasons, until repairs could be made. Building damage could also potentially result in damage to the fleet, valued at $270,000.

LANDSLIDE HAZARD PROFILE

Landslide is a general term for a wide variety of down slope movements of earth materials that result in the perceptible downward and outward movement of soil, rock, and vegetation under the influence of gravity. The materials may move by falling, toppling, sliding, spreading, or flowing. Some landslides are rapid, occurring in seconds, whereas others may take hours, weeks, or even longer to develop. Although landslides usually occur on steep slopes, they also can occur in areas of low relief. Landslides can occur as ground failure of river bluffs, cut and-fill failures that may accompany highway and building excavations, collapse of mine-waste piles, and slope failures associated with quarries and open-pit mines. While gravity is the primary reason for landslides, there can be other contributing factors, including:

- Saturation, by snowmelt or heavy rains, that weaken rock or soils on slopes
- Erosion by rivers, glaciers, or ocean waves that create over-steepened slopes
- Topography of slope – its shape, size, degree of slope and drainage
- Stress from earthquakes magnitude 4.0 and greater can cause weak slopes to fail
- Volcanic eruptions that produce loose ash deposits and debris flows
- Excess weight, from accumulation of rain or snow, from stockpiling of rock or ore, from waste piles, or from manmade structures, may stress weak slopes to failure
- Human action, such as construction, logging or road building that disturbs soils and slopes

Determining probability of future landslide events in specific locations is difficult because so many factors can contribute to the cause of a landslide or ground failure. Landslides typically occur on slopes and in areas where they have taken place before. Areas historically subject to landslides in Washington include the Columbia River Gorge, the banks of Lake Roosevelt, the Interstate 5 corridor, U.S. 101 Highway corridor along the Pacific Coast and from the coast to Olympia, in the Cascades, Olympics, and Blue Mountains and along Puget Sound coastal bluffs.

Washington State has six landslide provinces, each with its own characteristics. Southeastern Washington is part of the Columbia Basin province. This province has extensive layers of sediments intermingling with basalt flows; sediments generally are thicker in the western part of the province. Landslides in this province include slope failures in bedrock and landslides in overlying sediments. Bedrock slope failures are most common in the form of very large ancient slumps or earth flows. A final triggering mechanism appears to have been over-steepening of a slope or removal of toe support by streams or glacial floods. Sediments contemporary with or overlying Columbia River basalt make up a major part of the large landslide complexes in the province. Major landslide problems occurred during the relocation of transportation routes required by the filling of the reservoir behind the John Day

dam.[22] Irrigation in the Columbia Basin compounds the province's landslide problems. For example, irrigation near Pasco has increased drainage and landslide problems ten-fold since 1957.

Landslides range from shallow debris flows to deep-seated slumps. They destroy homes, businesses, and public buildings, undermine bridges, derail railroad cars, interrupt transportation infrastructure, damage utilities, and take lives. Sinkholes affect roads and utilities. Losses often go unrecorded because insurance claims are not filed, no report is made to emergency management, there is no media coverage, or the transportation damages are recorded as regular maintenance.

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

These are characteristics that may be indicative of a landside hazard area:

- Bluff retreat caused by sloughing of bluff sediments, resulting in a vertical bluff face with little vegetation.
- Pre-existing landside area.
- Tension or ground cracks along or near the edge of the top of a bluff.
- Structural damage caused by settling and cracking of building foundations and separation of steps from the main structure.
- Toppling bowed or jack sawed trees.
- Gullying and surface erosion.
- Mid-slope ground water seepage from a bluff face.

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

The primary factors that increase landslide risk are slope and certain soil characteristics. In general, the potential for landslide occurrence intensifies as slope increases on all soil types and across a wide range of geological formations. Landslide may occur on slopes steepened by man during construction, or on natural ground never disturbed. However, most slides occur in areas that have had sliding in the past. All landslides are initiated by factors such as weaknesses in the rock and soil, earthquake activity, the occurrence of heavy snow or rainfall, or construction activity that changes a critical factor involved with maintaining stability of the soil or geology of the area. A prime example of this includes previously stable

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

slopes where home construction utilizing independent septic systems are added. The increased moisture in the ground, when coupled with an impermeable layer below the septic systems has led to surface soil movements and mass wasting.

Landslides can be triggered by natural changes in the environment or by human activities. Inherent weaknesses in the rock or soil often combine with one or more triggering events, such as heavy rain, snowmelt, or changes in ground water level. Late spring-early summer is slide season, particularly after days and weeks of greater than normal precipitation. Long-term climate change may result in an increase in precipitation and ground saturation and a rise in ground-water level, reducing the shear strength and increasing the weight of the soil.

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

Landslides are a recurrent menace to waterways and highways and a threat to homes, schools, businesses, and other facilities. The unimpeded movement over roads—whether for commerce, public utilities, school, emergencies, police, recreation, or tourism—is essential to the normal functioning of southeastern Washington. The disruption and dislocation of these or any other routes caused by landslides can quickly jeopardize travel and vital services. Although small slumps on cut and fill slopes along roads and highways is relatively common, nearly all of the landslide risk in Garfield County is associated with the steeper slopes of the Blue Mountains. There are very few structures and little infrastructure at risk in the landslide prone areas of the Blue Mountains; however, a major slide could cause severe damage to any of the major watersheds, which would have significant negative impacts on communities downstream.

LANDSLIDE RISK ASSESSMENT

LOCAL EVENT HISTORY

To date, there is no recorded history of major landslides occurring in Garfield County. Nevertheless, there are some areas in Columbia County that have specific landslide concerns. Areas that are generally prone to landslides are:

- On existing landslides, old or recent
- On or at the base or top of slopes
- In or at the base of minor drainage hollows
- At the base or top of an old fill slope
- At the base or top of a steep cut slope

The majority of the landslide potential in Garfield County occurs in the more remote areas of the Blue Mountains on the southern end of the County as well as along some sections of the Snake River. Most of the landslide damage potential due to development occurs in east Pomeroy and a small populated area near Lower Granite Dam. The probability of occurrence of major, high velocity landslide hazard events, including those caused by severe local storms, is low.

February 1996 – Stafford Act disaster assistance totalled $113 million and Small Business Administration disaster loans approved $61.2 million. The National Weather Service, Seattle Forecast Office considers this storm one of the top 10 weather events in Washington during the 20th Century. Near-record snowfall in January followed by warm, heavy rain, mild temperatures and snowmelt in February caused flooding, mudflows and landslides throughout the state. The storm caused three deaths, and 10 people were injured. Landslides damaged or destroyed nearly 8,000 homes, and closed traffic along major highways for several days. Damage from all causes throughout the Pacific Northwest was at least $800 million. The landslide that created the most significant impact blocked Interstate 5 and the state's main north-south railroad tracks three miles north of Woodland, Cowlitz County. The initial slide on February 8 blocked northbound lanes of I-5; a second, larger slide covered all lanes of the freeway as well as the railroad tracks to the west. It took crews until February 19 to fully reopen the interstate. The highest concentration of landslides occurred at the northwest edge of the Blue Mountains near Walla Walla. The main areas affected were the Mill Creek, Blue Creek, Touchet, Tucannon, and Walla Walla drainages. Debris flows were most numerous on open, grassy hillsides. In the Mill Creek area, debris flows destroyed seven vehicles and five homes. Similar occurrences of flooding and landslides took place in 1931 and 1964.

Probability of Future Events

The only major populated areas and infrastructure in Garfield County occurs in the rolling hills of the Columbia Basin. There is a moderate probability of small slides occurring on slopes ranging from 5-35%. This type of slide is common on the eyebrows of hills, especially where there has been soil disturbance. Generally, these low angle slides will have a low velocity and will not impact structures or infrastructure.

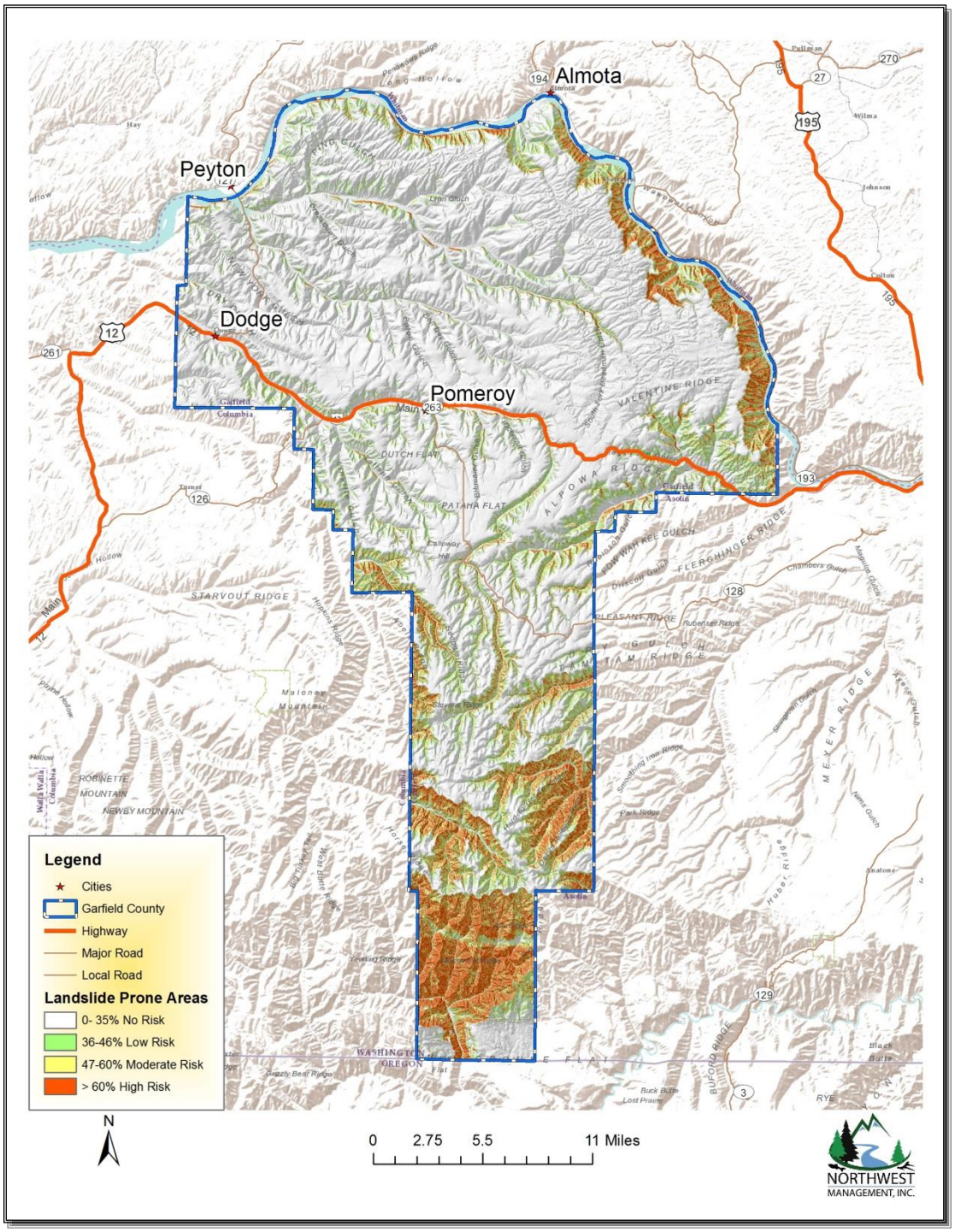
Soil factors that increase the potential for landslide are soils developed from parent materials high in schist and granite, and soils that are less permeable containing a resistive or hardpan layer. These soils tend to exhibit higher landslide potential under saturated conditions than do well drained soils. To determine the high-risk soils in Garfield County, the NRCS State Soils Geographic Database (STATSGO) layer was used to identify the location and characteristics of all soils in the County. The specific characteristics of each major soil type within the County were reviewed. According to this database, it was determined that the soils in Garfield County generally are not developed from schist and granitic parent materials, indicating that landslide potential is primarily due to factors associated with gravity and slope.

To portray areas of probable landslide risk due to slope related factors, slope models were used to identify areas of low, moderate and high risk. This analysis identified the low risk areas as slopes in the range of 20°-25° (36-46%), moderate as 26°-30° (48-60%) and high risk as slopes in the range of 31°-60°

(60-173%). Slopes that exceeded 60° (173%) were considered low risk due to the fact that sliding most likely had already occurred relieving the area of the potential energy needed for a landslide. From the data layer created by this analysis, it is possible to depict areas of risk and its proximity to development and human activity. With additional reconnaissance, the areas of high risk were further defined by overlaying additional data points identifying actual slide locations, thus improving the resolution by specifically identifying the highest risk areas. This method of analysis is similar to a method developed by the Clearwater National Forest in north central Idaho.[23]

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

FIGURE 11: GARFIELD COUNTY LANDSLIDE PRONE LANDSCAPES



IMPACTS OF LANDSLIDE EVENTS BY JURISDICTION

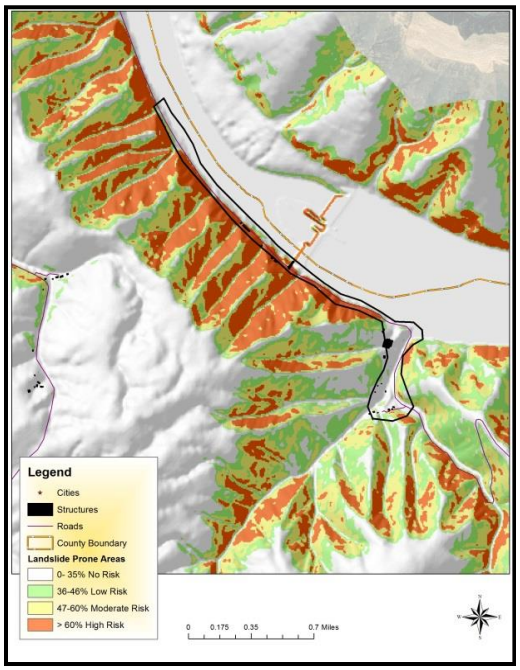
GARFIELD COUNTY

While a large portion of Garfield County is at high risk to landslides, most of this area occupies the most remote mountainous regions. Home and business development in the County has been mainly on lands not at significant risk to landslides.

Much of the populated areas in Garfield County are at risk to flooding, which often results in damaging landslides. Flash floods typically carry large amounts of debris, silt, and rocks that are deposited in downstream floodplains. Additionally, soil saturation ensuing from prolonged periods of rain or flooding can lead to slope instability. Cut and fill slopes, even those well outside of the flood plain, are particularly at risk to slides and/or slumping as a result of soil saturation.

The Lower Granite Landslide Impact Zone encompasses a small population cluster along the Snake River just upstream of Lower Granite Dam on the northern border of the County. In addition to the residences, this Impact Zone may affect the Wawawai Grade.

The slopes in this impact zone are comprised by material deposited by past landslides. In fact, much of the lower slopes near the valley floors are alluvial fans created by sediment being carried downstream and deposited at the mouths of the several small drainages in that area. The presence of this material indicates the historic occurrence of high-energy, short duration floods and debris flows in these chutes in response to severe climatic conditions, such as thunderstorms and rain-on-snow events. These events are historically infrequent, with recurrence cycles on the order of years to decades. However, they can result in significant damage to buildings and infrastructure, disrupt travel, reduce water quality, and jeopardize safety.



Lower Granite Landslide Impact Zone

The largest landslides typically occur where human development or disturbance has exposed landslide-prone sediments to steep topography. Today, initiation and reactivation of landslides is closely tied to unusual climatic events and land-use changes. Even small landslide activity on the upper slopes can transform into high-energy debris flows that endanger roads, buildings, and people below. Landslide debris is highly unstable when modified through natural variations in precipitation, artificial cuts, fills, and changes to surface drainage and ground water.[24]

The primary slope stability problem is associated with the sediments within and along the boundary of the Snake River. The occurrence of new landslides and the reactivation of old landslides increased dramatically with the filling of reservoirs behind the Lower Granite Dam. Drawdowns for flood control

[24] Weisz, D.W., et al. 2003. Surficial Geological Map of the Payette Quadrangle. Idaho and Lewis Counties, Idaho. Idaho Geological Survey.

and power generation also trigger new landslides and/or reactivate and extend old ones. With landslide activity relatively common along hundreds of miles of shoreline, one hazard in such a setting is water waves generated by fast-moving landslide masses.

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

Value of Resources at Risk

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

There are currently 22 structures located in the Lower Granite Landslide Impact Zone with a total estimated value of approximately $1.5 million.

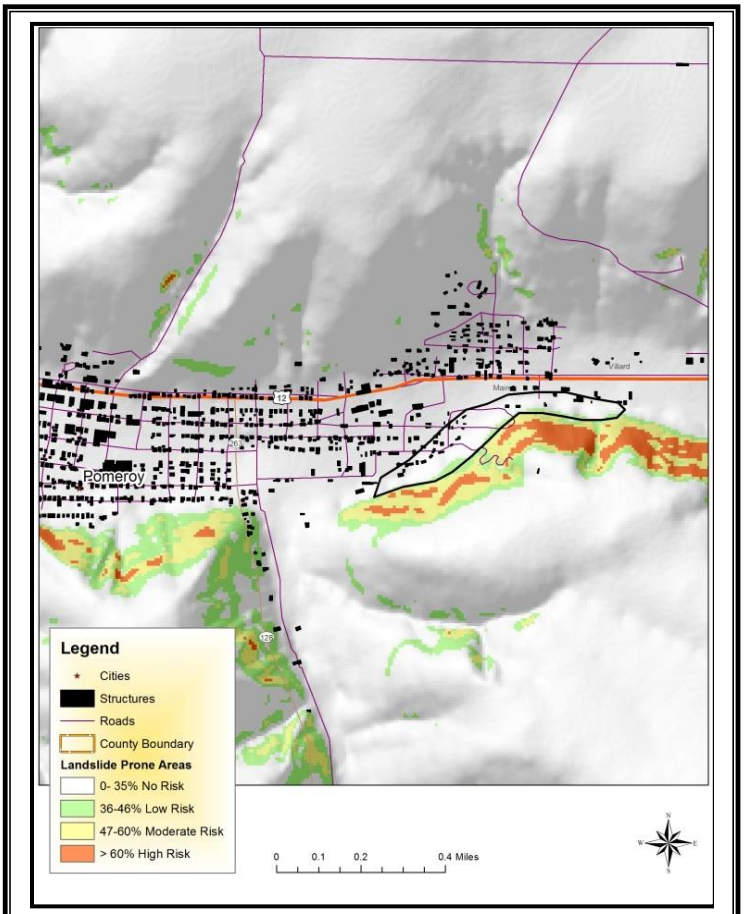
There are currently an estimated 15 structures, 16 parcels, and 2 improvements located in the Lower Granite Landslide Impact Zone. The total improvement value is estimated at $89,100.

Slides in this impact zone are more likely to be larger and more damaging as weaknesses in the underlying rock formations give way. Although infrequent, this type of slide has the potential to not only block, but destroy road corridors, dam waterways, and demolish structures. There are numerous homes in this impact zone; however, for the most part, they are widely scattered. Thus, single slide events will not likely impact the entire population, but rather individual structures. Much of the Wawawai Grade through this area could be at risk from slides.

CITY OF POMEROY

To date, there is no recorded history of major landslides occurring in Pomeroy. Nevertheless, there is at least one area that has some specific landslide concerns. Areas that are generally prone to landslides are:

- On existing landslides, old or recent
- On or at the base or top of slopes
- In or at the base of minor drainage hollows
- At the base or top of an old fill slope
- At the base or top of a steep cut slope



Pomeroy Impact Zone

Soil factors that increase the potential for landslide are soils developed from parent materials high in schist and granite, and soils that are less permeable containing a resistive or hardpan layer. These soils tend to exhibit higher landslide potential under saturated conditions than do well drained soils. To identify the high-risk soils in Garfield County, the NRCS State Soils Geographic Database (STATSGO) layer was used to identify the location and characteristics of all soils in the County. The specific characteristics of each major soil type within the County were reviewed. According to this database, soils in Garfield County are not highly prone to landslides; thus, slope angle was the major contributing factor for slide potential.

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

The majority of the landslide potential occurs on the southeastern edge of Pomeroy. The slope rising above the structures in this area is relatively steep and the housing development and road building along the toeslope may have decreased the stability of the soil. Additionally, Pataha Creek flows along the base of this slope. In some areas, undermining of the stream bank during floods or even natural

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

migration of the channel could lead to slope instability. The probability of a slide within this impact zone is moderate.

Flash floods typically carry large amounts of debris, silt, and rocks that are deposited in downstream floodplains. Pomeroy Hill and structures out the mouth of this small drainage may be at risk to mud and debris flows resulting from flash flood events. Soil saturation ensuing from prolonged periods of rain or flooding can lead to slope instability. Cut and fill slopes, even those well outside of the flood plain, are particularly at risk to slides and/or slumping as a result of soil saturation.

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

Value of Resources at Risk

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

The Pomeroy Landslide Impact Zone (shown below) contains an estimated 27 structures, 41 parcels, and 20 improvements with improvement values totaling more than $1.1 million.

Slides in this impact zone are more likely to be larger and more damaging as weaknesses in the underlying rock formations give way. Although infrequent, this type of slide has the potential to not only block, but destroy road corridors, dam Pataha Creek, and demolish structures.

GARFIELD COUNTY FIRE DISTRICT #1

The Fire District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, in the event of a significant landslide, Fire District #1 may assist with any necessary evacuations or traffic accident responses.

Value of Resources at Risk

The Garfield County Fire District #1 station in Pomeroy is not at risk to landslides due to its location in a relatively flat, heavily developed area. The District has no other known assets or other resources at risk to landslides.

POMEROY CONSERVATION DISTRICT

The Conservation District does not have any differing levels of risk associated with this hazard than Garfield County overall. However, the District may be involved in any cleanup efforts and slope stabilization projects following a landslide event in the County.

Value of Resources at Risk

Due to its location in a relatively flat area within the city of Pomeroy, the Conservation District office has a very low risk of being directly impacted by a landslide.

POMEROY SCHOOL DISTRICT #110

The School District's facilities are located in downtown Pomeroy and are not at risk to landslides. Slumps and/or cave-ins along the stream banks of Pataha Creek on school property are possible, particularly during a high water event. This type of slump may cause loss of usable property as well as sediment delivery into the stream.

Value of Resources at Risk

Due to its location in a relatively flat area within the city of Pomeroy, the Pomeroy School District's facilities have a very low risk of being directly impacted by a landslide. A slump or cave-in within the stream channel would not impact any school structures directly; however, the school may be involved in any necessary bank stabilization projects. It may also be necessary to fence off the slide area.

GARFIELD COUNTY HEALTH DISTRICT

Public Health's office in the Elementary School is located in downtown Pomeroy and is not at risk to landslides. Slumps and/or cave-ins along the stream banks of Pataha Creek on school property are possible, particularly during a high water event. This type of slump may cause loss of usable property as well as sediment delivery into the stream.

Value of Resources at Risk

The Public Health District does not have any facilities or assets at risk to landslides.

PORT OF GARFIELD

The Port of Garfield's facility is located in a flat area in west Pomeroy and is not at risk to landslides.

Value of Resources at Risk

The Port of Garfield does not have any facilities or assets at risk to landslides.

GARFIELD COUNTY HOSPITAL DISTRICT

Memorial Hospital is located on the northwest corner of Pomeroy at the base of a low-angle slope. This area did not show a moderate or high risk in the Landslide Prone Landscapes model; however, there is some potential for slumps in this area. The development along the base of this slope be contributing to some instability of the soils. During a severe storm, saturation of these soils may lead to small-scale slumps that deliver mud and other debris into the Hospital parking lot or roadways. In extreme events, slide debris could reach the Hospital structure. The probability of this type of event is extremely low.

Value of Resources at Risk

The Memorial Hospital structure as well as surrounding parking and travel ways may have a limited risk of experiencing a small slide originating on the slope to the north of facility. It is unlikely that there would be significant damages to the Hospital; however, there would be cleanup costs associated with a slide event.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

The GCTA parking area is located in downtown Pomeroy in an area away from moderate or high risk in the Landslide Prone Landscapes model, and therefore landslides nearby probably wouldn't affect the GCTA parking area. The more likely impact that a landslide event would impact the GCTA is if a landslide blocked a road, caused traffic disruptions, or damaged fleet vehicles.

Value of Resources at Risk

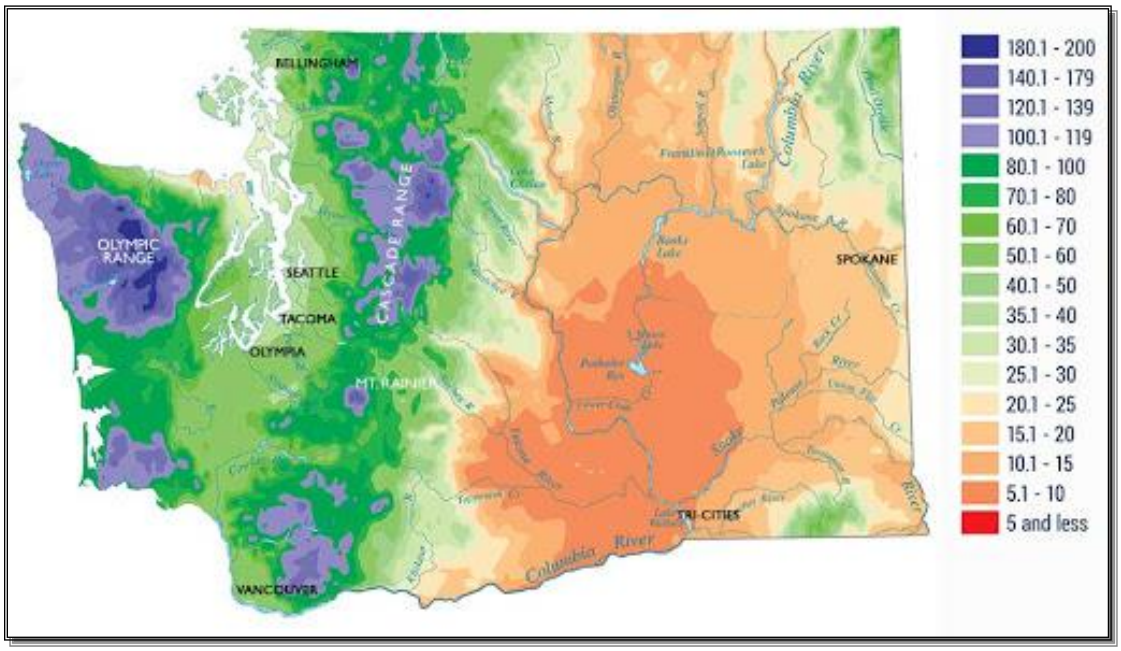
GCTA will not likely incur major structural damages from landslide events; however, landslide events in the county could potentially cause damage to the fleet or increase maintenance costs.

SEVERE WEATHER HAZARD PROFILE

The overall weather patterns that affect Garfield County are prevalent throughout Eastern Washington. This section of the state is part of the large inland basin between the Cascade and Rocky Mountains. In an easterly and northerly direction, the Rocky Mountains shield the inland basin from the winter season's cold air masses traveling southward across Canada. In a westerly direction, the Cascade Range forms a barrier to the easterly movement of moist and comparatively mild air in winter and cool air in summer. Some of the air from each of these source regions reaches this section of the State and produces a climate which has some of the characteristics of both continental and marine types. Most of the air masses and weather systems crossing eastern Washington are traveling under the influence of the prevailing westerly winds. Infrequently, dry continental air masses enter the inland basin from the north or east.

East of the Cascades, summers are warmer, winters are colder and precipitation is less than in western Washington. Annual precipitation ranges from seven to nine inches near the confluence of the Snake and Columbia Rivers and 15 to 30 inches along the eastern state line. During July and August, it is not unusual for four to eight weeks to pass with only a few scattered showers. Thunderstorms can be expected on one to three days each month from April through September. Most thunderstorms in the warmest months occur as isolated cells covering only a few square miles. A few damaging hailstorms are reported each summer. Maximum rainfall intensities to expect in one out of ten years are .6 of an inch in one hour; 1.0 inch in three hours; 1.0 to 1.5 inches in six hours; and 1.2 to 2.0 inches in 12 hours.

FIGURE 12: ANNUAL PRECIPITATION IN WASHINGTON STATE[26]



[26] Choose Washington, Washington State Department of Commerce. "Washington's diverse climate and geography." http://choosewashingtonstate.com/research-resources/about-washington/climate-geography/.

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

Winter season snowfall in the valleys varies from 40 to 80 inches. Both rainfall and snowfall increase along the slopes of the mountains. Snow can be expected in the higher elevations in October and in the lower valleys by the last of November. In the lower elevations, snow reaches a depth of 15 to 30 inches and remains on the ground most of the time from the first of December until March. The few snow survey reports available for elevations above 5,000 feet indicate six to eight feet of snow on the ground the first of April and four to five feet the first of May.

Cold continental air moving southward through Canada will occasionally cross the higher mountains and follow the north-south valleys into the Columbia Basin. On clear, calm winter nights, the loss of heat by radiation from over a snow cover produces ideal conditions for low temperatures. The lowest temperature in the State, -48° F, was recorded December 30, 1965, at Mazama and Winthrop. In January, the average maximum temperature is near 30° F and the minimum temperature is 15° F. Minimum temperatures from -10° to -20°F are recorded almost every winter and temperatures ranging from -25° to -42° F have been recorded in the colder valleys. In July, the average maximum temperature is 85° to 90° and the minimum temperature 45° to 50° F. Maximum temperatures reach 100° F on a few afternoons each summer and temperatures between 105° to 110° F have been recorded. The record high temperature of 118° F was recorded at Ice Harbor Dam on August 5, 1961. Temperatures in the mountains decrease three to five degrees Fahrenheit with each 1,000 feet increase in elevation. The average date of the freezing temperatures can be expected in the colder valleys by the first of September and before mid-October in the warmer areas.

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

Major disaster declarations related to severe storms have been common in Washington and typically lead to other kinds of disaster events. Regional operational plans should reflect warning and notification of the public, prioritization of roads and streets to be cleared, provision of emergency services, mutual aid with other public entities, and procedures for requesting state and federal assistance if needed. To prepare for severe local storms, local jurisdictions should provide public information on emergency preparedness and self-help.

SEVERE WEATHER RISK ASSESSMENT

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

LOCAL EVENT HISTORY

January 13, 1950 "The January 1950 Blizzard" - On this date, 21.4 inches of snow fell in Seattle, the second greatest 24-hour snowfall recorded. The snowfall was accompanied by 25-40 mph winds. The storm claimed 13 lives in the Puget Sound area. January had 18 days with high temperatures of 32 degrees or lower. The winter of 1949-50 was the coldest winter on record in Seattle, with an average temperature of 34.4 degrees. Eastern Washington, North Idaho, and parts of Oregon also were paralyzed by the snow – some lower-elevation snow depths reached nearly 50 inches and temperatures plunged into minus teens and twenties. Several dozen fatalities occurred.

1962 Columbus Day Wind Storm - The top weather event in Washington during the 20th Century, according to the National Weather Service, Seattle Forecast Office. This storm is the greatest windstorm to hit the Northwest since weather recordkeeping began in the 19th century, and called the "mother of all wind storms" in the 1900s. All windstorms in the Northwest are compared to this one. The Columbus Day Storm was the strongest widespread non-tropical windstorm to strike the continental U.S. during the 20th century, affecting an area from northern California to British Columbia. The storm claimed seven lives in Washington State; 46 died throughout the impacted region. One million homes lost power. More than 50,000 homes were damaged. Total property damage in the region was estimated at $235 million (1962 dollars). The storm blew down 15 billion board feet of timber worth $750 million (1962 dollars); this is more than three times the timber blown down by the May 1980 eruption of Mount St. Helens, and enough wood to replace every home in the state. Gusts of 88 miles per hour were recorded at Tacoma before power was lost to the recording stations.

February 1996 – Federal Disaster #1100. Stafford Act disaster assistance provided was $113 million. Small Business Administration disaster loans approved totaled $61.2 million. Heavy rainfall, mild temperatures and snowmelt caused flooding and mudslides in Adams, Asotin, Benton, Clark, Columbia, Cowlitz, Garfield, Grays Harbor, King, Kitsap, Kittitas, Klickitat, Lewis, Lincoln, Pierce, Skagit, Skamania, Snohomish, Spokane, Thurston, Wahkiakum, Walla Walla, Whitman and Yakima counties, and the Yakama Indian Reservation. This storm caused major flooding on rivers of western and southeast Washington. Mudslides occurred throughout the state. Three deaths, 10 people injured. Nearly 8,000 homes damaged or destroyed. Traffic flow both east and west, and north and south along major highways was shut down for several days. An avalanche closed Interstate 90 at Snoqualmie Pass. Mudslides in Cowlitz County and flooding in Lewis County closed Interstate 5. Damage throughout the Pacific Northwest estimated at $800 million.

December 1996 - January 1997 – Federal Disaster #1159. Stafford Act disaster assistance provided was $83 million. Small Business Administration loans approved totaled 31.7 million. Saturated ground combined with snow, freezing rain, rain, rapid warming and high winds within a five-day period produced flooding and landslides. Impacted counties – Adams, Asotin, Benton, Chelan, Clallam, Clark, Columbia, Cowlitz, Douglas, Ferry, Franklin, Garfield, Grant, Grays Harbor, Island, Jefferson, King, Kitsap, Kittitas, Klickitat, Lewis, Lincoln, Mason, Okanogan, Pacific, Pend Oreille, Pierce, San Juan, Skagit, Skamania, Snohomish, Spokane, Stevens, Thurston, Walla Walla, Whatcom, and Yakima. Twenty-four deaths; $140 million (est.) in insured losses; 250,000 people lost power. More than 130 landslides between Seattle and Everett, primarily along shorelines. Interstate 90 at Snoqualmie Pass was closed due to avalanche. High winds and ice contributed to the repeated and extended power outages to rural power customers in Garfield, Asotin, and Columbia Counties. This storm also resulted in numerous rural residences being cut off from any emergency service response for several days, due to drifting snow. The accumulations aggravated by rain, drifting snow, and ice in roof drains caused excessive weight and the collapse of structures.

1997 Tornadoes – There are 14 tornadoes on record for Washington in 1997. In May of that year, Tacoma experienced a small tornado that did an estimated $125,000 damage in a narrow swath across ten city blocks. Tornadoes also touched down north of nearby Asotin County and east of Vancouver the same day. Tornadoes within this region are infrequent and touchdowns are not consistent or specific to any particular area within the region.

December 14-15 2006 Windstorm - Federal Disaster # 1682. The most powerful windstorm since the Inauguration Day Storm of 1993 slammed into Washington State with 90 MPH winds on the Coast, gusts up to 70 MPH in the Puget Sound basin, and peak winds well over 100 MPH along the Cascade Crest. Up to 1.5 million residents were without power for up to 11 days. The storm resulted in 15 deaths (including 8 from carbon monoxide poisoning). Governor Gregoire proclaimed an emergency for all 39 Counties. Total damages are still being tallied but will exceed 50 million dollars.

March 2, 2009 - President Obama declared that a major disaster exists in the State of Washington. This declaration made Public Assistance requested by the Governor available to State and eligible local governments and certain private nonprofit organizations on a cost-sharing basis for emergency work and the repair or replacement of facilities damaged by the severe winter storm and record and near record snow in Clallam, Clark, Columbia, Cowlitz, Garfield, Grays Harbor, Island, Jefferson, King, Klickitat, Lewis, Lincoln, Mason, Pacific, Pend Oreille, Skagit, Skamania, Snohomish, Spokane, Stevens, Thurston, Wahkiakum, Walla Walla, and Whatcom Counties. This declaration also made emergency protective measures (Category B), including snow removal assistance, under the Public Assistance program, requested by the Governor, available in Adams, Asotin, Benton, Chelan, Clallam, Columbia, Cowlitz, Franklin, Grays Harbor, Jefferson, King, Kittitas, Klickitat, Lewis, Mason, Pacific, Pierce, Skagit, Skamania, Snohomish, Spokane, Thurston, Wahkiakum, Walla Walla, Whatcom, Whitman, and Yakima for any continuous 48-hour period during or proximate to the incident period. Finally, this declaration made Hazard Mitigation Grant Program assistance requested by the Governor available for hazard mitigation

measures statewide.[27] Garfield County reported $154.71 per capita impact from this event, which was by far the highest in the State (statewide average countywide per capita was $3.28).[28]

April 23, 2020 – Winter Storms cause damage in southeast Washington. President Trump declared that a major disaster exists in the state of Washington for areas affected by severe storms, flooding, landslides, and mudslides. Three counties in southeast Washington (Walla Wall, Columbia, and Garfield) along with several western Washington counties were awarded public assistance for an incident period between January 20 and February 10, 2020.[29]

According to the Tornado History Project[30] and the National Weather Service[31], there have been no reports of tornadoes in Garfield County. Neighboring Whitman County had a minor tornado reported in 2011. This event occurred northwest of St. John and was reported to be a brief touchdown with no damage.

Probability of Future Events

All of Garfield County is at risk to severe winter weather events and there is a high probability of their continued occurrence in this area. Due to topography and climatologic conditions, the higher mountainous areas are often the most exposed to the effects of these storms. Normally the mountainous terrain and the north/south orientation of the Cascades tend to isolate severe storms into localized areas of the County. For example, higher elevations will receive snowfall, while the valley areas may not. Periodically though, individual storms can generate enough force to impact the entire County at one time. From high winds to ice storms to freezing temperatures, there are all types of winter storms that take place during the course of any given year.

An average of at least two severe storms is anticipated each winter in Garfield County. Garfield County is considered to be one of the counties most vulnerable to winter storms and blizzards in Washington according to the Washington State Hazard Mitigation Plan.

Garfield County is considered to be one of the counties most vulnerable to severe thunderstorms according to the Washington State Hazard Mitigation Plan. Areas most vulnerable to this type of storm are those subject to a strong southwesterly flow of moist, unstable air that generates strong, sometimes violent thunderstorms with one or more of the following characteristics: strong damaging winds, large hail, waterspouts, or tornados.

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[27] FEMA. 2009. *Severe Winter Storm and Record and near Record Snow*. FEMA 1825-DR. Available online at http://www.fema.gov/pdf/news/pda/1825.pdf.
[28] FEMA. 2009. *Severe Winter Storm and Record and near Record Snow*. FEMA 1825-DR. Available online at http://www.fema.gov/pdf/news/pda/1825.pdf.
[29] FEMA. 2020. *Washington Severe Storms, Flooding, Landslides, and Mudslides.* FEMA DR-4539. Available online at https://www.fema.gov/disaster/4539
[30] Tornado History Project. 1999. St. Johnsbury, Vermont. Available online at http://www.tornadohistoryproject.com/tornado/Washington/table.
[31] The National Weather Service. Deparment of Commerce. National Oceanic and Atmospheric Administration. Portland, Oregon. Available online at http://www.wrh.noaa.gov/pqr/paststorms/tornado.php.

Hail can occur in any strong thunderstorm, which means hail is a threat everywhere. Often the hail that occurs does not grow to a size larger than one-half inch in diameter, and the areas affected are usually small. Quite often hail comes during early spring storms, when it is mostly of the small, soft variety with a limited damaging effect.

Areas most vulnerable to tornados are those subject to severe thunderstorms or those with a recurrence rate of 5 percent or greater, meaning the County experiences one damaging severe thunderstorm event at least once every 20 years.

Impacts of Severe Weather Events by Jurisdiction

Garfield County

Winter storms: Winter storms with heavy snow, high winds, and/or extreme cold can have a considerable impact on Garfield County; however, most residents are well accustomed to the severe winter conditions in this part of Washington. Power outages and unplowed roads are a frequent occurrence throughout many parts of the County, but most residents are prepared to handle the temporary inconvenience.

Commonly, heavy snow accumulations are the cause of disruptions to normal commuting activities (delays and inability to plow roads and driveways). When coupled with extreme cold weather, severe winter storms have a detrimental impact on residents in Garfield County, particularly the senior population. Severe winter storms also have the potential to cause large losses among livestock and wildlife. Animal losses are usually the result of dehydration rather than cold or suffocation.

Snow loads on roofs, ice-slides off of roofs onto vehicles or other buildings, and damaged frozen pipes are also potential hazards associated with winter weather. These events represent a significant hazard to public health and safety, a substantial disruption of economic activity, and a constant threat to structures during the winter months.

Thunderstorms: The impacts of thunderstorms are fairly limited and do not significantly affect the communities enough to declare a disaster. The secondary impacts of thunderstorms, floods, are emphasized within the flood Section of this document.

Hail: The potential impacts of a severe hail storm in Garfield County include crop damage, downed power lines, downed or damaged trees, broken windows, roof damage, and vehicle damage. Hail storms can, in extreme cases, cause death by exposure. The most common direct impact from ice storms to people is traffic accidents. Over 85% of ice storm deaths nationwide are caused by traffic accidents. Hail storms also have the potential to cause losses among livestock. The highest potential damage from hail storms in Garfield County is the economic loss from crop damage. Even small hail can cause significant damage to young and tender plants and fruit.

High Winds: Windstorms are frequent in Garfield County and they have been known to cause substantial damage. Under most conditions, the County's highest winds come from the south or

southwest. Due to the abundance of agricultural development in Columbia County, crop damage due to high winds can have disastrous effects on the local economy. In the case of extremely high winds, some buildings may be damaged or destroyed. Wind damages will generally be categorized into four groups: 1) structure damage to roofs, 2) structure damage from falling trees, 3) damage from wind-blown dust on sensitive receptors, or 4) wind driven wildfires. Structural injury from damaged roofs is not uncommon in Garfield County. Structural damage from falling trees is also relatively common. Many homeowners have planted ornamental trees for shade and windbreak protections. However, many of these trees are located near, and upwind of homes putting them at risk to falling trees which could cause substantial structural damage and potentially put lives at risk. Airborne particulate matter increases during high wind events. When this occurs, sensitive receptors including the elderly and those with asthma are at increased risk to complications.

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

If a major tornado was to strike a populated area in Garfield County, damage could be widespread. Businesses could be forced to close for an extended period, and routine services such as telephone or power could be disrupted.

Value of Resources at Risk

It is difficult to estimate the cost of potential winter storm damages to structures and the economy in Garfield County. Damage to roofs by heavy snow accumulations depends on the moisture content of the snow and the structural characteristics of the buildings. In general, snow in this region tends to have low moisture content because of the low temperatures and arid environment. However, heavy snow is not uncommon. Frozen water pipes are the most common damage to residential and business structures. Older homes tend to be at a higher risk to frozen water pipes than newer ones. Snow plowing in Garfield County occurs from a variety of departments and agencies. The state highways are maintained by the State of Washington. Plowing of county roads is done by the Columbia County Public Works Department and the city of Pomeroy road department. Private landowners are responsible for maintaining their own driveways or other private roads. Utility supplies are impacted during severe winter storms as power is lost on a regional basis. This has a two-fold impact on Garfield County residents as not only is power cut to homes and businesses, but primary heating is lost for many residents. Gas furnaces and wood stoves supplement electrical heating, but with wood heating the senior population is at a disadvantage. Emergency response to severe winter storms includes site visits by police or fire department personnel, opening of shelters, or assistance with shopping, medical attention, and communications. The economic losses caused by severe winter storms may frequently be greater than structural damages. Employees may not be able to travel to work for several days and businesses may not open. Damages are seen in the form of structural repair and loss of economic activity. Garfield County schools are occasionally

closed during and right after a severe winter storm because of cold temperatures and snow covered roads.

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

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

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

Based on county parcel data, there are 1,445 total assessed improvements in Garfield County with a total value of approximately $118 million. There are approximately 3,247 structures in Garfield County (using a statewide GIS structure layer) that could sustain potential damage from severe weather events.

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

CITY OF POMEROY

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

Value of Resources at Risk

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

GARFIELD COUNTY FIRE DISTRICT #1

The Fire District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, in the event of significant severe weather events, Fire District #1 would assist with accident response, delivery of special aid if necessary, and search and rescue missions.

Value of Resources at Risk

The Garfield County Fire District #1 station in the Pomeroy may be at risk to severe high wind events, hail damage, or significant snow accumulations. The District has no other known assets or other resources at risk to severe weather events.

POMEROY CONSERVATION DISTRICT

The Conservation District does not have any differing levels of risk associated with this hazard than Garfield County as a whole.

Value of Resources at Risk

The Conservation District office in the Pomeroy may be at risk to severe high wind events, hail damage, or significant snow accumulations. The building has a flat roof that has a tendency to leak if the drain plugs with debris causing snow or rain to accumulate. The District has no other known assets or other resources at risk to severe weather events.

POMEROY SCHOOL DISTRICT #110

The School District does not have any differing levels of risk associated with this hazard than Garfield County as a whole.

Value of Resources at Risk

The School District buildings in Pomeroy may be at risk to severe high wind events, hail damage, or significant snow accumulations. The District has no other known assets or other resources at risk to severe weather events.

GARFIELD COUNTY HEALTH DISTRICT

The Public Health District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. Garfield County Emergency Management would act as the lead agency during a weather-related hazard event and the Public Health District would respond as a supporting agency.

Value of Resources at Risk

Public Health's office in the Elementary School may be at risk to severe high wind events, hail damage, or significant snow accumulations. However, the structure is owned by the School District; thus, the

Public Health District is not responsible for damages or upgrades to the facility. The District has no other known assets or other resources at risk to severe weather events.

PORT OF GARFIELD

The Port of Garfield does not have any differing levels of risk associated with this hazard than Garfield County as a whole. The Port of Garfield has a 15,000 square foot facility (9,500 sf) that is rented to Columbia Pulp. The roof is a flat roof that has been repaired. Severe weather would be a risk to the Port and its tenant Columbia Pulp.

Value of Resources at Risk

The Port of Garfield facilities in Pomeroy may be at risk to severe high wind events, hail damage, or significant snow accumulations. These structures have incurred significant weather-related damages on numerous occasions in the last 20 years. The Port of Garfield office facility is valued at $1.6 million with its contents valued at an estimated $600,000. The warehouse facility has an approximate value of $500,000.

GARFIELD COUNTY HOSPITAL DISTRICT

The Garfield County Hospital does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, any injuries, including traffic accidents, resulting from severe storms would likely be treated at the hospital.

Value of Resources at Risk

Garfield County Memorial Hospital will not likely incur major structural damages from severe weather events; however, damage to roofing, windows, or other structural components could result in closure of the hospital due to safety issues until repairs could be made. Additionally, structural damage may, in turn, cause damage or complete loss of much of the medical equipment within the building due to collapses or contamination.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

The Garfield County Transportation Authority does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, traffic accidents, road closures, or unsafe travel conditions resulting from severe storms would have the potential of also disrupting GCTA services.

Value of Resources at Risk

GCTA will not likely incur major structural damages from severe weather events; however, damage to roofing, windows, or other structural components of the Senior Center and parking area could result in closures or fleet damage until repairs could be made. Severe weather events, such as hail, snow, or ice, may cause damage to the fleet or increase maintenance costs.

WILDLAND FIRE HAZARD PROFILE

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

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

Weather

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

Topography

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

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

Fuels

Fuel is any material that can ignite and burn. Fuels describe any organic material, dead or alive, found in the fire environment. Grasses, brush, branches, logs, logging slash, forest floor litter, conifer needles, and buildings are all examples. The physical properties and characteristics of fuels govern how fires burn. Fuel loading, size and shape, moisture content and continuity and arrangement all have an affect on fire behavior. Generally speaking, the smaller and finer the fuels, the faster the potential rate of fire spread. Small fuels such as grass, needle litter and other fuels less than a quarter inch in diameter are most responsible for fire spread. In fact, "fine" fuels, with high surface to volume ratios, are considered the primary carriers of surface fire. This is apparent to anyone who has ever witnessed the speed at which grass fires burn. As fuel size increases, the rate of spread tends to decrease, as surface to volume ratio decreases. Fires in large fuels generally burn at a slower rate, but release much more energy, burn with much greater intensity. This increased energy release, or intensity, makes these fires more difficult to control. Thus, it is much easier to control a fire burning in grass than to control a fire burning in timber.

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

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

WILDLAND FIRE RISK ASSESSMENT

The Garfield County Community Wildfire Protection Plan[32] provides a comprehensive analysis of the wildland fire risks and recommended protection and mitigation measures for all jurisdictions in Garfield County. The information in the "Wildland Fire" sections of this Garfield County Annex is excerpted from that more detailed document.

SEWA WILDFIRE HAZARD ASSESSMENT

Southeastern Washington was analyzed using a variety of models, managed on a Geographic Information System (GIS) system. Physical features of the region including roads, streams, soils, elevation, and remotely sensed images were represented by data layers. Field visits were conducted by specialists from Northwest Management, Inc. and others. Discussions with area residents and local fire suppression professionals augmented field visits and provided insights into forest health issues and

[32] King, Tera and V. Bloch. 2008. Garfield County Community Wildfire Protection Plan. Northwest Management, Inc.. Moscow, Idaho.

treatment options. This information was analyzed and combined to develop an objective assessment of wildland fire risk in the region.

Historic Fire Regime

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

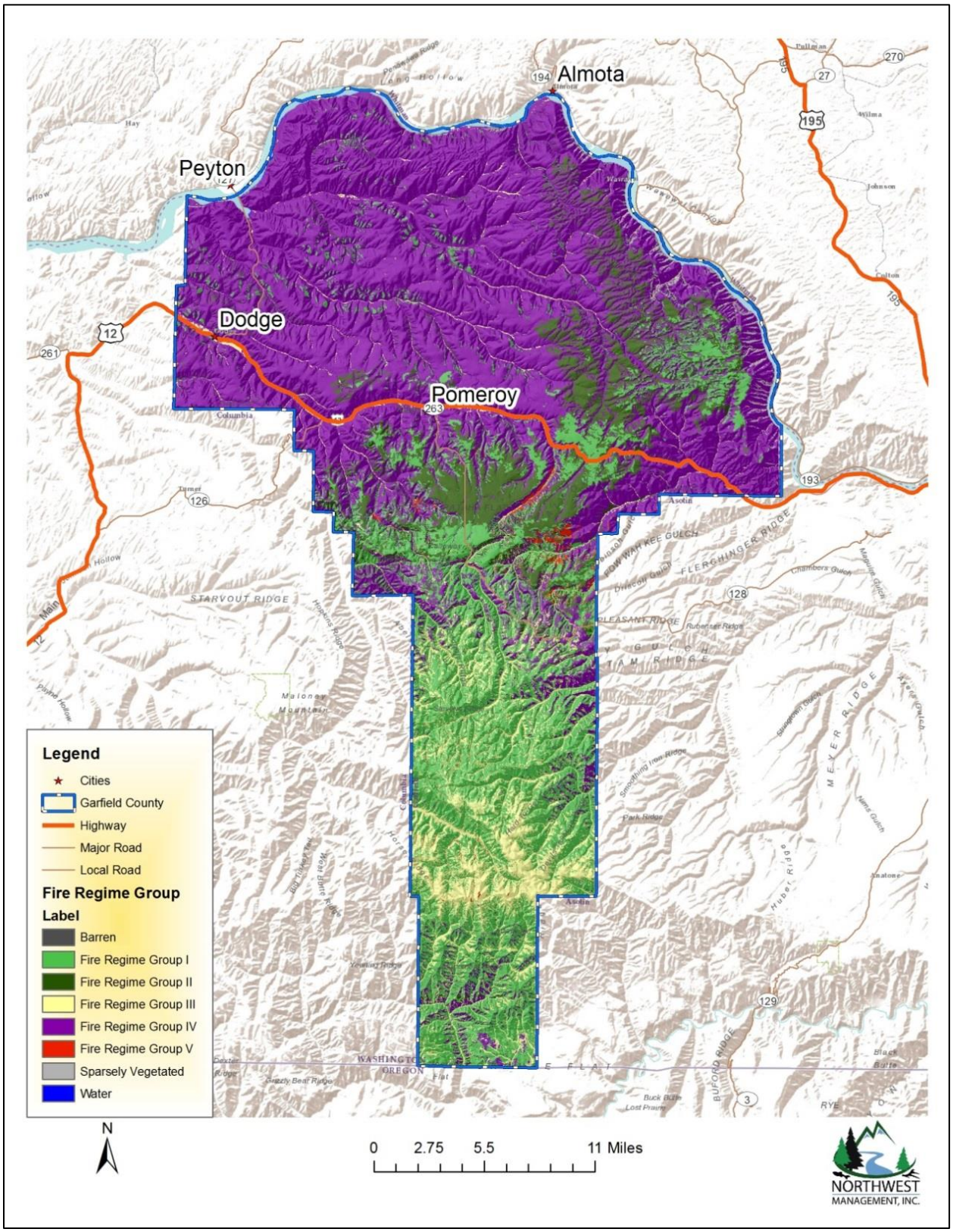
Many ecological assessments are enhanced by the characterization of the historical range of variability which helps managers understand: (1) how the driving ecosystem processes vary from site to site; (2) how these processes affected ecosystems in the past; and (3) how these processes might affect the ecosystems of today and the future. Historical fire regimes are a critical component for characterizing the historical range of variability in fire-adapted ecosystems. Furthermore, understanding ecosystem departures provides the necessary context for managing sustainable ecosystems. Land managers need to understand how ecosystem processes and functions have changed prior to developing strategies to maintain or restore sustainable systems. In addition, the concept of departure is a key factor for assessing risks to ecosystem components. For example, the departure from historical fire regimes may serve as a useful proxy for the potential of severe fire effects from an ecological perspective.

TABLE 16: FIRE REGIME GROUPS IN GARFIELD COUNTY

Group	Description	Acres	% of Total
Fire Regime Group I	<= 35 Year Fire Return Interval, Low and Mixed Severity	108,244.1	23.6%
Fire Regime Group II	<= 35 Year Fire Return Interval, Replacement Severity	43,999.7	9.6%
Fire Regime Group III	35 - 200 Year Fire Return Interval, Low and Mixed Severity	40814.3	8.9%
Fire Regime Group IV	35 - 200 Year Fire Return Interval, Replacement Severity	255,801.5	55.7%
Fire Regime Group V	> 200 Year Fire Return Interval, Any Severity	2,005.2	0.4%
Water	Water	5,112.9	1.1%
Barren	Barren	149.5	<0.1%
Sparsely Vegetated	Sparsely Vegetated	3,124.8	0.7%
		459,252	100.0%

The table above shows the amount of acreage in each defined fire regime in Garfield County. The historic fire regime model shows that more than half of the area (more than 55.7%) has historically experienced a fire return rate of 35 to 200 years with replacement severity fires. The next most significant amount of the county (more than 108,000 acres) falls into category FRG I, meaning it has historically experienced a fire return rate of equal to, or less than 35 years with low and mixed severity fires.

FIGURE 13: FIRE REGIME GROUPS IN GARFIELD COUNTY



Fire Regime Condition Class

The Fire Regime Condition Class model was used in past wildfire risk hazards for Garfield County and Southeast Washington. The following information was included in the 2011 Southeast Washington MHMP but this analysis was not redone for the 2021 update and the VCC model was used instead.

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning.[33, 34] Coarse scale definitions for historic fire regimes have been developed by Hardy et al[35] and Schmidt et al[36] and interpreted for fire and fuels management by Hann and Bunnell.

A fire regime condition class (FRCC) is a classification of the amount of departure from the historic regime. [37] The three classes are based on low (FRCC 1), moderate (FRCC 2), and high (FRCC 3) departure from the central tendency of the natural (historical) regime.[38,39] The central tendency is a composite estimate of vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated natural disturbances. Low departure is considered to be within the natural (historical) range of variability, while moderate and high departures are outside.

An analysis of Fire Regime Condition Classes in Southeast Washington shows that a significant portion of the region is either moderately departed (30%) or severely departed (23%) from its natural fire regime and associated vegetation and fuel characteristics. In most scenarios, the more departed an area is from its natural fire regime, the higher the wildfire potential; however, this is not true 100% of the time.

TABLE 17: ASSESSMENT OF FIRE REGIME CONDITION CLASS IN SOUTHEAST WASHINGTON

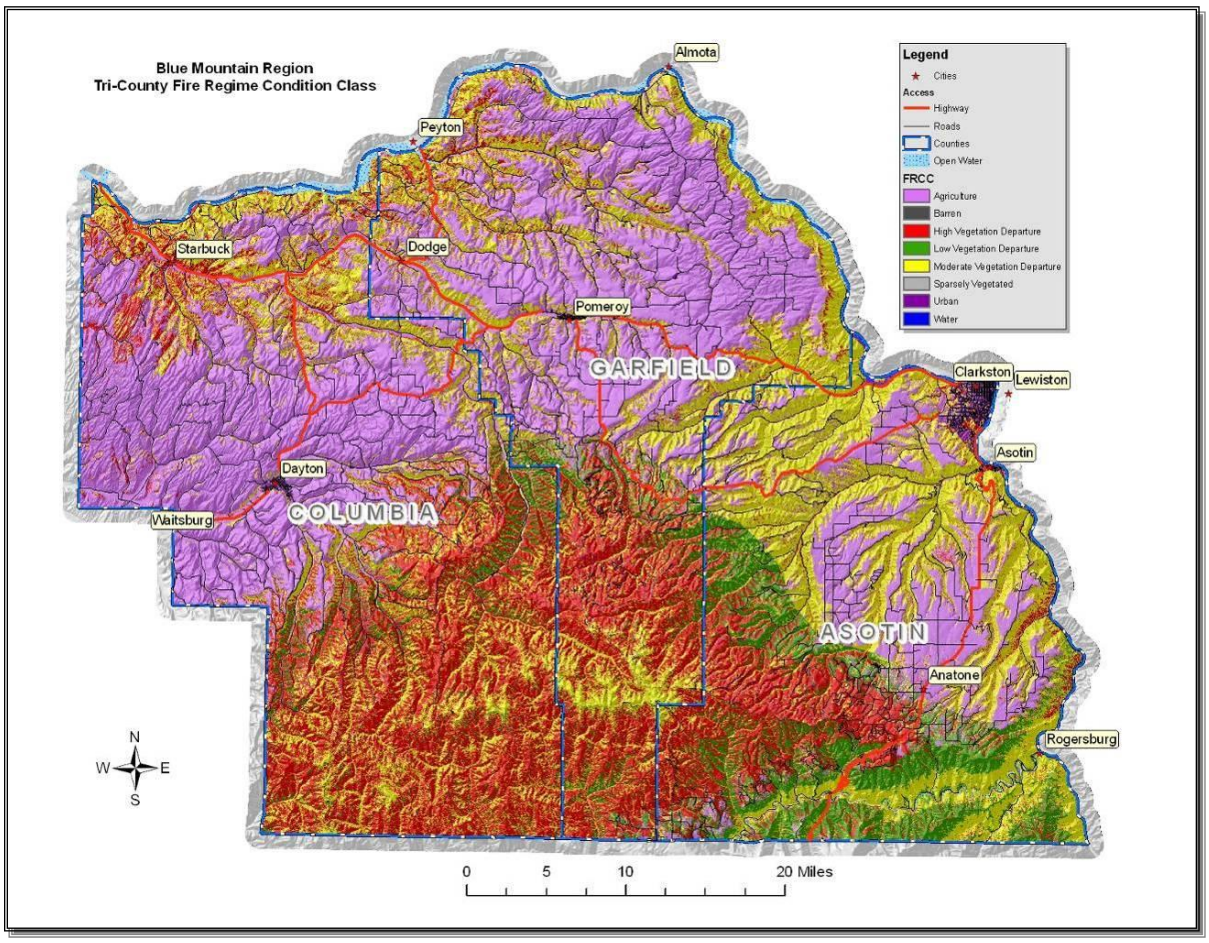
Condition Class	Acres	Percent
Fire Regime Condition Class I	109,425	8%
Fire Regime Condition Class II	423,443	30%
Fire Regime Condition Class III	329,743	23%
Water	11,140	1%
Urban	33,530	2%

[33] Agee, J. K. Fire Ecology of the Pacific Northwest forests. Oregon: Island Press. 1993.
[34] Brown. J. K. "Fire regimes and their relevance to ecosystem management." *Proceedings of Society of American Foresters National Convention*. Society of American Foresters. Washington, D.C. 1995. Pp 171-178.
[35] Hardy, C. C., et al. *"Spatial data for national fire planning and fuel management."* International Journal of Wildland Fire. 2001. Pp 353-372.
[36] Schmidt, K. M., et al. *"Development of coarse scale spatial data for wildland fire and fuel management."* General Technical Report, RMRS-GTR-87. U.S. Department of Agriculture, Forest Service. Rocky Mountain Research Station. Fort Collins, Colorado. 2002.
[37] Hann, W. J. and D. L. Bunnell. "Fire and land management planning and implementation across multiple scales." International Journal of Wildland Fire. 2001. Pp 389-403.
[38] Hardy, C. C., et al. *"Spatial data for national fire planning and fuel management."* International Journal of Wildland Fire. 2001. Pp 353-372.
[39] Schmidt, K. M., et al. *"Development of coarse scale spatial data for wildland fire and fuel management."* General Technical Report, RMRS-GTR-87. U.S. Department of Agriculture, Forest Service. Rocky Mountain Research Station. Fort Collins, Colorado. 2002.

Barren	513	0%
Sparsely Vegetated	693	0%
Agriculture	520,231	36%
Total	1,428,719	100%

Much of the Umatilla National Forest and surrounding forestlands are classified as Condition Class III due most likely to successful fire suppression efforts over the past 100 years. The exclusion of wildland fires in this area has led to overcrowded forest conditions and changes in species composition, which will tend to increase fire severity and result in more stand replacing wildland fires. The School Fire and Columbia Complex Fire are good examples of the trend towards higher severity, stand replacing fires in this area.

FIGURE 14: MAP SHOWING FIRE REGIME CONDITION CLASS IN SOUTHEAST WASHINGTON



Vegetation Condition Class

Vegetation Condition Class (VCC) represents a simple categorization of the associated Vegetation Departure (VDEP) layer and indicates the general level to which current vegetation is different from the simulated historical vegetation reference conditions. VDEP and VCC are based upon methods originally described in Interagency Fire Regime Condition Class Guidebook, but are not identical to those methods.

In LANDFIRE 2012™, the original three VCC classes were divided in half to create six VCC classes to provide additional precision.[40]

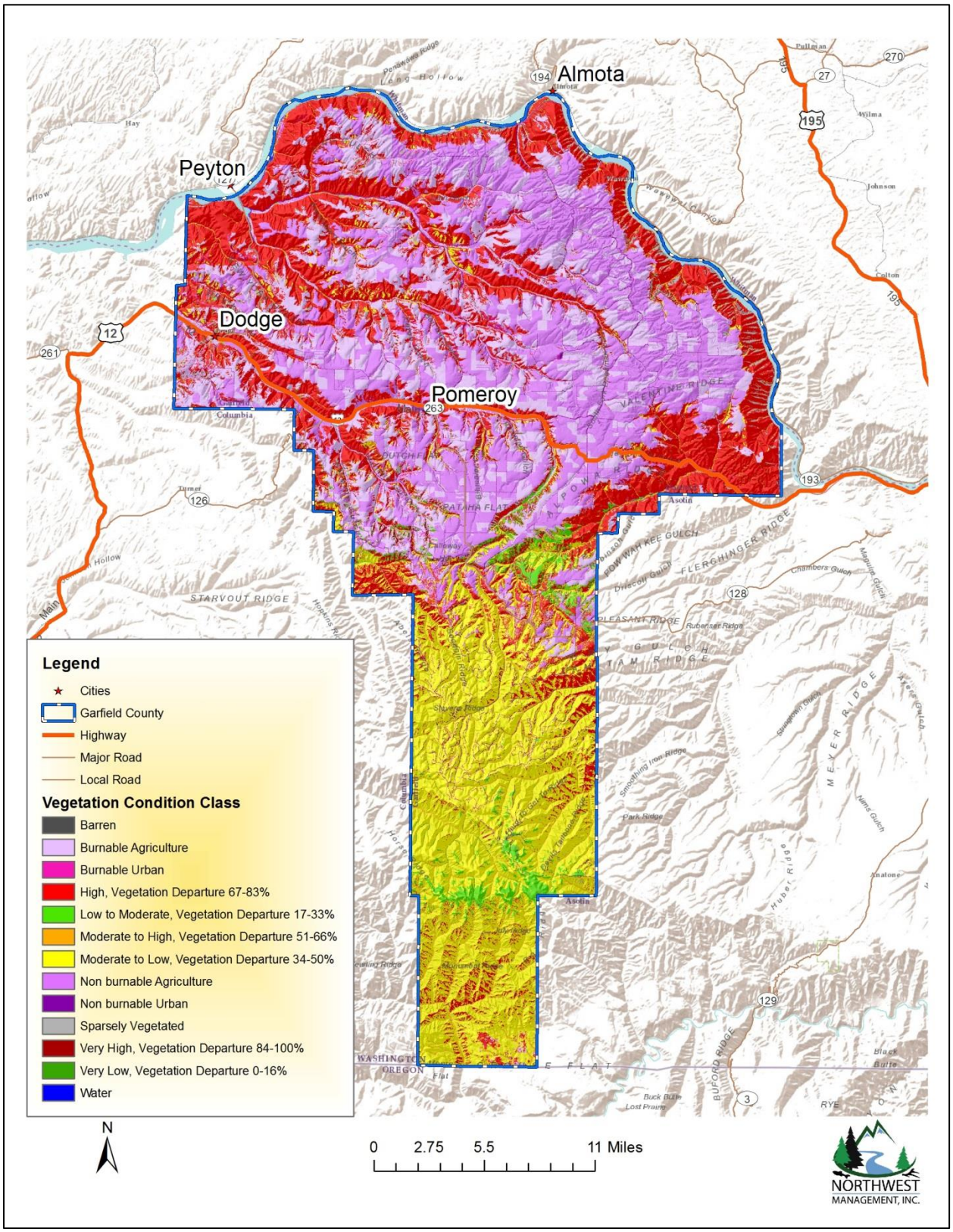
An updated GIS layer using LANDFIRE data was used to create a vegetation condition class map specific to Garfield County. This resource was not available during the planning process for the 2011 Southeast Washington MHMP. The following table expresses the data captured in the VCC map.

TABLE 18: VEGETATION CONDITION CLASS IN GARFIELD COUNTY

NEW CLASS	NEW DESCRIPTION	Acres	% of Total
Vegetation Condition Class I.A	Very Low, Vegetation Departure 0-16%	603.5	0.1%
Vegetation Condition Class I.B	Low to Moderate, Vegetation Departure 17-33%	11,262.4	2.5%
Vegetation Condition Class II.A	Moderate to Low, Vegetation Departure 34-50%	101,352.6	22.1%
Vegetation Condition Class II.B	Moderate to High, Vegetation Departure 51-66%	12,122.4	2.6%
Vegetation Condition Class III.A	High, Vegetation Departure 67-83%	119,691.0	26.1%
Vegetation Condition Class III.B	Very High, Vegetation Departure 84-100%	858.4	0.2%
Water	Water	5,112.9	1.1%
Non burnable Urban	Non burnable Urban	6,605.5	1.4%
Burnable Urban	Burnable Urban	9,200.1	2.0%
Barren	Barren	149.5	<0.1%
Sparsely Vegetated	Sparsely Vegetated	3,124.1	0.7%
Non burnable Agriculture	Non burnable Agriculture	96,489.5	21.0%
Burnable Agriculture	Burnable Agriculture	92,680.1	20.2%
		459,252.0	100.0%

[40] LANDFIRE. Vegetation Condition Class. Available online at https://www.landfire.gov/vcc.php.

FIGURE 15: VEGETATION CONDITION CLASS IN GARFIELD COUNTY



Wildland Urban Interface

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

A key component in meeting the underlying need for protection of people and structures is the protection and treatment of hazards in the wildland-urban interface. The wildland-urban interface refers to areas where wildland vegetation meets urban developments or where forest fuels meet urban fuels such as houses. The WUI encompasses not only the interface (areas immediately adjacent to urban development), but also the surrounding vegetation and topography. Reducing the hazard in the wildland-urban interface requires the efforts of federal, state, and local agencies and private individuals.[41] "The role of [most] federal agencies in the wildland-urban interface includes wildland firefighting, hazard fuels reduction, cooperative prevention and education, and technical experience. Structural fire protection [during a wildfire] in the wildland-urban interface is [largely] the responsibility of Tribal, state, and local governments".[42] The role of the federal agencies in southeast Washington is and will be much more limited. Property owners share a responsibility to protect their residences and businesses and minimize danger by creating defensible areas around them and taking other measures to minimize the risks to their structures.[43] With treatment, a wildland-urban interface can provide firefighters a defensible area from which to suppress wildland fires or defend communities against other hazard risks. In addition, a wildland-urban interface that is properly treated will be less likely to sustain a crown fire that enters or originates within it. [44]

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

- Minimizing the potential of high-severity ground or crown fires entering or leaving the area;
- Reducing the potential for firebrands (embers carried by the wind in front of the wildfire) impacting the WUI. Research indicates that flying sparks and embers (firebrands) from a crown fire can ignite additional wildfires as far as 1¼ miles away during periods of extreme fire weather and fire behavior;[45]
- Improving defensible space in the immediate areas for suppression efforts in the event of wildland fire.

[41] Norton, P. Bear Valley National Wildlife Refuge Fire Hazard Reduction Project: Final Environmental Assessment. Fish and Wildlife Services, Bear Valley Wildlife Refuge. June 20, 2002.
[42] USFS. 2001. United States Department of Agriculture, Forest Service. Wildland Urban Interface. Web page. Date accessed: 25 September 2001. Accessed at: http://www.fs.fed.us/r3/sfe/fire/urbanint.html
[43] USFS. 2001. United States Department of Agriculture, Forest Service. Wildland Urban Interface. Web page. Date accessed: 25 September 2001. Accessed at: http://www.fs.fed.us/r3/sfe/fire/urbanint.html
[44] Norton, P. Bear Valley National Wildlife Refuge Fire Hazard Reduction Project: Final Environmental Assessment. Fish and Wildlife Services, Bear Valley Wildlife Refuge. June 20, 2002.
[45] McCoy, L. K., et all. Cerro Grand Fire Behavior Narrative. 2001.

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

- **Interface Condition** – a situation where structures abut wildland fuels. There is a clear line of demarcation between the structures and the wildland fuels along roads or back fences. The development density for an interface condition is usually 3+ structures per acre;
- **Intermix Condition** – a situation where structures are scattered throughout a wildland area. There is no clear line of demarcation; the wildland fuels are continuous outside of and within the developed area. The development density in the intermix ranges from structures very close together to one structure per 40 acres; and
- **Occluded Condition** – a situation, normally within a city, where structures abut an island of wildland fuels (park or open space). There is a clear line of demarcation between the structures and the wildland fuels along roads and fences. The development density for an occluded condition is usually similar to that found in the interface condition and the occluded area is usually less than 1,000 acres in size.

In addition to these classifications detailed in the Federal Register, four additional classifications of population density have been included to augment these categories:

- **Rural Condition** – a situation where the scattered small clusters of structures (ranches, farms, resorts, or summer cabins) are exposed to wildland fuels. There may be miles between these clusters. The condition of the WUI connects these clusters into a relatively homogenous area.
- **High Density Urban Areas** – those areas generally identified by the population density consistent with the location of larger incorporated cities, however, the boundary is not necessarily set by the location of city boundaries: it is set by very high population densities (more than 15-30 structures per acre or more). Many counties and reservations in the west do not have high density urban areas. Garfield County, Washington, was determined not to have any areas of high density urban based on current (2006) structure locations. However, in the nearby Asotin County, Clarkston, Washington, is representative of a high density urban condition.
- **Infrastructure Area WUI** – those locations where critical and identified infrastructure are located outside of populated regions and may include high tension power line corridors, critical escape or primary access corridors, municipal watersheds, areas immediately adjacent to facilities in the wildland such as radio repeater towers or fire lookouts. These are identified by county or reservation level core teams.
- **Non-WUI Condition** - a situation where the above definitions do not apply because of a lack of structures in an area or the absence of critical infrastructure crossing these unpopulated regions. This classification is not WUI.

Garfield County's wildland-urban interface (WUI) is based on population density. Relative population density across the county was estimated using a GIS based kernel density population model that uses object locations to produce, through statistical analysis, concentric rings or areas of consistent density. To graphically identify relative population density across the county, structure locations were

determined by examining aerial photography. The aerial photographs used are 1 meter resolution (very high quality) and show land based features with acceptable resolution and quality. County level mosaics were obtained for Garfield County and were used to provide locations for digitized structures in the region. The resulting output identified the extent and level of population density throughout the county. Based on committee review and discussion, the output was adjusted to include areas of significant infrastructure and to incorporate gaps along important transportation routes.

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

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

Another way to analyze the wildland-urban interface is to look at the distribution and density of structures within the WUI. Using a state of Washington building footprint layer from Microsoft[46], maps were created to express structure location and density for different regions of Garfield County. These maps are intended to accompany the WUI map (Figure 16). These structure density maps (Figures 17-19) have not replaced the established WUI classification from the CWPP, but they are to be used as additional planning tools. This type of analysis may be useful for identifying project areas based on the way structures and wildland fuels intermingal.

[46] Microsoft. "US Building Footprints." Available online at https://github.com/microsoft/USBuildingFootprints.

FIGURE 16: GARFIELD COUNTY WILDLAND-URBAN INTERFACE MAP

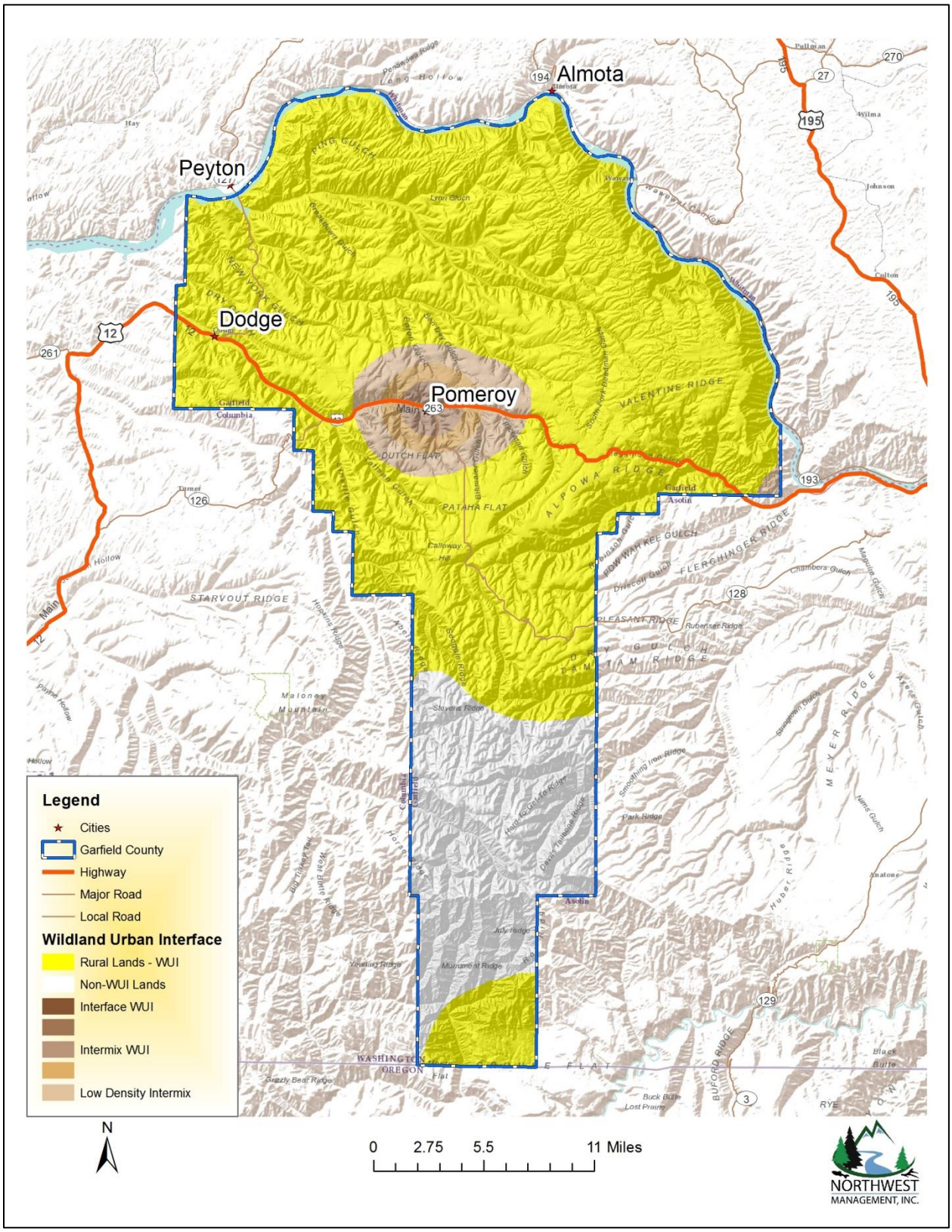


FIGURE 17: STRUCTURE DENSITY IN CENTRAL GARFIELD COUNTY

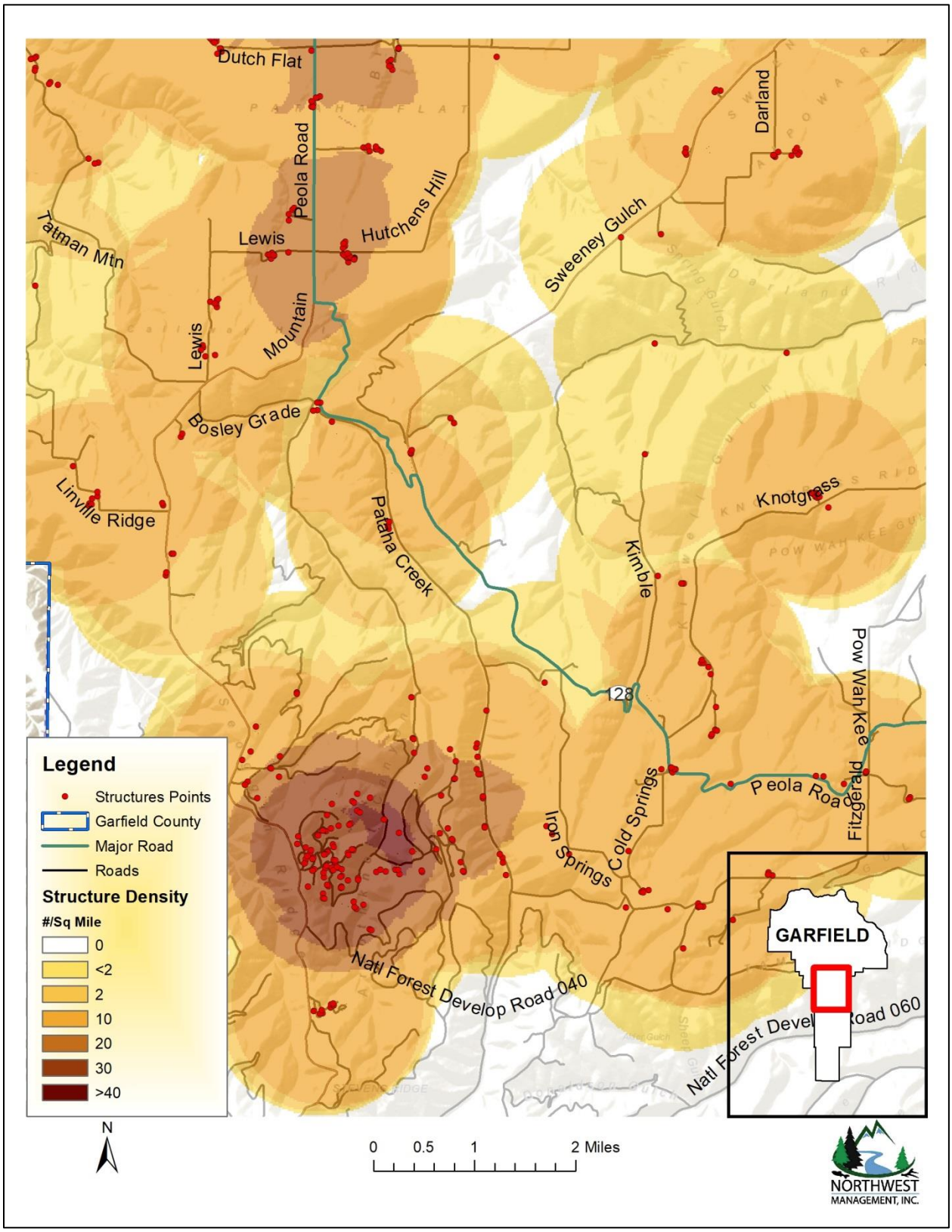


FIGURE 18: STRUCTURE DENSITY IN SOUTHERN GARFIELD COUNTY

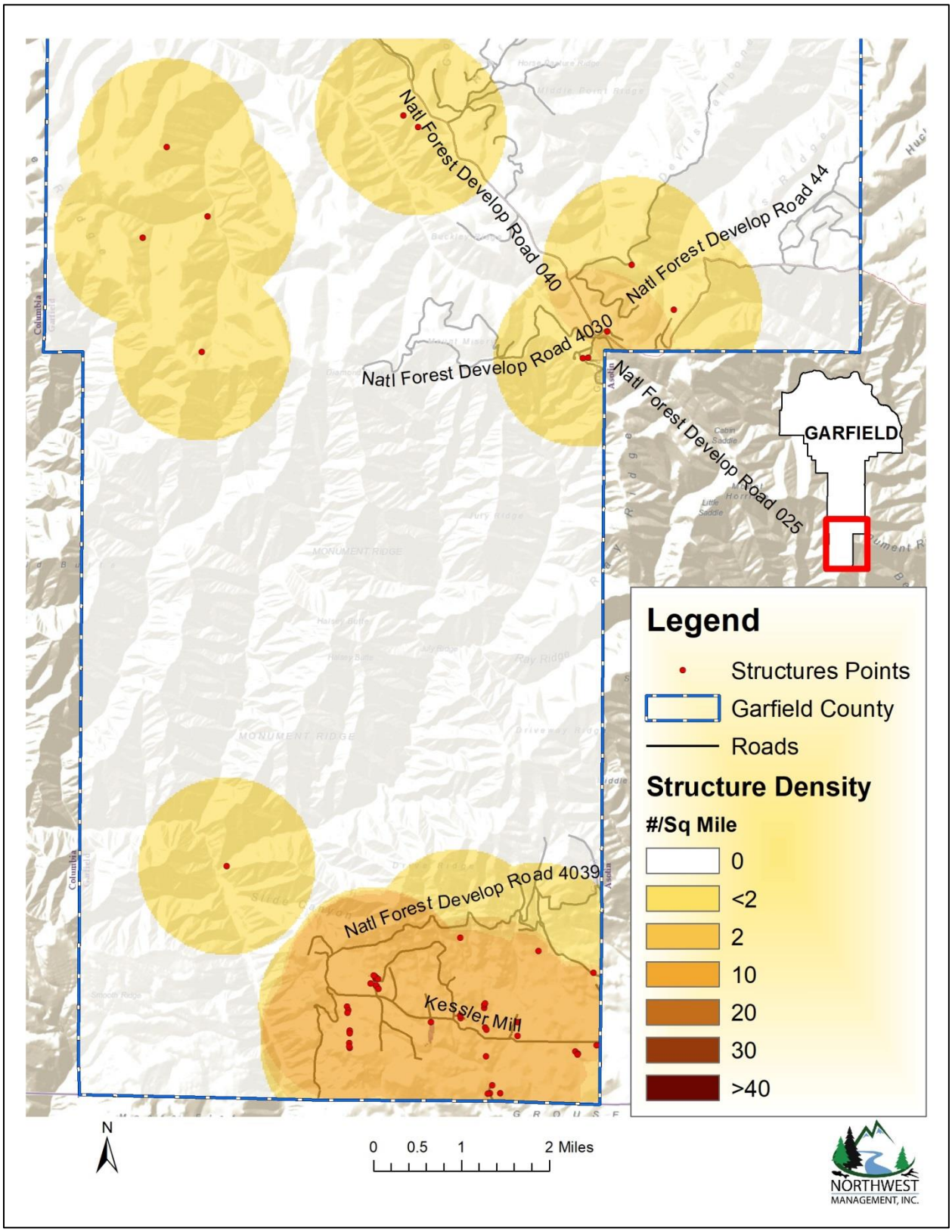
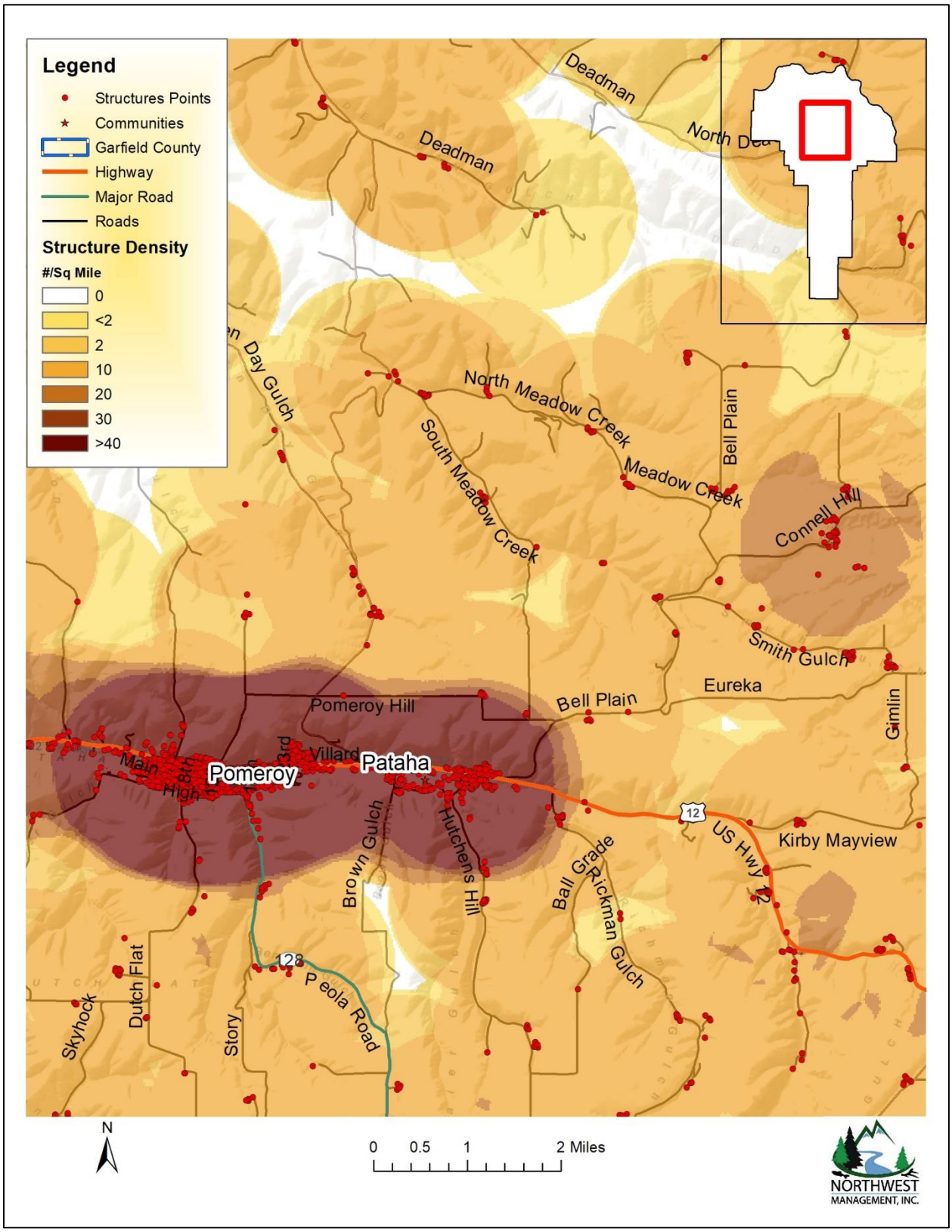


FIGURE 19: STRUCTURE DENSITY IN THE POMEROY AREA OF GARFIELD COUNTY



LOCAL EVENT HISTORY

Fire was once an integral function of the majority of ecosystems in southeastern Washington. The seasonal cycling of fire across the landscape was as regular as the July, August and September lightning storms plying across the canyons and mountains. Depending on the plant community composition, structural configuration, and buildup of plant biomass, fire resulted from ignitions with varying intensities and extent across the landscape. Shorter return intervals between fire events often resulted in less dramatic changes in plant composition.[47] The fires burned from 1 to 47 years apart, with most at 5- to 20-year intervals.[48] With infrequent return intervals, plant communities tended to burn more severely and be replaced by vegetation different in composition, structure, and age.[49] Native plant communities in this region developed under the influence of fire, and adaptations to fire are evident at the species, community, and ecosystem levels. Fire history data (from fire scars and charcoal deposits) suggest fire has played an important role in shaping the vegetation in the Columbia Basin for thousands of years.

This plan update uses the Washington Department of Natural Resources database of wildfire ignitions, covering the years 2010-2019. The data includes ignition causes, acres burned and incident identifiers. This database does not include all fires that occurred in the county for the time period, only those incidences specifically tracked by the Washington DNR that originated in Garfield County.

TABLE 19: WA DNR FIRE STARTS IN GARFIELD COUNTY BY CAUSE, 2010-2019

Cause	Number of Ignitions	Acres Burned	% of Acres Burned
Debris Burn	2	1.3	0.1%
Lightning	8	1.1	0.1%
Miscellaneous	3	2011.6	97.3%
Recreation	1	0.5	<0.1%
Undetermined	5	53.3	2.6%
Total	19	2067.8	100.0%

[47] Johnson, C. G. 1998. Vegetation Response after Wildfires in National Forest of Northeastern Oregon. 128 pp.
[48] Barrett, J. W. 1979. *Silviculture of ponderosa pine in the Pacific Northwest: The state of our knowledge. USDA Forest Service*. General Technical Report PNW-97. Pacific Northwest Forest and Range Experiment Station. Portland, Oregon. 106pp.
[49] Johnson, C.G.; et al. 1994. *Biotic and Abiotic Processes of Eastside Ecosytems: the Effects of Management on Plant and Community Ecology, and on Stand and Landscape Vegetation Dynamics*. Gen. Tech. Report PNW-GTR-322. USDA-Forest Service. PNW Research Station. Portland, Oregon. 722pp.

The U.S. Forest Service wildfire database used for this plan update contains federal fire data for the period of 2010-2019 for fires that originated in Garfield County and were responded to by the Forest Service.

TABLE 20: USFS FIRE STARTS IN GARFIELD COUNTY BY CAUSE, 2010-2019

Cause	Number of Ignitions	Acres Burned	% of Acres Burned
Lightning	177	293.5	81.5%
Equipment Use	3	3.2	0.9%
Smoking	6	2.5	0.7%
Campfire	71	8.7	2.4%
Debris Burning	7	45.8	12.7%
Arson	7	0.7	0.2%
Miscellaneous	10	5.9	1.6%
Total	281	360.3	100.0%

Both databases show that the highest fire risk for both number of ignitions and acres burned is lightning by a significant majority. Debris burning, equipment (both logging and farming), and campfires also result in numerous ignitions and acres burned each year. This data demonstrates that the aggressive initial attack policy employed by both wildfire agencies and local fire agencies keeps most fires from growing over one acre in size.

FIGURE 20: STATE AND FEDERAL WILDFIRE STARTS BY CAUSE IN GARFIELD COUNTY

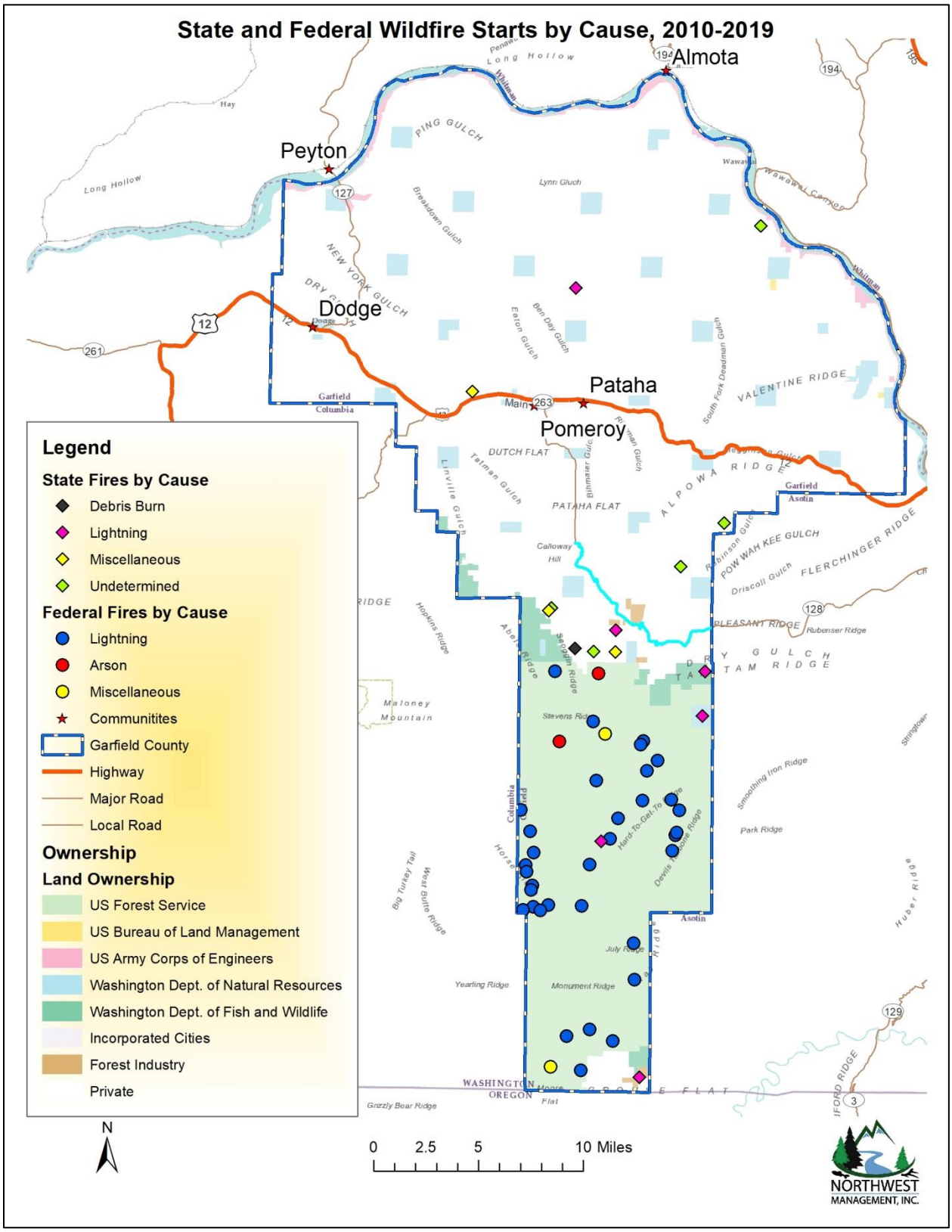
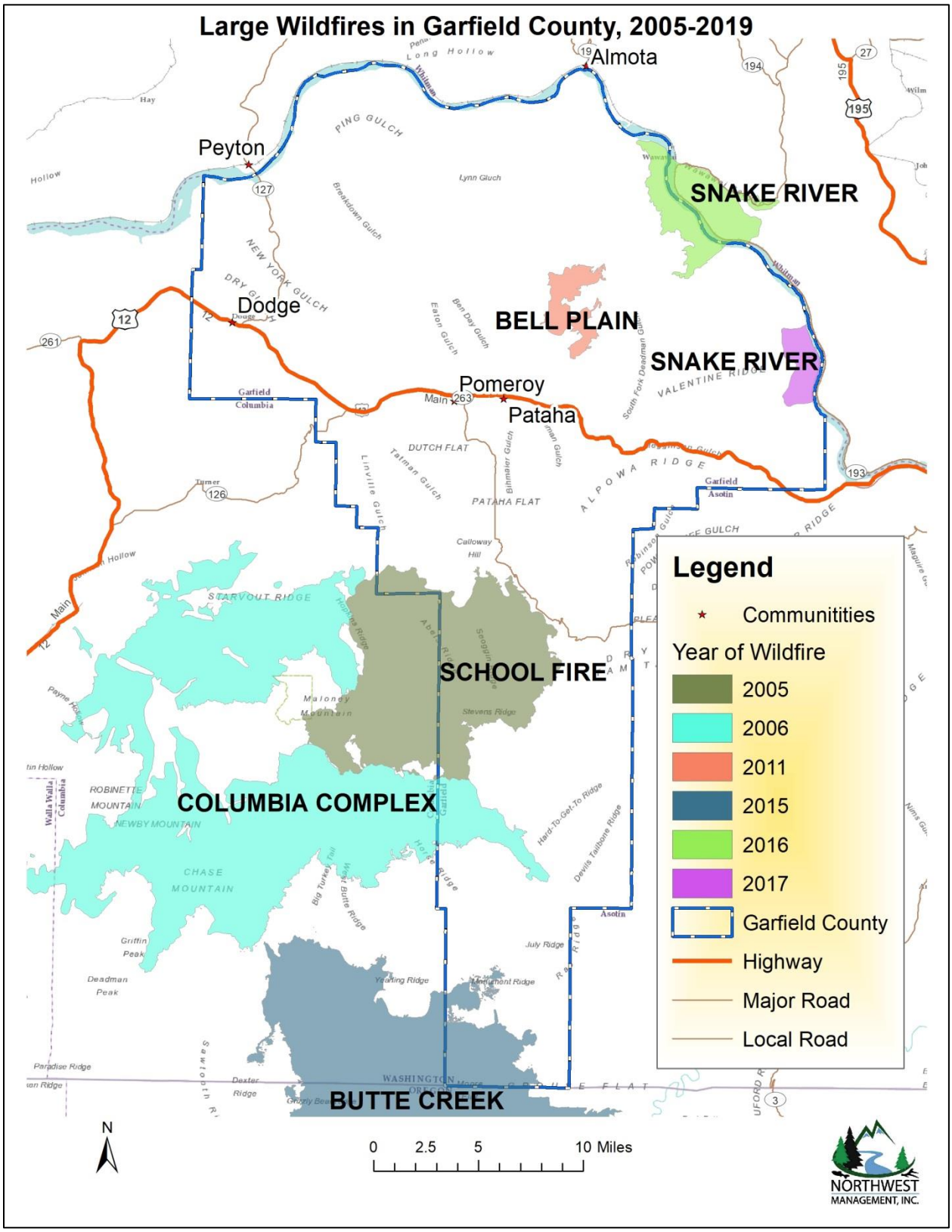


FIGURE 21: RECENT LARGE WILDFIRES BY YEAR IN GARFIELD COUNTY



PROBABILITY OF FUTURE EVENTS

Vegetative structure and composition in Garfield County is closely related to elevation, aspect, and precipitation. Relatively mild and dry environments characterize the undulating topography of the region which transitions from the Snake River valley riparian plant communities to the rangeland ecosystems that characterize the vast majority of the land area in Garfield County. Forested communities extend this transition as elevations increases, soils change, and conditions favor forest tree species. Forests contain high fuel accumulations that have the potential to burn at moderate to high intensities. Highly variable topography coupled with dry, windy weather conditions typical of the region is likely to create extreme fire behavior.

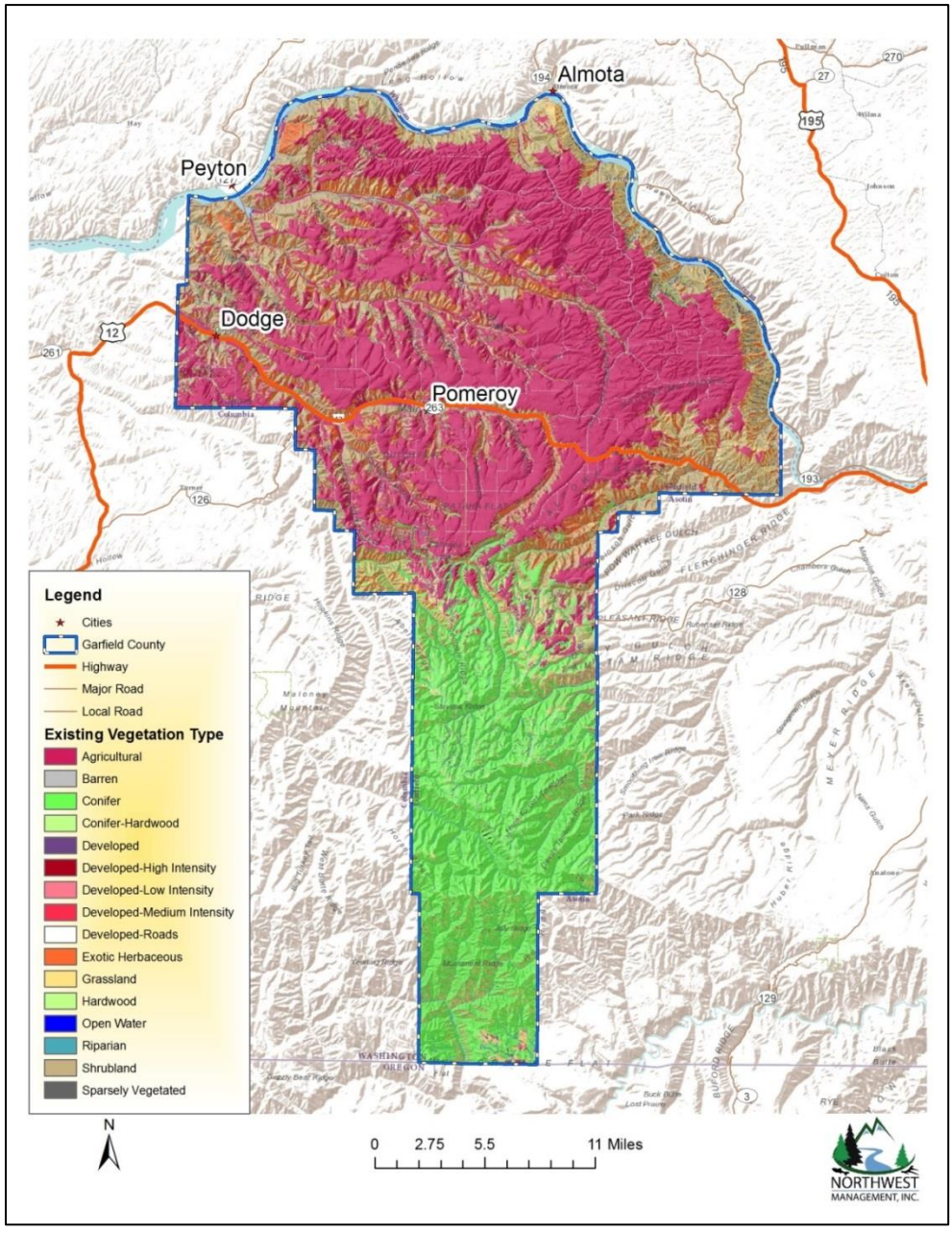
The transition between developed agricultural land and timberlands occurs somewhat abruptly, usually along toe slopes or distinct property boundaries. At higher elevation mountainous regions, moisture becomes less limiting due to a combination of higher precipitation and reduced solar radiation. Vegetative patterns shift from forested communities dominated by ponderosa pine, western larch, grand fir, and Douglas-fir at the lower elevations to lodgepole pine and subalpine fir at the higher elevations. Engelmann spruce is found in moist draws and frost pockets. These forested conditions possess a greater quantity of both dead and down fuels as well as live fuels. Rates of fire spread tend to be lower than those in the grasslands; however, intensities can escalate dramatically, especially under the effect of slope and wind. These conditions can lead to control problems and potentially threaten lives, structures and other valued resources.

TABLE 21: EXISTING VEGETATION IN GARFIELD COUNTY

Existing Vegetation Type	Acres	% of Total
Agricultural	189,169.6	41.2%
Barren	149.5	<0.1%
Conifer	100,278.4	21.8%
Conifer-Hardwood	40.2	<0.1%
Developed	9,200.1	2.0%
Developed-High Intensity	11.3	<0.1%
Developed-Low Intensity	589.5	0.1%
Developed-Medium Intensity	70.2	<0.1%
Developed-Roads	5,934.4	1.3%
Exotic Herbaceous	32,515.1	7.1%
Grassland	25,340.0	5.5%
Hardwood	711.7	0.2%
Open Water	5,112.9	1.1%
Riparian	4,605.8	1.0%
Shrubland	82,298.8	17.9%
Sparsely Vegetated	3,224.3	0.7%
	459,252.0	100.0%

As elevation and aspect increase available moisture, forest composition transitions to moister habitat types. Increases in moisture keep forest fuels unavailable to burn for longer periods during the summer. This increases the time between fire events, resulting in varying degrees of fuel accumulation. When these fuels do become available to burn, they typically burn in a mosaic pattern at mid elevations, where accumulations of forest fuels result in either single or group tree torching, and in some instances, short crown fire runs. At the highest elevations, fire events are typically stand replacing, as years of accumulation fuel large, intense wildfires.

FIGURE 22: EXISTING VEGETATION TYPES IN GARFIELD COUNTY



Insects and disease can cause widespread mortality of forest stands in a very short amount of time. Mountain pine beetle populations have continued to increase at epidemic levels throughout Washington State; however, mortality increases are most pronounced in Eastern Washington. Ponderosa pine and lodgepole pine seem to be the most affected species at all elevations in Garfield County. The occurrence of Ips beetles, Douglas-fir Bark-beetle, Douglas-fir Tussock Moth, and root disease have also been recorded in Eastern Washington (Washington State Department of Natural Resources 2006). Insects and disease often focus and cause the most mortality in forest stands that are overcrowded or otherwise stressed by drought, recent fires, or other factors. Large areas of dead trees are a significant fire hazard. Oftentimes, dry, dead needles hang on the killed trees for several years making them prime for a potential ignition and subsequent crown fire. Thinning overcrowded stands can help reduce stress on individual trees allowing them to better withstand insect attacks. Planting of appropriate species for the site and continual management can also help ward off future outbreaks.

Many lower elevation forested areas throughout Garfield County are highly valued for their scenic qualities as well as for their proximity to travel corridors. These attributes have led to increased recreational home development and residential home construction in and around forest fuel complexes. The juxtaposition of highly flammable forest types and rapid home development will continue to challenge management of wildland fires in the wildland-urban interface.

The slight to undulating topography and moisture availability across much of Garfield County facilitates extensive farming operations, especially in the northern half of the county. Agricultural fields infrequently serve to fuel a fire after curing; burning in much the same manner as consistent low grassy fuels. Fires in grass and rangeland fuel types tend to burn at relatively low intensities, with moderate flame lengths and only short-range spotting.

The Umatilla National Forest boundary is located approximately twelve miles south of Pomeroy. This area is a patch-work of dry ponderosa pine and Douglas-fir woodlands that, in many areas, have begun suffering from forest health issues. In addition, tree regeneration is resulting in multistoried conditions with abundant ladder fuels. During pre-settlement times, much of this area was characterized by low intensity fires due to the relatively light fuel loading, which mostly consisted of small diameter stems. Frequent, low intensity fires generally kept stands open; free of fire intolerant species and maintained seral species such as ponderosa pine as well as larger diameter fire resistant Douglas-fir. In some areas, low intensity fires stimulated shrubs and grasses, maintaining vigorous browse and forage. The shrub layer could either inhibit or contribute to potential fire behavior, depending on weather and live fuel moisture conditions at the time of the burn.

Increased activities by pathogens will continue to increase levels of dead and down forest fuels, as host trees succumb to insect attack and stand level mortality increases. Overstocked, multi-layered stands and the abundance of ladder fuels lead to horizontal and vertical fuel continuity. These conditions, combined with an arid and often windy environment, can encourage the development of a stand replacing fire. These fires can burn with very high intensities and generate large flame lengths and fire brands that can be lofted long distances. Such fires present significant control problems for suppression resources, often developing into large, destructive wildland fires.

A probability that needs to be planned for is the likelihood of extended spot fires. Large fires may easily produce spot fires from ½ to 2 miles away from the main fire. How fire suppression forces respond to spot fires is largely dependent upon the fuels in which they ignite. Stands of timber that are managed for fire resilience are much less likely to sustain torching and crowning behavior that produces more spot fires. The objective of fuel reduction thinning is to change the fuels in a way that will moderate potential fire behavior. If fire intensity can be moderated by vegetation treatments, then ground and air firefighting resources can be much more effective.

IMPACTS OF WILDLAND FIRE EVENTS BY JURISDICTION

GARFIELD COUNTY

The northern part of Garfield County is less timbered and typically the land is used in some sort of agricultural capacity. Suppression resources are generally quite effective in such fuels. Homes and other improvements can be easily protected from the direct flame contact and radiant heat through adoption of precautionary measures around the structure. Although fires in these fuels may not present the same control problems as those associated with large, high intensity fires in timber fuel types, they can cause significant damage if precautionary measures have not taken place prior to a fire event. Wind driven fires in these short grass fuel types spread rapidly and can be difficult to control. During extreme drought and when pushed by high winds, fires in grassland fuel types can exhibit extreme rates of spread, thwarting suppression efforts.

South of the city of Pomeroy, Garfield County begins to shift from predominately open grassland areas to a patch-work of dry ponderosa pine and Douglas-fir woodlands. The private land parcels closer to the boundary with the Umatilla National Forest contain more of a mix of forestland and open grassland. Properties in this area, including structures, infrastructure, farmlands, timberlands, and utilities, are especially at risk to damage from wildfire.

Value of Resources at Risk

It is difficult to estimate potential losses in Garfield County from wildland fire due to the unpredictability of wildfire behavior and the nature of ignition sources. It is impossible to forecast the path a wildfire will take and what type of assets and resources, manmade and ecological, will be at risk. Thus, no value estimates were made for this hazard. It is unlikely that the entire county would be threaten by a single fire; however, it is possible that several small fires (lightning strikes) could escape initial attack efforts and cause crews to fight fires on several fronts at once. Under the influence of wind and/or high temperatures/low humidity, multiple fires could burn together within a few days.

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

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

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

CITY OF POMEROY

Garfield County possesses only one incorporated city, Pomeroy. It is located in the geographic center of the county and is surrounded by native rangelands on moderate to steep slopes and abundant agricultural fields where terrain permits. Pomeroy is the population center of the County as well as the County Seat. It is located along U.S. Highway 12.

The risk from structure loss due to a wildfire entering Pomeroy is moderate. Range fires and agricultural fires have the potential to spread long distances when fanned by high winds.

Rangeland fuels are present along the entire northern and southern border of Pomeroy. These fuels are primarily grass, cheatgrass, and sagebrush intermixed with agriculture fields. Most of the native vegetation in this intermix area is grazed by livestock. Undeveloped sites and vacant lots adjacent to the city pose a potential wildfire threat due to the accumulation of grass fuels unmanaged by the owner. This fuel type is very flashy, but typically does not burn with the intensity of a forestland fuel complex. While these fuels do not generally threaten homes in the area, they could ignite debris and wood structures adjacent to the homes (e.g. firewood stacks, decks, stored lumber, or rubbish). In this manner, these scattered lots within the city limits and adjacent to homes can act as a fuse carrying wildfire from the rangeland to homes. The converse is also true, in that a structure fire can spread to adjacent rangeland fuels, which is then carried to neighboring structures or into the rangeland.

Identification of the vacant lots in the area which support rangeland fuels and are on steep slopes, especially those leading to homes perched on the top of ridges, is critical to reducing the wildfire risk in Pomeroy.

There are many ornamental trees around homes and within parks maintained within Pomeroy. These hardwoods and softwoods do not pose a substantial wildfire risk in that most are maintained in a green and lush condition for the majority of the fire season.

Pomeroy is at moderate risk to a wildfire threatening the city; however, structure fires within the city have some potential to spread from one structure to another; either carried by radiant heat or spread through common vegetation between structures. This risk is lessened by the presence of an active fire protection district.

The Garfield County Fire District #1 provides both structural and wildland fire protection to all of Garfield County. A complete system of fire hydrants is present in the city. Access by fire protection apparatus is generally adequate within the city; however, there are ingress/egress issues in some areas

of the unincorporated county such as unrated bridges, steep or narrow driveways, and high risk fuels abutting the roadway.

All of the private lands in Garfield County have joint jurisdiction with the Washington Department of Natural Resources (DNR). Under joint jurisdiction, it is recognized that the fire district has primary responsibility for structure protection and the DNR will have primary responsibility for wildland fire suppression on state and private lands. The DNR provides wildfire protection during fire season between April and October with varying degrees of available resources in the early spring and late autumn months. U.S. Forest Service responds to all wildland fires on their jurisdiction and may also respond to wildland fires on private or state lands based on a closest-forces, reciprocal agreement with the DNR when resources are available.

Value of Resources at Risk

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

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

GARFIELD COUNTY FIRE DISTRICT #1

Garfield County Fire District #1 covers all of Garfield County. The District provides both structural and wildland fire protection in the city of Pomeroy as well as the surrounding rural counties through mutual-aid agreements. The majority of private lands south of Lewis Road within the fire protection district have joint jurisdiction with the Washington Department of Natural Resources (DNR). Under this joint jurisdiction, it is recognized that the fire district has primary responsibility for structure protection and the DNR will have primary responsibility for wildland fire suppression on state and private lands. The DNR provides wildfire protection during the fire season between April and October with varying degrees of available resources in the early spring and late autumn months.

The Fire District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, in the event of a wildland fire, Fire District #1 would provide emergency response, protection, and search and rescue services.

Value of Resources at Risk

The Garfield County Fire District #1 station in Pomeroy is not at risk to wildland fire due to its location in an urban area. The District has no other known assets or other resources at risk to wildland fires.

POMEROY CONSERVATION DISTRICT

The Conservation District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, the District would be heavily involved in rehabilitation and erosion control following a wildland fire.

Value of Resources at Risk

Due to its location within the city of Pomeroy, the Conservation District office has a very low risk of being directly impacted by wildland fire.

POMEROY SCHOOL DISTRICT #110

The School District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, the District may be impacted by smoke causing delays or closure of the schools. Much of the high-risk fire season occurs during the District's summer break.

Value of Resources at Risk

Due to its location within the city of Pomeroy, the School District office has a very low risk of being directly impacted by wildland fire.

GARFIELD COUNTY HEALTH DISTRICT

The Public Health District does not have any differing levels of risk associated with this hazard than Garfield County as a whole.

Value of Resources at Risk

Due to its location within the city of Pomeroy, the Public Health office has a very low risk of being directly impacted by wildland fire.

PORT OF GARFIELD

The Port of Garfield does not have any differing levels of risk associated with this hazard than Garfield County as a whole.

Value of Resources at Risk

Due to its location within the city of Pomeroy, the Port facility has a very low risk of being directly impacted by wildland fire.

GARFIELD COUNTY HOSPITAL DISTRICT

Memorial Hospital does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, any injuries resulting from a wildfire would likely be treated at the hospital including smoke inhalation and heat exhaustion.

Value of Resources at Risk

Due to its location within the city of Pomeroy, the Hospital facility has a very low risk of being directly impacted by wildland fire.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

GCTA does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, any transportation route disruptions resulting from a wildfire would likely impact the GCTA, resulting in a temporary suspension of services. Any closures would negatively impact many who rely on GCTA services.

Value of Resources at Risk

Due to its location in downtown Pomeroy, GCTA has a very low risk of being directly impacted by wildland fire.

AVALANCHE HAZARD PROFILE

An avalanche is a rapid flow of snow downslope from either natural triggers or human activity. Typically occurring in mountainous terrain, an avalanche can mix air and water with the descending snow. Powerful avalanches have the capability to entrain ice, rocks, trees, and other material on the slope. Avalanches are primarily composed of flowing snow, and are distinct from mudslides, rock slides, rock avalanches, and serac collapses on an icefall. In mountainous terrain, avalanches are among the most serious objective hazards to life and property, with their destructive capability resulting from their potential to carry an enormous mass of snow rapidly over large distances.

Avalanche in neighboring Walla Walla County.

There are two types of avalanches, loose and slab, and two types of slab avalanches, dry and wet. Although the most dangerous avalanche is the slab avalanche, loose slides can and do produce injury and death. Loose avalanches occur when grains of snow cannot hold onto a slope and begin sliding downhill, picking up more snow and fanning out in an inverted V. Slab avalanches occur when a cohesive mass of snow breaks away from the slope all at once. Most slides in the Northwest are slab avalanches. Dry slab avalanches occur when the stresses on a slab overcome the internal strength of the slab and its attachment to surrounding snow. A decrease in strength produced through warming, melting snow, or rain, or an increase in stress produced by the weight of additional snowfall, a skier or a snowmobile cause this type of avalanche. Dry slab avalanches can travel 60 to 80 miles per hour or more, reaching these speeds within five seconds after the fracture; they account for most avalanche fatalities. Wet slab avalanches occur when water percolating through the top slab weakens it and dissolves its bond with a lower layer, decreasing the ability of the weaker, lower layer to hold on to the top slab, as well as decreasing the slab's strength.

For a slope to generate an avalanche it must be simultaneously capable of retaining snow and allowing snow to accelerate once set in motion. The angle of the slope that can hold snow depends on the ductile and shear strength of the snow, which is determined by the temperature and moisture content. Drier and colder snow, with lower ductile and shear strength, will only bond to lower angle slopes; while wet and warm snow, with higher ductile and shear strength, can bind to very steep surfaces. Snow that has been water saturated to the point of slush can accelerate on shallow angled terrain; while a cohesive snow pack will not accelerate on steep slopes.

A number of weather and terrain factors determine avalanche danger:

Weather:

- Storms – A large percentage of all snow avalanches occur during and shortly after storms.
- Rate of snowfall – Snow falling at a rate of one inch or more per hour rapidly increases avalanche danger.
- Temperature – Storms starting with low temperatures and dry snow, followed by rising temperatures and wetter snow, are more likely to cause avalanches than storms that start warm and then cool with snowfall.
- Wet snow – Rainstorms or spring weather with warm, moist winds and cloudy nights can warm the snow cover resulting in wet snow avalanches. Wet snow avalanches are more likely on sun-exposed terrain (south-facing slopes) and under exposed rocks or cliffs.

Terrain:

- Ground cover – Large rocks, trees and heavy shrubs help anchor snow.
- Slope profile – Dangerous slab avalanches are more likely to occur on convex slopes.
- Slope aspect – Leeward slopes are dangerous because windblown snow adds depth and creates dense slabs. South facing slopes are more dangerous in the springtime.
- Slope steepness – Snow avalanches are most common on slopes of 30 to 45 degrees.

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

The only known avalanche in southeastern Washington occurred in Pomeroy in 1932. No injuries were reported, but snow had to be removed from the railroad tracks. In southeastern Washington, the only area having significant risk to avalanches is the Blue Mountains in the southern regions of Asotin and Garfield County. This area is primarily at risk due to the intensity of winter recreation activities, particularly skiing and snowmobiling. With this exception, this region is not at risk of avalanches as snowpack is typically minimal.

Avalanche Risk Assessment

Local Event History

There have been no reported damages or lives lost due to an avalanche in Garfield County.

Winter 1932 - The only reported occurrence was in 1932 when a small avalanche covered the railroad tracks on the south side of Pomeroy. This event did require crews to shovel off the tracks, but no other damages were reported.

Probability of Future Events

The Blue Mountains in the southern part of the County have a high propensity for avalanches. There is a small possibility that an avalanche could cover a rural section of a County or Forest Service road.

Impacts of Avalanche Events by Jurisdiction

Garfield County

The Blue Mountains in the southern part of the County have a high propensity for avalanches; however, there are very few structures or infrastructure in these higher risk areas. Recreational activities such as skiing and snowmobiling are increasing in some of these areas; thus, as more people frequent the area during the winter, the higher the risk. There are currently no avalanche mitigation programs occurring in Garfield County.

Value of Resources at Risk

Garfield County has no assets at significant risk of avalanches due to low snow accumulations in populated areas. The highest potential risk would likely be the result of a skier, snowboarder, snowmobiler, or other recreationist becoming trapped in an avalanche. These areas are generally difficult to access; thus, a rescue attempt may also be difficult.

There is a small possibility that an avalanche could cover a rural section of a County or Forest Service road; however, this type of road is not likely critical to daily travel; thus the damages would likely be minimal.

City of Pomeroy

The city of Pomeroy has very little risk of experiencing an avalanche. The Blue Mountains in southern Garfield County have a high probability of experiencing avalanches in remote areas, however, the city of Pomeroy will not be directly impacted by this type of localized event.

In 1932, a small avalanche occurred on the south side of Pomeroy covering the railroad tracks. This slide did not causing any recorded damages.

Value of Resources at Risk

As the 1932 event demonstrates, there is a small possibility of an occurrence; however, there are currently no structures or infrastructure that would be impacted.

Garfield County Fire District #1

Although the Blue Mountains in southern Garfield County has a high probability of experiencing avalanches in remote areas, Garfield County Fire District #1 will not be directly impacted by this type of localized event. However, in the event of a significant avalanche event, Fire District #1 may assist with any necessary evacuations or search and rescue operations.

Value of Resources at Risk

The Garfield County Fire District #1 in Pomeroy is not at risk to avalanches due to its location in a relatively flat, heavily developed area. The District has no other known assets or other resources at risk to avalanches.

POMEROY CONSERVATION DISTRICT

Although the Blue Mountains in southern Garfield County have a high probability of experiencing avalanches in remote areas, the Pomeroy Conservation District will not be directly impacted by this type of localized event.

Value of Resources at Risk

The Conservation District office in Pomeroy is not at risk to avalanches due to its location in a relatively flat, heavily developed area. The District has no other known assets or other resources at risk to avalanches.

POMEROY SCHOOL DISTRICT #110

Although the Blue Mountains in southern Garfield County have a high probability of experiencing avalanches in remote areas, the Pomeroy School District will not be directly impacted by this type of localized event.

Value of Resources at Risk

The School District facilities in Pomeroy are not at risk to avalanches due to its location in a relatively flat, heavily developed area. The District has no other known assets or other resources at risk to avalanches.

GARFIELD COUNTY HEALTH DISTRICT

Although the Blue Mountains in southern Garfield County have a high probability of experiencing avalanches in remote areas, the Public Health District will not be directly impacted by this type of localized event.

Value of Resources at Risk

The Public Health District office at the Elementary School is not at risk to avalanches due to its location in a relatively flat, heavily developed area. The District has no other known assets or other resources at risk to avalanches.

PORT OF GARFIELD

Although the Blue Mountains in southern Garfield County have a high probability of experiencing avalanches in remote areas, the Port of Garfield will not be directly impacted by this type of localized event.

Value of Resources at Risk

The Port of Garfield is not at risk to avalanches due to its location in a relatively flat, heavily developed area. The District has no other known assets or other resources at risk to avalanches.

GARFIELD COUNTY HOSPITAL DISTRICT

Although the Blue Mountains in southern Garfield County have a high probability of experiencing avalanches in remote areas, Memorial Hospital is not at risk to this type of localized event. Theoretically, snow could slide from the slope just north of the Hospital facility; however, due to the south aspect of the slope and typically low snow accumulation in Pomeroy, this is very unlikely.

Value of Resources at Risk

Memorial Hospital is not at risk to avalanches due to its location in Pomeroy. The District has no other known assets or other resources at risk to avalanches.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

Although the Blue Mountains in southern Garfield County have a high probability of experiencing avalanches in remote areas, the GCTA is not at risk to this type of localized event. The risk of an avalanche impacting any GCTA travel routes is also very low.

Value of Resources at Risk

GCTA is not at risk to avalanches due to its location in Pomeroy.

TSUNAMI HAZARD PROFILE

While a true tsunami will never directly impact southeast Washington, the Snake River shoreline is vulnerable to inland tsunamis (pronounced soo-ná-mees); more accurately referred to as seiches. An inland tsunami, or seiche, is a sudden, large wave that can cause loss of life and property damage. Inland tsunamis are typically defined as standing waves on a closed or semi-closed body of water such as rivers, reservoirs, ponds, and lakes.

The effect of an inland tsunami is caused by resonances in a body of water that has been disturbed by one or more of a number of factors, most often meteorological effects (wind and atmospheric pressure variations), seismic activity, or landslides. Gravity always seeks to restore the horizontal surface of a body of liquid water, as this represents the configuration in which the water is in hydrostatic equilibrium. Vertical harmonic motion produces an impulse that travels the length of the basin at a velocity that depends on the depth of the water. The impulse is reflected back from the end of the basin generating interference. Repeated reflections produce standing waves with one or more nodes, or points, that experience no vertical motion. The frequency of the oscillation is determined by the size of the basin, its depth and contours, and the water temperature.[50]

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

The Snake River corridor does not have a history of landslides that resulted in inland tsunamis, but due to the steep topography and continued development along the adjacent slopes, there is potential for a landslide initiating a wave that causes damage on the opposite shoreline. Inland tsunamis on Lake Roosevelt in northeastern Washington, which has similar topography and land and water uses, have exclusively been the result of landslides. Reports of these events suggest that only one wave hit the shoreline opposite of a landslide. The two major geologic parameters that affect the generation of a water wave from a landslide are the volume of the slide mass and the motion of the mass as it reaches the water.

Lake Roosevelt Inland Tsunamis

Landslides into Lake Roosevelt generated numerous seiches (commonly recorded as tsunamis) from 1944 to 1953 after Grand Coulee Dam created the lake on the Columbia River. Most seiches on Lake Roosevelt have generated large waves (30 to 60 feet in height) that struck the opposite shore of the

[50] Wikipedia. "Seiche." Wikipedia Foundation, Inc. Available online at http://en.wikipedia.org/wiki/Seiche. Accessed March 17, 2011.

lake, with some waves observed miles from the source. Several seiches have been recorded on Lake Roosevelt since 1944.[51]

The most recent example of a seiche on Lake Roosevelt happened in 2009 in Lincoln County, Washington. On August 25, 2009 a large landslide occurred near the Blue Creek drainage on the Spokane Indian Reservation side of the Spokane Arm of Lake Roosevelt. This resulted in a 12-foot wave hitting Porcupine Campground on the south shore of the lake. Damage to National Park Service facilities was estimated at $250,000.[52]

TSUNAMI RISK ASSESSMENT

The northern border of Garfield County is formed by the Snake River, the only body of water large enough to experience a tsunami.

LOCAL EVENT HISTORY

There have been no damages reported from this type of occurrence along the Snake River.

PROBABILITY OF FUTURE EVENTS

There is a low probability of landslides causing localized tsunamis in the vicinity of the Snake River.

IMPACTS OF TSUNAMI EVENTS BY JURISDICTION

GARFIELD COUNTY

Due to the very low population density and the lack of infrastructure along the Snake River, it is unlikely that an inland tsunami would cause significant damages within the county.

Value of Resources at Risk

Individual crops, structures, or docks may be damaged, but widespread losses are unlikely. It is also not highly probable that an inland tsunami would have a significant impact on Lower Granite Dam.

CITY OF POMEROY

Although Garfield County's northern border has some low probability risk of being impact by an inland tsunami on the Snake River, the city of Pomeroy will not be directly impacted by this type of localized event.

Value of Resources at Risk

Pomeroy has no assets at risk to an inland tsunami event.

[51] Sliding Thought Blog: Washington's Landslide Blog. *Lake Roosevelt Landslide/Seiche*. Available online at https://slidingthought.wordpress.com/2009/04/.
[52] Sliding Thought Blog: Washington's Landslide Blog. *Porcupine Bay Landslide, Lincoln, County*. Available online at https://slidingthought.wordpress.com/2009/08/.

Garfield County Fire District #1

Although Garfield County's northern border has some low probability risk of being impact by an inland tsunami on the Snake River, the Fire District will not be directly impacted by this type of localized event. However, it is likely that Fire District #1 would be involved in any emergency response required including search and rescue.

Value of Resources at Risk

Garfield County Fire District #1 has no assets at risk to inland tsunamis.

Pomeroy Conservation District

Although Garfield County's northern border has some low probability risk of being impact by an inland tsunami on the Snake River, the Conservation District will not be directly impacted by this type of localized event.

Value of Resources at Risk

The Pomeroy Conservation District has no assets at risk to inland tsunamis.

Pomeroy School District #110

Although Garfield County's northern border has some low probability risk of being impact by an inland tsunami on the Snake River, the School District will not be directly impacted by this type of localized event.

Value of Resources at Risk

The Pomeroy School District has no assets at risk to inland tsunamis.

Garfield County Health District

Although Garfield County's northern border has some low probability risk of being impact by an inland tsunami on the Snake River, the Public Health District will not be directly impacted by this type of localized event.

Value of Resources at Risk

The Public Health District has no assets at risk to inland tsunamis.

Port of Garfield

Although Garfield County's northern border has some low probability risk of being impact by an inland tsunami on the Snake River, the Port of Garfield's facilities will not be directly impacted by this type of localized event. An inland tsunami along the Snake River may affect river commerce by damaging docking locations as well as possibly changing channel locations, which will temporarily impact the Port and the regional economy.

Value of Resources at Risk

The Port of Garfield has no assets at risk to inland tsunamis.

GARFIELD COUNTY HOSPITAL DISTRICT

Although Garfield County's northern border has some low probability risk of being impact by an inland tsunami on the Snake River, the Garfield County Hospital District has no assets in the potentially impacted area. Nevertheless, any injuries resulting from a tsunami event, would be routed to the District's medical facilities in Pomeroy.

Value of Resources at Risk

Memorial Hospital has no assets at risk to inland tsunamis.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

Although Garfield County's northern border has some low probability risk of being impact by an inland tsunami on the Snake River, the Garfield County Transportation Authority has no assets in the potentially impacted area. Nevertheless, any travel closures resulting from a tsunami event, would impact the GCTA and potentially disrupt services.

Value of Resources at Risk

The GCTA has no assets at risk to inland tsunamis.

VOLCANO HAZARD PROFILE

The Cascade Range of the Pacific Northwest has more than a dozen potentially active volcanoes. Cascade volcanoes tend to erupt explosively, and on average two eruptions occur per century—the most recent were at Mount St. Helens, Washington (1980–86 and 2004–8), and Lassen Peak, California (1914–17). On May 18, 1980, after 2 months of earthquakes and minor eruptions, Mount St. Helens, Washington, exploded in one of the most devastating volcanic eruptions of the 20th century. Although less than 0.1 cubic mile of molten rock (magma) was erupted, 57 people died, and damage exceeded $1 billion. Fortunately, most people in the area were able to evacuate safely before the eruption because public officials had been alerted to the danger by U.S. Geological Survey (USGS) and other scientists. To help protect the Pacific Northwest's rapidly expanding population, USGS scientists at the Cascades Volcano Observatory in Vancouver, Washington, monitor and assess the hazards posed by the region's volcanoes.[53]

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

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

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

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

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

can be trapped in low areas in concentrations that are deadly to people and animals. Fluorine, which in high concentrations is toxic, can be adsorbed onto volcanic ash particles that later fall to the ground. The fluorine on the particles can poison livestock grazing on ash-coated grass and also contaminate domestic water supplies.[54]

VOLCANOES OF THE CASCADES[55]

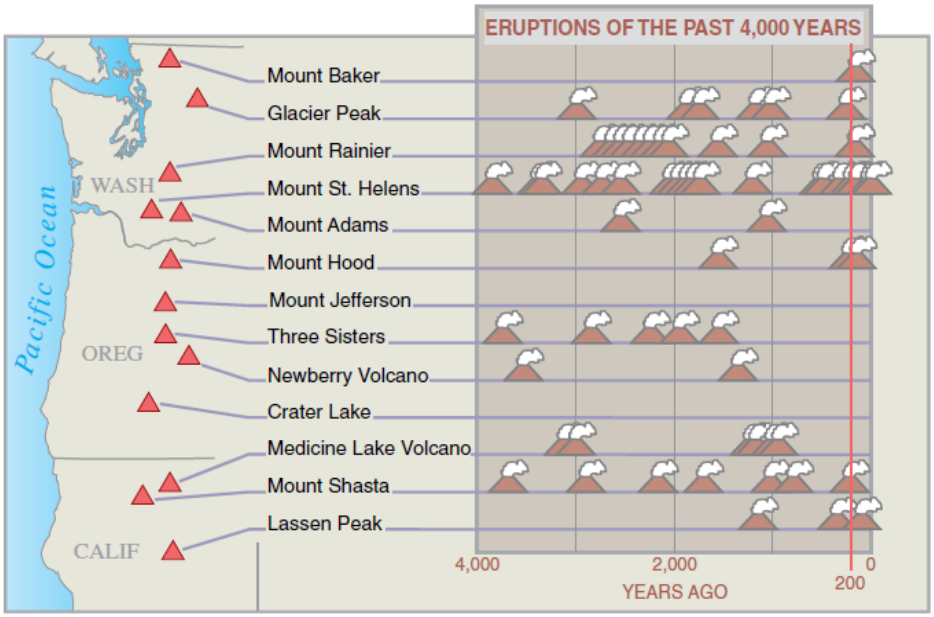
The volcanoes of the Cascade Range, which stretches from northern California into British Columbia, have produced more than 100 eruptions, most of them explosive, in just the past few thousand years. However, individual Cascade volcanoes can lie dormant for many centuries between eruptions, and the great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

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

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

[54] Myers, Bobbie, et al. "What are Volcano Hazards?" U.S. Geological Survey. Vancouver, Washington. July 2004.
[55] Dzurisim, Dan, et al. "Living with Volcanic Risk in the Cascades." U.S. Geological Survey – Reducing the Risk from Volcano Hazards. USGS. Vancouver, Washington. 1997.

FIGURE 23: RECORD OF CASCADE RANGE VOLCANIC ERUPTIONS



Of the 13 potentially active volcanoes in the Cascade Range, 11 have erupted in the past 4,000 years. More than 100 eruptions have occurred during that period, making the volcanoes of the Cascade Range some of the most hazardous in the U.S. Each eruption symbol in the diagram represents from one to several eruptions closely spaced in time at or near the named volcano.

Washington

Mount Baker erupted in the mid-1800s for the first time in several thousand years. Activity at steam vents (fumaroles) in Sherman Crater, near the volcano's summit, increased in 1975 and is still vigorous, but there is no evidence that an eruption is imminent. **Glacier Peak** has erupted at least six times in the past 4,000 years. About 13,000 years ago, an especially powerful series of eruptions deposited volcanic ash at least as far away as Wyoming. **Mount Rainier** has produced at least ten eruptions and numerous lahars in the past 4,000 years. It is capped by more glacier ice than the rest of the Cascade volcanoes combined, and parts of Rainier's steep slopes have been weakened by hot, acidic volcanic gases and water. These factors make this volcano especially prone to landslides and lahars. **Mount St. Helens** is the most frequently active volcano in the Cascades. During the past 4,000 years, it has produced many lahars and a wide variety of eruptive activity, from relatively quiet outflows of lava to explosive eruptions much larger than that of May 18, 1980. **Mount Adams** has produced few eruptions during the past several thousand years. This volcano's most recent activity was a series of small eruptions about 1,000 years ago.

Oregon

Mount Hood last erupted about 200 years ago, producing pyroclastic flows, lahars, and a prominent lava dome (Crater Rock) near the volcano's summit. Most recently, a series of steam blasts occurred between 1856 and 1865. **Mount Jefferson** last erupted more than 20,000 years ago. However, eruptions nearby have produced several lava flows and small volcanic cones in the past 10,000 years. Three Sisters Volcanic Center in central Oregon includes five large volcanoes—**North Sister, Middle Sister, South Sister, Broken Top**, and **Mount Bachelor**. About 2,000 years ago, eruptions occurred on South Sister, as

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

Reducing the Risk

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

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

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

Volcano Risk Assessment

Local Event History

The Mount St. Helens eruption in 1980 deposited several inches of ash causing widespread damages to vehicles and other equipment in Garfield County. The airborne particulates can also cause respiratory problems for both people and animals. These affects are particularly notable for populations already dealing with respiratory illnesses. Local accounts of the 1980 eruption, did not indicate that the ash deposition adversely affected crops. In fact, some noted that the addition of volcanic ash increased the water retention properties of the soil.

Probability of Future Events

Garfield County is not directly at risk of experiencing a volcano; however, there is a high probability that ash and other particulates from an eruption in western Washington or Oregon would be carried to and deposited within the county.

Impacts of Volcano Events by Jurisdiction

Garfield County

The secondary effects of ash and airborne particulates may have varying degrees of negative effects within the county. Residents of Garfield County will be at risk to health problems associated with the respiratory effects of breathing airborne particulates.

Value of Resources at Risk

Garfield County has no assets at direct risk of being impacted by a volcanic eruption. Damages to property will likely be limited to vehicles and cleanup costs.

City of Pomeroy

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

Value of Resources at Risk

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

Garfield County Fire District #1

The Fire District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, in the event of a volcanic eruption in western Washington or Oregon, Fire District #1 may assist with any necessary evacuations, medical responses, or traffic accidents.

Value of Resources at Risk

The Garfield County Fire District #1 station in Pomeroy does not have any direct risk to volcanoes; however, there may be damage to the structure and/or equipment caused by ash fallout.

Pomeroy Conservation District

The Conservation District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, in the event of a volcanic eruption in western Washington or Oregon, the District may assist with any necessary cleanup efforts, particularly if local farmers and ranchers require technical assistance.

Value of Resources at Risk

The Conservation District office in Pomeroy does not have any direct risk to volcanoes; however, there may be damage to the structure and/or equipment caused by ash fallout.

Pomeroy School District #110

The School District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, in the event of a volcanic eruption in western Washington or Oregon, the District may be shut down due to the respiratory effects of ash.

Value of Resources at Risk

The School District office in Pomeroy does not have any direct risk to volcanoes; however, there may be damage to the structure and/or equipment caused by ash fallout. There may also be some cleanup required before children could be allowed to return to school.

Garfield County Health District

The School District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, in the event of a volcanic eruption in western Washington or Oregon, the District would be involved with educating and treating any illnesses or side-effects caused by ash inhalation.

Value of Resources at Risk

The Public Health District office does not have any direct risk to volcanoes; however, there may be damage to the Elementary School structure caused by ash fallout. However, the structure is owned by the School District; thus, the Public Health District is not responsible for damages or upgrades to the facility.

Port of Garfield

The Port of Garfield does not have any differing levels of risk associated with this hazard than Garfield County as a whole.

Value of Resources at Risk

The Port of Garfield facility does not have any direct risk to volcanoes; however, there may be damage to the structures and cleanup costs caused by ash fallout.

Garfield County Hospital District

Memorial Hospital does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, any injuries resulting from a volcano, including the respiratory effects caused by ash inhalation, would likely be treated at the hospital.

Value of Resources at Risk

The Memorial Hospital facility does not have any direct risk to volcanoes; however, there may be damage to the structures and cleanup costs associated with the ash fallout.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

Ash fall is the hazard associated with a volcanic eruption that is likely to affect Garfield County. The main way that GCTA would be impacted by this hazard is through disruptions to its services, such as poor visibility and other unsafe traveling conditions.

Value of Resources at Risk

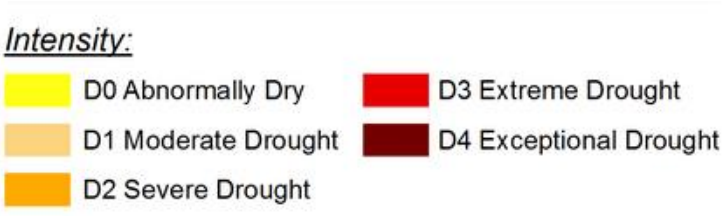
Ash fall from a volcanic eruption could potentially damage GCTA vehicles or cause increased maintenance and repair costs.

DROUGHT HAZARD PROFILE

Drought is defined as a prolonged period of dryness severe enough to reduce soil moisture, water levels, and snow levels below the minimum necessary for sustaining plant, animal and economic systems.[56] The National Drought Mitigation Center says the following: "In the most general sense, drought is defined as a deficiency of precipitation over an extended period of time (usually a season or more), resulting in a water shortage."[57] In the past century, Washington State has experienced a number of drought cycles including several that lasted for more than a single season.

Since the inception of the U.S. Drought Monitor in 2000, the longest duration of drought (D1-D4) in Washington lasted 116 weeks beginning on January 7, 2014 and ending on March 22, 2016. The most intense period of drought occurred the week of August 25, 2015 where D3 affected 84.64% of Washington land.[58]

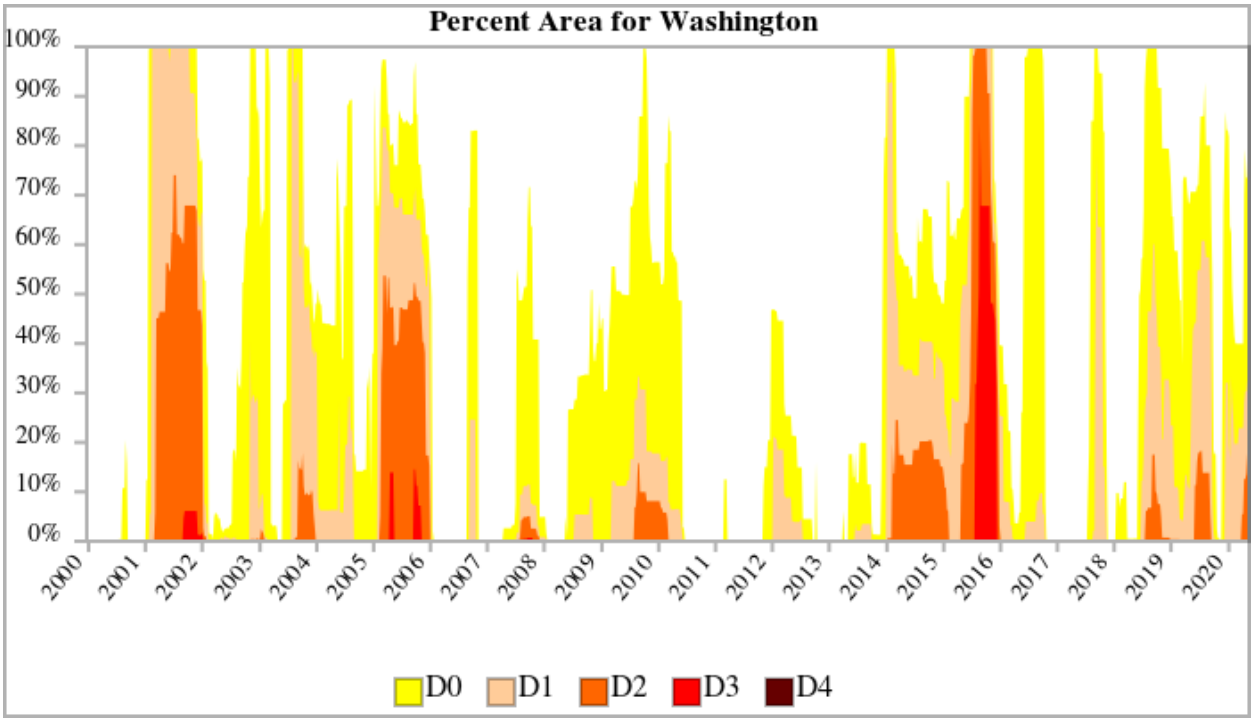
FIGURE 24: DROUGHT INTENSITY CATEGORIES AND SEVERITY SCALE



Description	Possible Impacts
Abnormally Dry	Going into drought: short-term dryness slows growth of crops/pastures. Coming out of drought: some lingering water deficits; crops/pastures not fully recovered.
Moderate Drought	Some damage to crops/pastures; streams, reservoirs, or wells are low with some water shortages developing or imminent; voluntary water-use restrictions requested.
Severe Drought	Crop/pasture losses are likely; water shortages are common and water restrictions are imposed.
Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions.
Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies.

[56] Washington Emergency Management Division. *Drought*. https://mil.wa.gov/drought.
[57] National Drought Mitigation Center. University of Nebraska-Lincoln. *Drought Basics*. https://drought.unl.edu/Education/DroughtBasics.aspx.
[58] National Integrated Drought Information System. *Drought in Washington*. https://www.drought.gov/drought/states/washington.

FIGURE 25: PERCENT AREA IN DROUGHT IN WASHINGTON FROM 2000-2020 AS DISCUSSED IN THE PREVIOUS PARAGRAPH



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

1. An area has to be experiencing or projected to experience a water supply that is below 75 percent of normal.
2. Water users within those areas will likely incur undue hardships as a result of the shortage.[59]

On average, the nationwide annual economic impacts of drought – between $6 billion and $8 billion annually in the United States – are greater than the impacts of any other natural hazard. They occur primarily in the agriculture, transportation, recreation and tourism, forestry, and energy sectors. Social and environmental impacts are also significant, although it is difficult to put a precise cost on these impacts. A drought directly or indirectly affects all of the residents of Garfield County. The National Drought Mitigation Center groups drought impacts into three main categories: economic, environmental, and social. Specific impacts within each category include farmers losing livelihood due to destroyed crops, loss or destruction of habitat or water for animals, and threat to public safety from increased wildfires.[60]

Additionally, drought threatens the supply of electricity in Washington. When supplies of locally generated hydropower shrink because of drought, utilities seek other sources of electricity, which can drive up prices as well as reduce supply. According to the U.S. Energy Information Administration, electricity is primarily produced from hydropower. "Hydroelectric power typically accounts for more

[59] Washington Emergency Management Division. *Drought*. https://mil.wa.gov/drought.
[60] National Drought Mitigation Center. University of Nebraska-Lincoln. *Drought Basics*. https://drought.unl.edu/Education/DroughtBasics.aspx.

than two-thirds of Washington's electricity generation. In 2018, hydropower accounted for 69% of the state's net generation. In part because of the relatively low operating costs of hydroelectric power generation, Washington had the nation's third-lowest average retail price for electricity in 2018."[61]

Drought can also effect groundwater sources, but generally not as quickly as surface water supplies. However, groundwater supplies usually take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at the normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Low ground and surface water supplies directly impact Southeastern Washington fisheries by reducing river and stream levels and thereby reducing potential habitat.

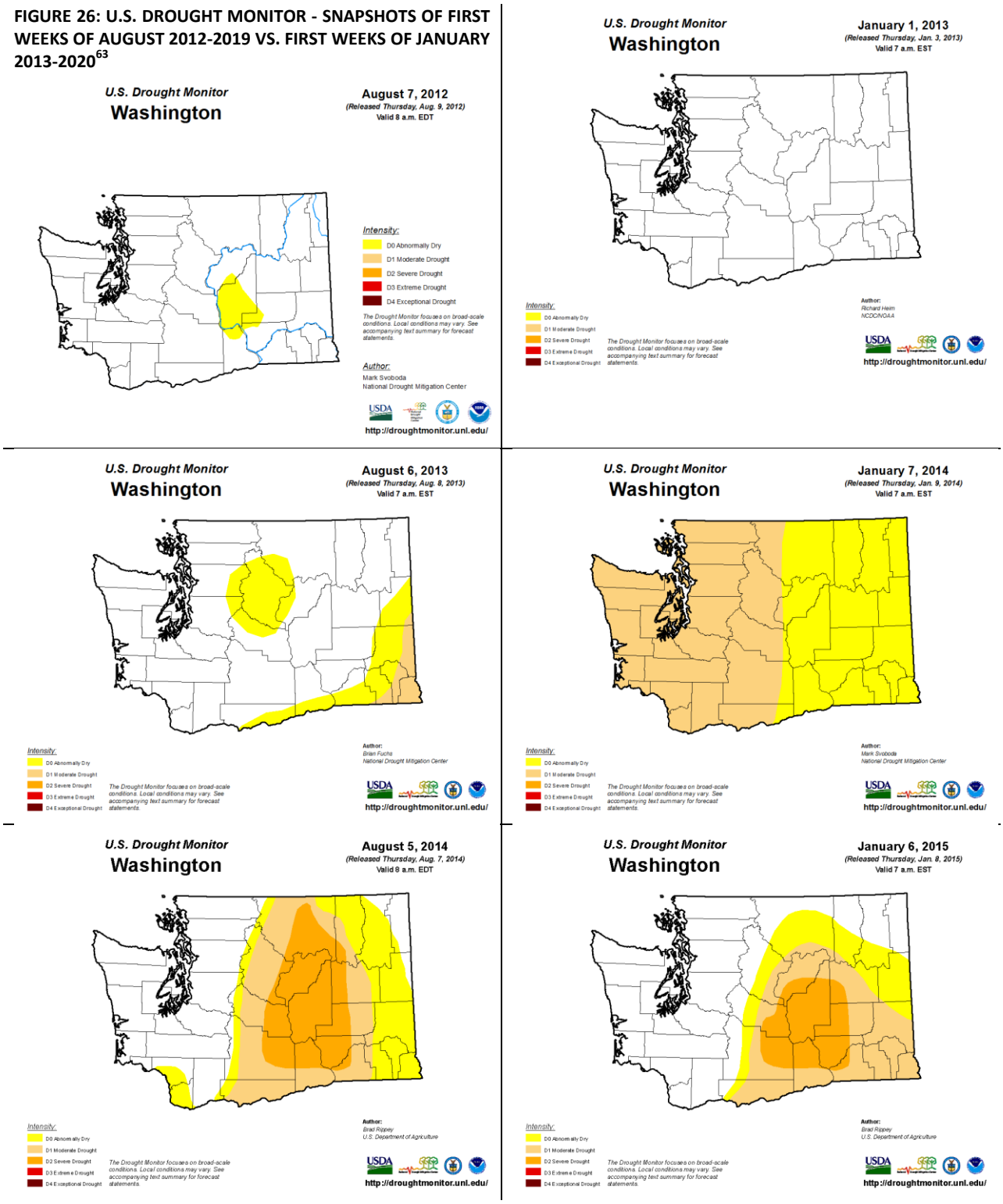
Agriculture is the industry most heavily affected by drought. Low water flow in the Snake River can present problems for wheat growers in Southeastern Washington since more than 80% of their crop is transported by barge. Lack of dredging combined with low river levels reduces the capacity for barge transportation down river from Lewiston, forcing Southeast Washington growers to use higher cost alternatives such as trucking and rail.

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

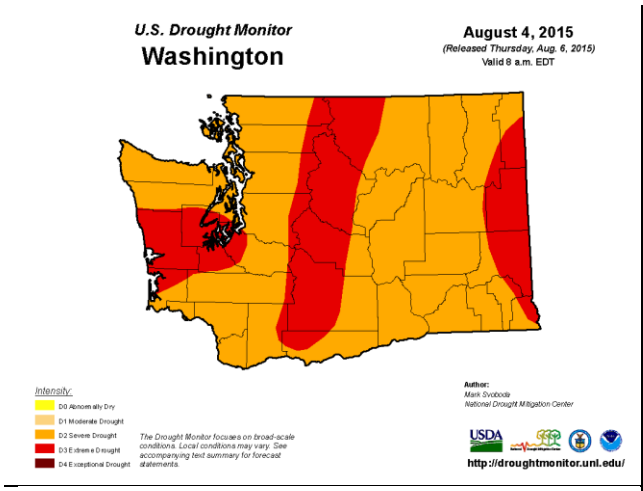
[61] U.S. Energy Information Administration. "Washington: Electricity". Available online at https://www.eia.gov/state/analysis.php?sid=WA.

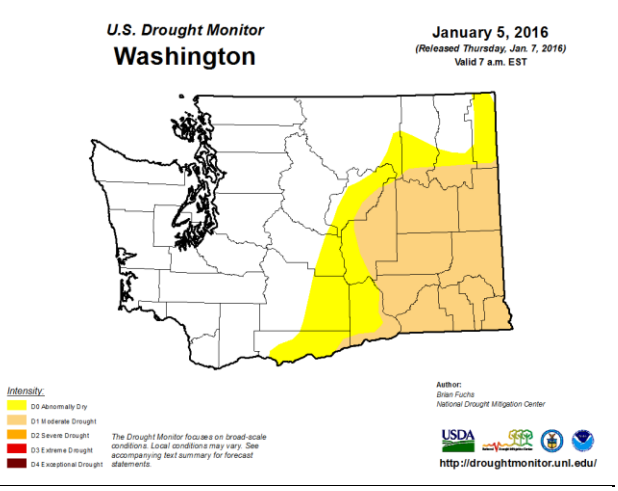
[62] National Drought Mitigation Center. University of Nebraska-Lincoln. "U.S. Drought Monitor". Available online at https://droughtmonitor.unl.edu/. May 2020.

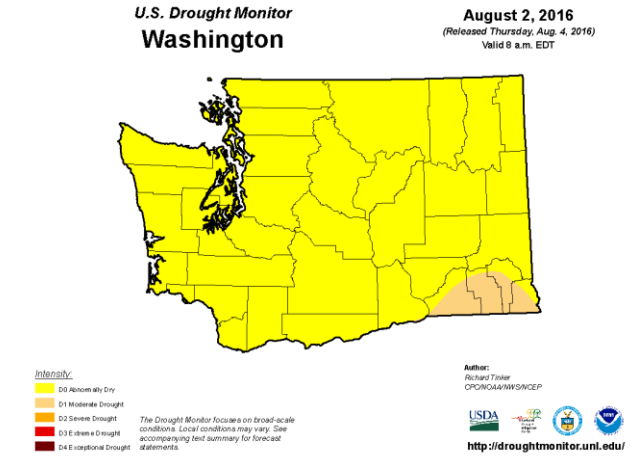
FIGURE 26: U.S. DROUGHT MONITOR - SNAPSHOTS OF FIRST WEEKS OF AUGUST 2012-2019 VS. FIRST WEEKS OF JANUARY 2013-2020[63]

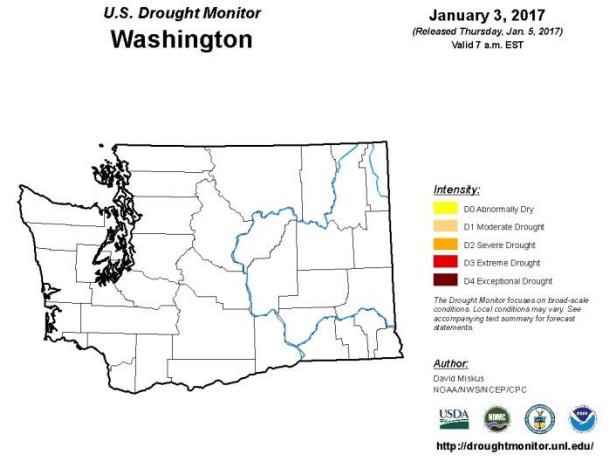


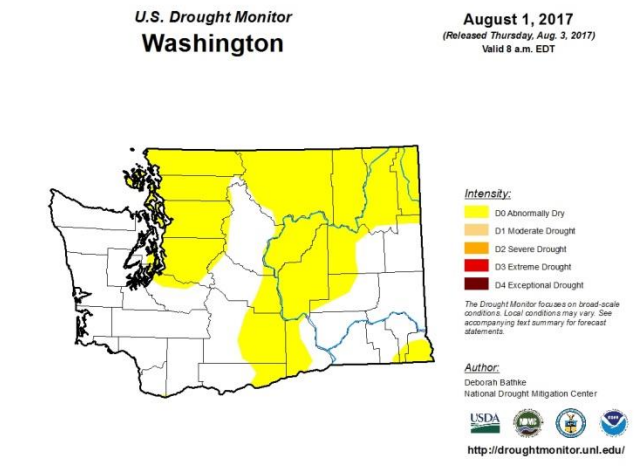
[63] National Drought Mitigation Center. University of Nebraska-Lincoln. "U.S. Drought Monitor". Available online at https://droughtmonitor.unl.edu/. May 2020.

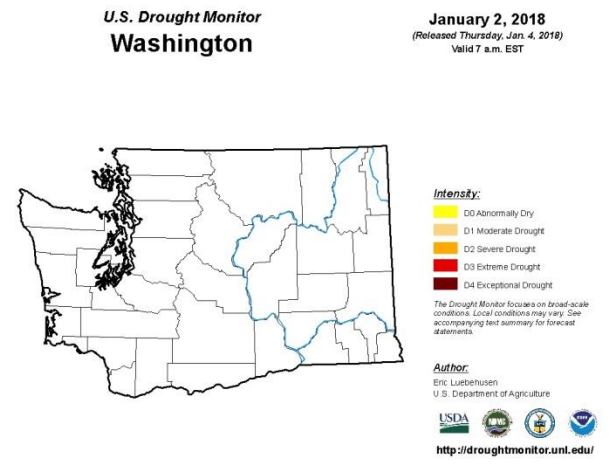

U.S. Drought Monitor
Washington
August 4, 2015
(Released Thursday, Aug. 6, 2015)
Valid 8 a.m. EDT
Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
Author:
Mark Svoboda
National Drought Mitigation Center
http://droughtmonitor.unl.edu/

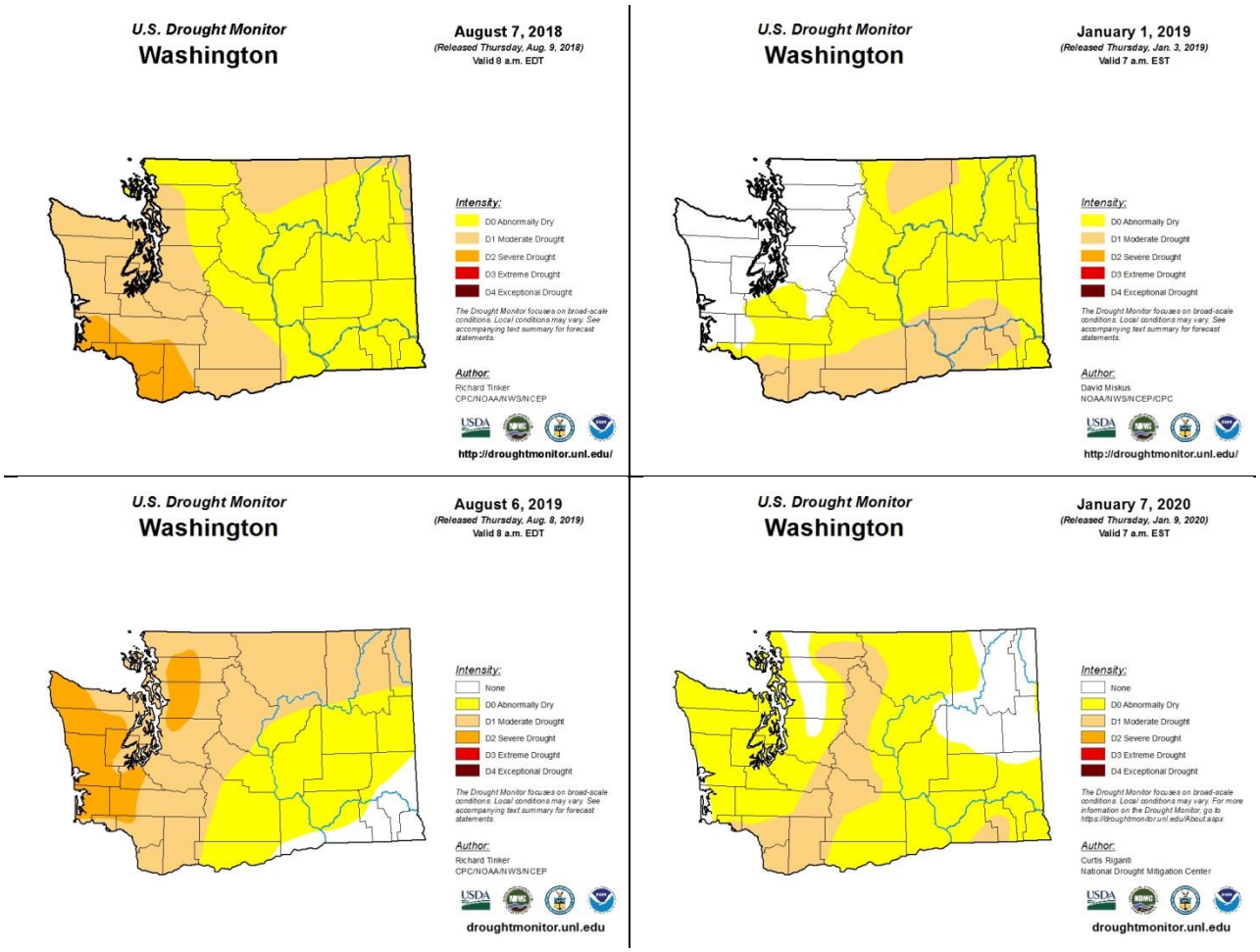

U.S. Drought Monitor
Washington
January 5, 2016
(Released Thursday, Jan. 7, 2016)
Valid 7 a.m. EST
Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
Author:
Brian Fuchs
National Drought Mitigation Center
http://droughtmonitor.unl.edu/


U.S. Drought Monitor
Washington
August 2, 2016
(Released Thursday, Aug. 4, 2016)
Valid 8 a.m. EDT
Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
Author:
Richard Tinker
CPC/NOAA/NWS/NCEP
http://droughtmonitor.unl.edu/


U.S. Drought Monitor
Washington
January 3, 2017
(Released Thursday, Jan. 5, 2017)
Valid 7 a.m. EST
Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
Author:
David Miskus
NOAA/NWS/NCEP/CPC
http://droughtmonitor.unl.edu/


U.S. Drought Monitor
Washington
August 1, 2017
(Released Thursday, Aug. 3, 2017)
Valid 8 a.m. EDT
Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
Author:
Deborah Bathke
National Drought Mitigation Center
http://droughtmonitor.unl.edu/


U.S. Drought Monitor
Washington
January 2, 2018
(Released Thursday, Jan. 4, 2018)
Valid 7 a.m. EST
Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
Author:
Eric Luebehusen
U.S. Department of Agriculture
http://droughtmonitor.unl.edu/



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

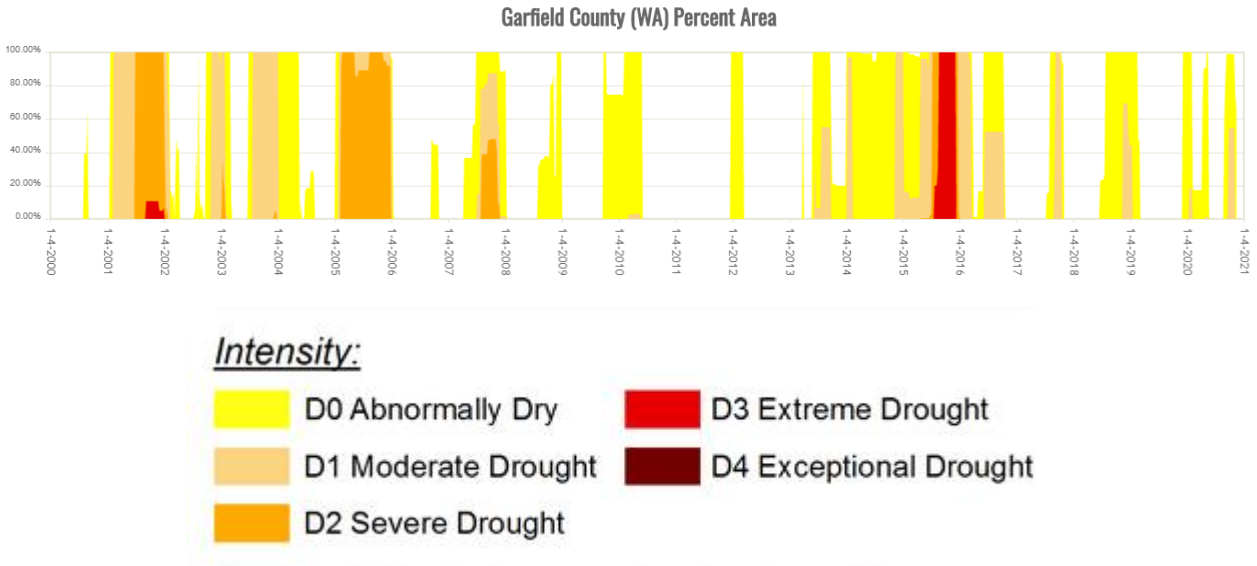
DROUGHT RISK ASSESSMENT

LOCAL EVENT HISTORY

The Washington State Legislature in 1989 gave permanent drought relief authority to the Department of Ecology and enabled them to issue orders declaring drought emergencies. Nearly all areas of the state are vulnerable to drought. In every drought, agriculture is adversely impacted, especially in non-irrigated areas such as dry land farms and rangelands. Droughts impact individuals (farm owners, tenants, and farm laborers), the agricultural industry, and other agriculture-related sectors.

The National Integrated Drought Information System has a time series feature (see below). This is an interactive tool that shows how long drought durations spanned from the years 2000 through 2020. This tool can be used to view what percent area of Garfield County was in drought during a given timespan.[64]

FIGURE 27: TIME SERIES FROM 2000 TO 2020 SHOWING THE PERCENT AREA OF GARFIELD COUNTY IN DROUGHT



The time series highlights the most recent severe drought event experienced in Garfield County. This occurred in 2015, roughly between late August and late November. During this period 100% of the county was in severe (D2) to extreme (D3) drought.

PROBABILITY OF FUTURE EVENTS

The Washington State Enhanced Hazard Mitigation Plan considers Garfield County to be at a medium risk to drought. This is a comparatively lower risk than nearby counties (such as Whitman, Walla Walla, and Asotin) and is, in part, due to the fact that Garfield County does not have as large of a population as its neighbors. The Washington State Enhanced Hazard Mitigation Plan makes the following statement regarding drought likelihood and prediction:

"Predicting future probability of a drought is difficult because of the number of variables involved in modeling the underlying climatic conditions. Whether a drought will occur (and how long it will last) depends on a huge number of factors including atmospheric and ocean circulation, soil moisture, topography, land surface processes and interactions between the air, land and ocean which ultimately influence temperature and precipitation. Predicting drought depends on the ability to forecast these two fundamental meteorological surface parameters, precipitation and temperature. From the historical record we know that climate is inherently variable, and that anomalies of precipitation and temperature

[64] United States Drought Monitor. "Time Series." Available online at https://droughtmonitor.unl.edu/Data/Timeseries.aspx.

may last from several months to several decades. But, given the number of variables involved it is difficult to predict future drought events."[65]

IMPACTS OF DROUGHT EVENTS BY JURISDICTION

GARFIELD COUNTY

Drought affects water levels for use by industry, agriculture and individual consumers. Water shortages affect firefighting capabilities through reduced flows and pressures. Drought also affects power production. Much of Washington State's power is produced by hydro-electric dams. When water levels drop, electric companies cannot produce enough power to meet demand and are forced to buy electricity from other sources. It is often difficult to recognize a drought before being in the middle of it. Droughts do not occur spontaneously, they evolve over time as certain conditions are met. Therefore, it is difficult to measure the losses and gains due to a drought.

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

The Washington State Legislature in 1989 gave permanent drought relief authority to the Department of Ecology and enabled them to issue orders declaring drought emergencies. Nearly all areas of the state are vulnerable to drought. In every drought, agriculture is adversely impacted, especially in non-irrigated areas such as dry land farms and rangelands. Droughts impact individuals (farm owners, tenants, and farm laborers), the agricultural industry, and other agriculture-related sectors.

Problems of domestic and municipal water supplies are historically corrected by building another reservoir, a larger pipeline, a new well, or some other facility. Short-term measures, such as using large capacity water tankers to supply domestic potable water, have also been used. As a result of droughts, agriculture uses new techniques. Federal and state governments play an active role in developing new water projects and soil conservation programs. RCW 43.83B.400 and Chapter 173-66 WAC pertain to drought relief.

Drought increases the danger of forest and wildland fires. Millions of board feet of timber have been lost. Loss of forests and trees increases erosion causing serious damage to aquatic life, irrigation, and power development by heavy silting of streams, reservoirs, and rivers. Low stream flows have created high temperatures, oxygen depletion, disease, and lack of spawning areas for our fish resources.

High quality agricultural soils exist in much of central and northern Garfield County. These areas of the county sustain dry land crops such as wheat that are dependent upon moisture through the winter and spring and dry arid conditions in the summer. While Garfield County does experience droughts, on the whole, they are mild and do not cause long term damage.

[65] Washington Military Department Emergency Management Division. "Washington State Enhanced Hazard Mitigation Plan." October 1, 2018. Available online at https://mil.wa.gov/asset/5d1626c2229c8.

Value of Resources at Risk

The most direct impact of drought is economic rather than loss of life or immediate destruction of property. Droughts impact individuals, the agricultural industry, and other related sectors. Additionally, there is increased danger of wildland fires associated with most droughts. Millions of board feet of timber have been lost, and in many cases, erosion occurred which caused serious damage to aquatic life, irrigation, and power production by heavy silting of streams, reservoirs, and rivers.

The 2001 and 2005 drought years caused only minor damages. There were no threats to any critical facilities. Thus, a minor to moderate drought has a low probability of affecting the county's economy directly.

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

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

CITY OF POMEROY

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

Value of Resources at Risk

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

GARFIELD COUNTY FIRE DISTRICT #1

The Fire District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, in severe drought years, the District may have difficulty finding adequate water resources for wildland fire fighting purposes, particularly where drafting from ponds or streams is necessary.

Value of Resources at Risk

The Garfield County Fire District #1 station in Pomeroy does not have any direct risks to drought.

POMEROY CONSERVATION DISTRICT

The Conservation District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, in severe drought years, the District will assist local farmers and ranchers with enrollment and participation in drought relief programs. The District also assists residents with cost share practices such as drilling wells, installing storage tanks or troughs, and pasture management that may lessen their risk of being impacted by drought conditions.

Value of Resources at Risk

The Conservation District office in Pomeroy does not have any direct risks to drought.

POMEROY SCHOOL DISTRICT #110

The School District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, the schools may partner with the city of Pomeroy and others to deliver water conservation education programs.

Value of Resources at Risk

The School District facilities in Pomeroy do not have any direct risks to drought.

GARFIELD COUNTY HEALTH DISTRICT

The Public Health District does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, the District may partner with the School District and others to deliver water conservation education programs.

Value of Resources at Risk

The Public Health District office does not have any direct risks to drought.

PORT OF GARFIELD

The Port of Garfield does not have any differing levels of risk associated with this hazard than Garfield County as a whole. However, the Port would be drastically affected by low water levels that impact commerce on the Snake River. The Pomeroy Grain Growers at the Port of Garfield site at Central Ferry ships approximately 10 million bushels of grain a year. Any slow down or blockage of this transportation route would be disastrous to the Pomeroy Grain Growers.

Value of Resources at Risk

The Port of Garfield does not have any direct risks to drought.

GARFIELD COUNTY HOSPITAL DISTRICT

Memorial Hospital does not have any differing levels of risk associated with this hazard than Garfield County as a whole.

Value of Resources at Risk

Memorial Hospital does not have any direct risks to drought.

GARFIELD COUNTY TRANSPORTATION AUTHORITY

The GCTA does not have any differing levels of risk associated with this hazard than Garfield County as a whole.

Value of Resources at Risk

The GCTA does not have any direct risks to drought.

SECTION 5 - HAZARD MITIGATION STRATEGY

ADMINISTRATION AND IMPLEMENTATION OF ACTION ITEMS

Critical to the implementation of this Multi - Hazard Mitigation Plan will be the identification of, and implementation of, an integrated schedule of action items targeted at achieving an elimination of lives lost and reduction in structures destroyed, infrastructure compromised, and unique ecosystems damaged that serve to sustain the way-of-life and economy of Garfield County.

Garfield County encourages the philosophy of instilling disaster resistance in normal day-to-day operations. By implementing plan activities through existing programs and resources, the cost of mitigation is often a small portion of the overall cost of a project's design or program. Through their resolution of adoption as well as their participation on the planning team, each jurisdiction is aware of, and committed to incorporating the risk assessments and mitigation strategies contained herein. It is anticipated that the research, local knowledge, and documentation of hazard conditions coalesced in this document will serve as a tool for decision-makers as new policies, plans, and projects are evaluated.

All risk assessments were made based on the conditions existing during 2019-2020 planning process, thus, the recommendations in this section have been made in light of those conditions. However, risks can change as can the preparedness and resources of the county. It will be necessary to review the recommendations outlined in this plan annually to adjust for changes in the components of risk, population density changes, infrastructure modifications, and other factors.

PRIORITIZATION OF ACTION ITEMS

The prioritization process includes a special emphasis on benefit-cost analysis review. The process will reflect that a key component in funding decision is a determination that the project will provide an equivalent or more in benefits over the life of the project when compared with the costs. Projects will be administered by the individual jurisdictions or the assigned organizations with support provided by the Emergency Manager.

County Commissioners and the elected officials of all jurisdictions have evaluated opportunities and established their own unique priorities to accomplish mitigation activities where existing funds and resources are available and there is community interest in implementing mitigation measures. If no federal funding is used in these situations, the prioritization process may be less formal. Often the types of projects that each county can afford to do on their own are in relation to improved codes and standards, department planning and preparedness, and education. These types of projects may not meet the traditional project model, selection criteria, and benefit-cost model. Garfield County and each jurisdiction will use this Multi-Hazard Mitigation Plan as guidance when considering pre-disaster mitigation proposals.

The prioritization of new projects and deletion of completed projects will occur annually and be facilitated by the Emergency Manager and the planning team. All mitigation activities, recommendations, and action items mentioned in this document are dependent on available funding and staffing.

PRIORITIZATION SCHEME

SCHEME ONE

During the conception of the Southeast Washington Multi-Hazard Mitigation Plan, the action items and project recommendations made in this MHMP were prioritized by the Garfield County using a process referred to as Scheme One. Most of the jurisdictions met with their represented governing bodies and prioritized their own list of projects, ranking their mitigation strategy recommendations through a group discussion, informal benefit/cost review, and voting process. Projects in these sections are rated on a "High", "Moderate", or "Low" scale.

2021 MHMP UPDATE PRIORITIZATION SYSTEM

During the planning process for the 2021 update, the planning team utilized a variation of FEMA Worksheet 6.1 to evaluate and prioritize each mitigation action item. An example of Worksheet 6.1 is in the Section 6 Appendix page XX. The planning team used the criteria of Worksheet 6.1 and its rating system to then assign each action item a "High", "Moderate", or "Low" designation. This prioritization method combines the formulaic evaluation from the worksheet with the informal system of "Scheme One".

Using a set of criteria, each action/project was evaluated using a +1, -1, or 0 ranking. If the criterion was 'Life Safety', the action/project was scored as +1 if it was deemed highly effective at protecting human life. The action/project would score -1 if it was considered ineffective at safeguarding human life. A score of 0 would be assigned if it is not apparent whether the action/project would protect human life, or if the criterion is not applicable. Once the final numbers are added up the action item would be left with a score. This score then assists the planning team, or the representatives from the adopting jurisdiction, in ranking the action item as "High", "Moderate", or "Low".

JURISDICTIONAL MITIGATION ACTION ITEMS

GARFIELD COUNTY

Hazard/ Item ID	Action Item	Goals Addressed/ Priority	Responsible Departments or Organizations	Potential Resources	Proposed Cost	Projected Completion Year
General GC-1	Upgrade Garfield County's GIS capabilities including software and training.	Goal #2, 3, 4, and 5 Priority Ranking: High	Garfield County			Ongoing
General GC-2	Develop a Comprehensive Watershed Assessment for the tributaries of the Snake River in southeastern Washington to assist with integrating local priorities for maintaining critical infrastructure along waterways and improving salmon and other fisheries habitats.	Goal #1 Priority Ranking: Low	**Partnership**: Columbia County, Garfield, Asotin County, Pomeroy Conservation District, and the Snake River Salmon Recovery Project			Ongoing
General GC-3	Improve training and response capabilities for Garfield County and city of Pomeroy emergency services through joint training exercises.	Goal #2, 3, and 5 Priority Ranking: Moderate	**Partnership:** Garfield County and Garfield County Fire District #1			1 large joint exercise annually plus 1 individual exercise annually
General GC-4	Obtain funding to install a Reverse 911 system.	Goal #2, 3, and 5	**Partnership:** Sheriff's Office and Emergency Management	Subscription purchased through Alert Sense	$4800 annually	To be fully implemented in 2021
General GC-5	Obtain funding for a search and rescue vehicle capable of hauling equipment, aiding in rescue of the injured or stranded, and removing debris (e.g. Humvee).	Goal #2, 3, and 5 Priority Ranking: LOW	**Partnership:** Sheriff's Office and Emergency Management	US military		2025
General GC-6	Upgrade communication capabilities including, but not limited to, the addition of a mobile communications center that could keep emergency services operational during a catastrophic event affecting the courthouse.	Goal #2, 3, and 5 Priority Ranking: HIGH	**Partnership:** Sheriff's Office, Emergency Management, and Garfield County Fire District #1	Port of Garfield – broadband		Broadband 2021

Hazard/ Item ID	Action Item	Goals Addressed/ Priority	Responsible Departments or Organizations	Potential Resources	Proposed Cost	Projected Completion Year
General GC-7	Provide for public access to broadband communications.	Goal #2 Priority Ranking: Moderate	Emergency Management, Port of Garfield			PROJECT STARTED 2021
General GC-8	Obtain a backup generator to serve as an alternate power source for County Courthouse radios and 911.	Goal #3	Emergency Management and Sheriff's Office, 911			Completed for 911
Flood GC-9	Improve vegetation management program along streams and rivers to lessen the flood risk caused by debris blockages.	Goal #1 Priority Ranking: Low	Garfield County and Pomeroy Conservation District			Ongoing
Flood GC-10	Provide assistance and opportunities for homeowners along Pataha Creek, Alpowa Creek, Deadman Creek, Meadow Creek and within the community of Pataha to participate in the national flood insurance program.	Goal #1 Priority Ranking: Moderate	Garfield County Emergency Management, Garfield County Engineer			Ongoing
Flood GC-11	Obtain funding for a backhoe and front-end loader to remove debris from flood prone streams.	Goal #1 and 3 Priority Ranking: Moderate	**Partnership**: Garfield County and City of Pomeroy			BACK-HOE ACQUIRED
Flood GC-12	Obtain funding for a track-hoe or excavator and front-end loader to remove debris from flood prone streams.					
Wildland Fire GC-13	Continue to work on action items and proposed projects identified in the Garfield County Community Wildfire Protection Plan.	Goal #1 Priority Ranking: Low	**Partnership**: CWPP stakeholders, Fire District #1			Ongoing
General GC-14	Build an emergency command center.	Goal # Priority Ranking: Low				
General GC-15	Construct a new well and water lines to service the community of Pataha to, at a minimum, enhance fire response capabilities.	Goal # Priority Ranking: Medium				

CITY OF POMEROY

Hazard/ Item ID	Action Item	Goals Addressed/ Priority	Responsible Departments or Organizations	Potential Resources	Proposed Cost	Projected Completion Year
General Pom-1	Build a containment area around Behlmeier Spring to protect it from vandalism and other hazards.	Goal #1, 4, and 7 Priority Ranking: Moderate	City of Pomeroy	Purchased additional property for a larger buffer and installed a security fence		Completed in 2018
General Pom-2	Work with Garfield County on road surface preservation, maintenance, and funding opportunities.	Goal #4 Priority Ranking: Moderate	**Partnership:** Garfield County and City of Pomeroy, Port of Garfield	WA DOT		In grant application progress
Flooding Pom-3	Encourage homeowners in identified floodplains to participate in the national flood insurance program.	Goal #9 and 11 Priority Ranking: Moderate	City of Pomeroy, Garfield County			Ongoing
Flooding Pom-4	Work with Fish and Game, USACE, and other agencies to evaluate Pataha Creek drainage and remove obstructions that may cause structural damage or flooding at bridges during a high water event.	Goal #2, 5, 7, 8, and 11 Priority Ranking: High	**Partnership:** Garfield County, City of Pomeroy, USACE, Nez Perce Tribe, and Fish and Game	Garfield County, Washington DOT, Washington Parks and Recreation		Evaluation performed annually each spring. Obstructions removed as needed
Flooding Pom-5	Obtain funding for a backhoe and front-end loader to remove debris from Pataha Creek.	Goal #1 and 3 Priority Ranking: Moderate	**Partnership:** Garfield County and City of Pomeroy			
Wildland Fire Pom-6	Improve flow and storage capacity for the municipal water infrastructure.	Goal #1, 3, and 4 Priority Ranking: High	City of Pomeroy	State Department of Health		Project postponed until 2023
Wildland Fire Pom-7	Continue to work with the fire district on the public awareness campaign that informs residents about fire safety and fire hazards and holds property owners accountable for fire hazard abatement and assists them.	Goal #2, 3, 5, 6, and 12 Priority Ranking: Moderate	**Partnership:** Garfield County Fire District #1 and City of Pomeroy	Garfield County Sheriff		Project began in 2016-2017 and is ongoing
Wildland Fire Pom-8	Continue to work on action items and proposed projects identified in the Garfield County Community Wildfire Protection Plan.	Goal #1, 2, 3, 5, and 8 Priority Ranking: Moderate	**Partnership**: CWPP stakeholders			Ongoing

GARFIELD COUNTY FIRE DISTRICT #1

Hazard/ Item ID	Action Item	Goals Addressed/ Priority	Responsible Departments or Organizations	Potential Resources	Proposed Cost	Projected Completion Year
General GCFD-1	Obtain funding for equipment upgrades to keep up with recent growth of the district including a 4x4 ambulance, and 6x6 ATV for remote rescue.	Goal #1 Priority Ranking: High	Garfield County Fire District #1	Ambulance will arrive in November 2020		2 years
General GCFD-2	Remodel and expand fire station in order to house apparatus and other equipment as well as provide room for training and offices.	Goal #2 Priority Ranking: High	Garfield County Fire District #1	Completed in 2019 (fire station and offices).		4 years
General GCFD-3	Seek grant and local funding for procuring an interface structural engine capable of pumping from the Pomeroy water system and carrying a substantial amount of water into rural areas.	Goal #2 Priority Ranking: High	Garfield County Fire District #1			Ongoing Needs revisited but still desired.
General GCFD-4	Work with County Emergency Management to provide a staff position related to public safety combining the jobs of the fire chief, EMS director, and director of emergency management.	Goal #2 Priority Ranking: High	**Partnership:** Garfield County Fire District #1 and Emergency Management			2 years Needs revisited. Work in progress.
General GCFD-5	Work out an agreement to provide locally-based Advanced Life Support services to all of Garfield County.	Goal #2 Priority Ranking: Moderate	**Partnership:** Garfield County Fire District #1 and Emergency Management	MOUs with Lewiston, Asotin, and Life Flight		2 years
General GCFD-6	Identify potential hazardous material exposures and develop public education pertaining to hazardous material issues.	Goal #1 Priority Ranking: Moderate	Garfield County Fire District #1	PR campaign needs development through LEPC.		Ongoing Identification completed.
General GCFD-7	Obtain funding for training on high angle rescue techniques and equipment necessary for emergency response on new wind towers throughout the County.	Goal #2 Priority Ranking: High	Garfield County Fire District #1	Puget Sound Energy is a partner. MOUs needed.		2 years
Wildland Fire GCFD-9	Explore project to update the Garfield County Community Wildfire Protection Plan.	Goal #1 and 2 Priority Ranking: Moderate	**Partnership:** CWPP stakeholders			2025

GARFIELD COUNTY HOSPITAL DISTRICT

Hazard/ Item ID	Action Item	Goals Addressed/ Priority	Responsible Departments or Organizations	Potential Resources	Proposed Cost	Projected Completion Year
General Hosp-1	Develop a standard for the routine update of incident command policies and procedures, training, and disaster drills following the "Ladder Approach" to Incident Command Response Training.	Goal #1 Priority Ranking: High	**Partnership:** Garfield County Memorial Hospital, Emergency Management, and Public Health	Garfield County LEPC.		Ongoing. Has been implemented but needs to be formalized.

POMEROY SCHOOL DISTRICT NO 110

Hazard/ Item ID	Action Item	Goals Addressed/ Priority	Responsible Departments or Organizations	Potential Resources	Proposed Cost	Projected Completion Year
General PSD-1	Mitigate ground settling issues on northeast corner of the Pomeroy Junior/Senior High School.	Goal #2 Priority Ranking: High	Pomeroy School District No. 110			2 years
General PSD-2	Continue to provide structural fire and EMS safety education to elementary school grades.	Goal #1 and 2 Priority Ranking: High	**Partnership:** Pomeroy School District No. 110 and Garfield County Fire District #1			Ongoing
General PSD-3	Obtain a backup generator to serve as an alternate power source for the schools.	Goal #2 Priority Ranking: High	Pomeroy School District No. 110			2 years
Earthquake PSD-4	Seismically retrofit primary school facilities throughout District No 110.	Goal #2 Priority Ranking: High	Pomeroy School District No. 110			2 years
Wildland Fire PSD-5	Improve public outreach and education regarding wildland fire risks, evacuation procedures, etc.	Goal #1 Priority Ranking: Moderate	**Partnership:** Pomeroy School District No. 110 and Garfield County Fire District #1			Ongoing
Wildland Fire PSD-6	Continue to work on action items and proposed projects identified in the Garfield County Community Wildfire Protection Plan.	Goal #1 and 2 Priority Ranking: Low	**Partnership:** CWPP stakeholders			Ongoing

PORT OF GARFIELD

Hazard/ Item ID	Action Item	Goals Addressed/ Priority	Responsible Departments or Organizations	Potential Resources	Proposed Cost	Projected Completion Year
Severe Weather Port-1	Replace 15,000 square feet of roof on the Port of Garfield #3 building.	Goal #2 Priority Ranking: High	Port of Garfield		$90,000	3 years
Severe Weather Port-2	Replace 21,460 square feet of roof on main Port of Garfield building.	Goal #2 Priority Ranking: High	Port of Garfield		$120,000	5 years
Earthquake Port-3	Seismically retrofit office and warehouse structure.	Goal #3 Priority Ranking: Low	Port of Garfield			6 years
Wildland Fire Port-4	Continue to work on action items and proposed projects identified in the Garfield County Community Wildfire Protection Plan.	Goal #1 and 2 Priority Ranking: Medium	**Partnership:** CWPP stakeholders			Ongoing

GARFIELD COUNTY HEALTH DISTRICT

Hazard/ Item ID	Action Item	Goals Addressed/ Priority	Responsible Departments or Organizations	Potential Resources	Proposed Cost	Projected Completion Year
General Health-1	Continue to provide citizens with on-site evaluations, information on water testing, and technical assistance to ensure the water supply is safe for human consumption.	Goal #1 and 2 Priority Ranking: MODERATE	Garfield County Health District			Ongoing
General Health-2	Improve the integrated communications system with Garfield County.	Goal #2 Priority Ranking: High	**Partnership:** Garfield County Health District and Emergency Management			Ongoing
General Health-3	Continue to facilitate public awareness campaigns and programs regarding various public health and safety topics.	Goal #1 Priority Ranking: Low	Garfield County Health District			Ongoing
Wildland Fire Health-4	Continue to work on action items and proposed projects identified in the Garfield County Community Wildfire Protection Plan.	Goal #1 and 2 Priority Ranking: Low	**Partnership:** CWPP stakeholders			Ongoing

POMEROY CONSERVATION DISTRICT

Hazard/ Item ID	Action Item	Goals Addressed/ Priority	Responsible Departments or Organizations	Potential Resources	Proposed Cost	Projected Completion Year
General Cons-1	Continue to facilitate upland conservation projects to protect various natural resources.	Goal #1 and 4 Priority Ranking: High	Pomeroy Conservation District			Ongoing
General Cons-2	Promote through public education the installation of conservation practices and other best management practices that will protect the natural resources of Garfield County.	Goal #1 and 2 Priority Ranking: High	Pomeroy Conservation District			Ongoing
Severe Weather Cons-3	Upgrade network of weather stations in Garfield County.	Goal #2 Priority Ranking: High	**Partnership:** Garfield County Fire District #1 and Pomeroy Conservation District			3 years
Flood Cons-4	Continue to work with landowners to provide for buffer strips along stream channels for water protection.	Goal #1, 2, 3, and 4 Priority Ranking: Moderate	Pomeroy Conservation District			Ongoing
Flood Cons-5	Continue to facilitate stream bank stabilization projects on public and private lands in response to changes in the stream channel or land uses.	Goal #1, 2, and 4 Priority Ranking: Moderate	Pomeroy Conservation District			Ongoing
Wildland Fire Cons-6	Continue to work on action items and proposed projects identified in the Garfield County Community Wildfire Protection Plan.	Goal #1, 2, 3, 4, and 5 Priority Ranking: Moderate	**Partnership:** CWPP stakeholders			Ongoing
Severe Weather Pom-8	Upgrade network of weather stations in Garfield County.	Goal #1, 4, 6, and 12 Priority Ranking: Moderate	**Partnership:** Pomeroy Conservation District and Emergency Management			3 years

GARFIELD COUNTY TRANSPORTATION AUTHORITY

Hazard/ Item ID	Action Item	Goals Addressed/ Priority	Responsible Departments or Organizations	Potential Resources	Proposed Cost	Projected Completion Year
GCTA-1	Provide Transportation Assistance to local, state, and federal agencies when requested by Emergency Management.	Goal #1 Priority Ranking: HIGH	GCTA	Emergency Management, WA EMD		Yearly; ongoing agreement